Reflective Writing:
Quantitative Assessment and
Identification of Linguistic Features

By

ROSANNE BIRNEY, B.Sc.

Foirfe chun fónaimh

Waterford Institute of Technology

Research Supervisor: **Dr. Mícheál Ó hÉigeartaigh**

Thesis submitted to WIT for the Award of

Doctor of Philosophy

July 2012

Abstract

Reflective writing is used in higher education to encourage students to reflect on their learning or practice; in this context, reflective writing is frequently assessed. However, not enough is known about the criteria that educators use when assessing reflection. Many studies have developed rubrics for reflective writing assessment but these instruments are based on broad qualitative criteria and make no attempt to quantify depth of reflection. In addition to this, little is known about the linguistic structure of reflective writing; although some recent studies have examined its features, these characteristics have not been correlated to levels of reflective depth.

Also of concern are the ways in which technology can impact the reflective writing and assessment process. Although many studies tout the benefits of using reflective blogging in higher education there is a dearth of empirical data that compares the effectiveness of blogging with more traditional 'offline' journals.

A Delphi study was conducted with a group of international Reflective Practice experts to determine the criteria they use to assess reflective writing. The first round of the study identified 12 indicators of reflection; in the second round experts ranked these indicators according to depth of reflection. The reflection indicators form the basis of an instrument that can be used to assign a quantitative score to a piece of reflective writing based on the depth of reflection it contains.

This instrument was used to perform a content analysis on the academic reflective writing contained in 27 reflective blogs and journals. The linguistic resources used in students' writing were also assessed. A strong correlation was found between the overall reflective score and the total number of linguistic resources used, showing that reflective writing tends to be linguistically richer. In addition to this, relationships were seen between specific features of reflective writing and levels of reflection. A reflective scoresheet was developed that maps reflective writing assessment criteria to expected linguistic resources. This new understanding of the structure of reflective writing also has implications for the fields of automated writing evaluation and intelligent tutoring.

The study also compared the writing in blogs and journals and found no significant difference in the linguistic resources they utilised, showing that the type of language used is the same, regardless of medium. A correlation was seen between the provision of feedback and improvement in reflective writing over time. A model of the reflective writing and assessment process that describes how blogs can be used to support the provision of regular formative feedback was presented.

Declaration:

The author hereby declares that, except where duly acknowledged, this thesis is entirely her own work and has not been submitted for any degree in Waterford Institute of Technology, or in any other educational institution.

Signed: _____

<div align="right">

Rosanne Birney

</div>

Acknowledgements

Firstly I would like to thank my supervisor, Dr. Mícheál Ó hÉigeartaigh for his support throughout the duration of the research. Mrs. Mary Barry, who was involved in the supervision of the research at an early stage, provided an invaluable grounding in the procedures of postgraduate research.

I would also like to thank the many other people in the Waterford Institute of Technology who have helped me with my research, including the members of the WeLearnT Research group and the staff members with expertise in Reflective Practice who kindly agreed to be interviewed by me. Particular thanks go to Peter Carew, who assisted in performing an analysis to establish the reliability of the Reflective Writing Assessment Instrument developed in this study, and to Annetta Stack, who provided helpful comments on drafts of the educational context chapter.

A large component of this research was a Delphi study with a group of Reflective Practice experts. The development of the Reflective Writing Assessment Instrument would not have been possible without their valuable input. I am also extremely grateful to the several groups of students who agreed to give me access to their reflective journals. In addition to this, I would like to extend my gratitude to Margaret Denny and Suzanne Denieffe from WIT's Department of Nursing, who accommodated my requests for details of reflective writing assignments.

On a more personal note, I would like to thank my colleagues Amanda, Lucy, Sinéad, Brenda and Siobhán for their moral support and words of encouragement. My friends outside WIT also helped in this regard, particularly Sinéad Allen who provided regular inspirational quotes via email.

My parents, Colin and Mary, have given me their full support throughout my entire education, for which I am very grateful. My mother has patiently proofread many drafts of this thesis, which deserves a special mention. My brother, David, always reminds me that there's more to life than work and that other creative outlets are equally important. Finally, my husband Maurice has listened with a tireless ear to my daily ups and downs and given me many pep talks along the way; I am very thankful for his unwavering support.

To understand is hard. Once one understands, action is easy.

Sun Yat Sen (1866-1925)

Table of Contents

Table of Figures

Table of Tables

Chapter 1 : Introduction

1.0 Introduction to Research Problem

Reflective writing has long been used in higher education to reflect on learning (encouraging students to assimilate and integrate new knowledge and develop an understanding of their own learning processes) and on practice-based work placements (to create links with theory and improve on subsequent practice) (Boud, Keogh & Walker, 1985; Schön, 1987; Hatton & Smith, 1995). Reflective journals are used as a vehicle for students to demonstrate that they are reflective learners (possibly to meet the learning outcomes of a course or module) and therefore are often assessed either formally or informally (Moon, 1999a; George, 2002; Philip, 2006). Reflective frameworks habitually propose a hierarchy of levels at which reflection can occur, with each level representing a greater 'depth' of reflection (e.g. Van Manen, 1977; Mezirow, 1991; Hatton & Smith, 1995).

However, not enough is known about the criteria that educators use when assessing reflection, particularly when it comes to determining depth of reflection (Hargreaves, 2004; Hobbs, 2007). Several authors in the field call for the establishment of a more detailed set of reflective writing assessment criteria (e.g. Sumison & Fleet, 1996; Moon, 2007; Dalley, 2009; Toms, 2009). Many studies have developed rubrics for the assessment of reflective writing (e.g. Wong *et al.*, 1995; Plack *et al.*, 2007; Findlay, Dempsey & Warren-Forward, 2010) but all of these instruments are based on broad qualitative criteria and make no attempt to quantify 'depth' of reflection. Biggs (1999) notes that, for the purpose of accreditation, it is often required to turn holistic judgements into quantitative figures; this is not addressed by existing reflective writing assessment instruments.

Also, little is known about the linguistic structure of reflective writing. Research on this topic is scarce; however, a number of recent studies have begun to examine the features of academic reflective writing (Shaheed & Dong, 2006; Luk, 2008; Reidsema & Mort, 2009). A model of the linguistic resources used in academic reflection has been

proposed by Ryan (2011). Thus far, no attempt has been made to relate specific features in reflective writing to levels of reflective depth.

Also of concern are the ways in which technology can impact the reflective writing and assessment process, either positively or negatively. The nature of reflective writing may be changing given the new media used for reflection. Although there are many studies that tout the benefits of using reflective blogging in higher education (e.g. Shoffner, 2005; Ray & Hocutt, 2006; Lee, 2010) there is a dearth of empirical data that compares the effectiveness of blogging with more traditional 'offline' journals (Sim & Hew, 2010).

A frequently noted problem in the assessment of reflective writing is the workload involved from an assessor's point of view (particularly if regular, formative feedback is to be given to students) (Hearst, 2000; Buchanan, 2003; MacColl *et al.*, 2005). While automated assessment (or intelligent tutoring) is useful in addressing resource issues in other subject domains (Mitchell *et al.*, 2003; Higgins & Bligh, 2006), there are a number of obstacles to the automated assessment of reflective writing. Foremost among these issues are the two problems described above: that current descriptions of reflective writing assessment criteria are ill-defined and that there is insufficient knowledge on the linguistic features of reflective writing. Automated assessment systems that evaluate writing work by either comparing students' answers with a model answer or by training a system using a set of graded essays (Rudner & Liang, 2002; Sukkarieh, Pulman & Raikes, 2003). Both of these approaches assume that a 'correct' student essay will have similarities either with the model answer or other highly-scored essays. It is unknown whether reflective writing contains any discernible patterns of linguistic features that would allow a system to determine whether reflection was taking place (and at what level of reflective depth).

1.1 Research Questions

There is a need for more detailed reflective writing assessment criteria. The identification of linguistic features that relate to varying levels of reflective depth would also be useful, not just from an assessor's point of view but also in terms of any future implementations of automated assessment technologies in the reflective writing and assessment process. The goal of this thesis is to improve the current understanding of reflective writing and its assessment by answering the following questions:

1. What constructs most accurately describe the characteristics of a piece of reflective writing?

2. Does reflective writing have a predictable linguistic structure?

3. What is the likely impact of the integration of technology in the reflective writing and assessment process?

1.2 Clarification of terms

This section expounds a number of terms that are used regularly in this thesis.

- Higher education: this is used throughout the thesis as a 'catch-all' term to refer to both third-level (undergraduate) and fourth-level (postgraduate) education, either in a university or an institute of technology. Therefore, it encompasses courses of study that correspond to Levels 6 – 10 of the NQAI framework (NQAI, 2002).
- Reflective journal: a journal that has been used by the author to reflect on her learning or practice. This has been used as a generic term throughout the thesis to refer to any type of medium for reflective writing; wherever there is a

distinction made between media, this will be noted in the text. The types of media used for reflective writing can be categorised into offline and online formats:

- o Offline journal: sometimes referred to as a 'traditional' reflective journal, this format is often handwritten (although the journal can be typed using word processing software).

- o Online journal: an online reflective journal is one where the student utilises a web-based service in the writing of the journal (and the assessor may access the journal via the web). Reflective blogs are the online format that is most frequently referred to throughout the thesis. (A blog is a website with dated entries in reverse chronological order.)

1.3 Scope of Research

It is acknowledged that reflective writing takes place in many contexts. However, the focus of this study was reflective writing (and its assessment) in a higher education setting. This thesis examined academic reflective writing that was done by students to satisfy part of their coursework requirements.

The thesis documents the development of a Reflective Writing Assessment Instrument that assesses depth of reflection based on twelve criteria. These criteria were developed using a Delphi study with a group of international Reflective Practice experts. These experts were all involved in higher education.

The instrument that was developed was then implemented in an examination of reflective writing. The blogs and journals collected for this analysis were all used as reflective learning journals that formed part of an assessed reflective writing assignment in a higher education setting.

The goal of this thesis was to improve the current understanding of reflective writing. This was to be achieved by the development of detailed reflective writing assessment

criteria and the identification of related linguistic features in students' writing. While recommendations are made in the thesis about the ways in which technology (including automated assessment) might be integrated in the reflective writing and assessment process, the development of automated assessment tools was deemed to be far beyond the scope of this project.

This study examined reflective writing; however, it is acknowledged that writing is not the only means of expressing reflection. Evidence of reflection conveyed through other modes was not evaluated in this thesis. In addition to this, it is acknowledged that the degree to which a student's writing is reflective may not necessarily evince how reflective they are as a person. A variety of sociolinguistic factors may affect the way a student uses language (e.g. age, ethnicity, socioeconomic class, native language); these factors were not considered in this study.

1.4 Research Contribution

This thesis makes a number of contributions to knowledge, methodology and practice. The thesis adds to the understanding of reflective writing by examining its linguistic features and mapping these features to specific indicators of reflection (something that had not previously been attempted by other authors in this field). It also contributes to the body of research on the use of Web 2.0 technologies in education, where there is a lack of empirical data.

The Reflective Writing Assessment Instrument constructed in this thesis also makes a contribution to methodology. A review of studies that developed similar instruments was undertaken (in Section 3.1). In comparison to these instruments, the one developed in this thesis is unique as it the only one to assign a quantitative score to a piece of reflective writing based on depth of reflection. The reliability of this instrument has been confirmed and it could prove a useful tool for future researchers in this area.

In addition to this, the thesis makes a contribution to practice. Earlier, some problems with the assessment of reflective writing were set out from an assessor's point of view. Reflective writing assessment criteria are ill-defined; also, little is known about the linguistic features used in students' reflective writing. This thesis addresses these issues by providing a rubric that defines twelve indicators of reflection and specifies the expected linguistic resources in relation to each indicator. The thesis also provides a model that describes the ways in which technology might be integrated in the reflective writing and assessment process.

1.5 Structure of thesis

Chapter One introduces the research problem and sets out the research questions to be addressed. Terms used in the thesis are clarified and the scope is defined. The contribution of the research is recounted. The structure of the thesis is described (and is mapped out in Figure 1.1).

Chapter Two defines the educational context for the study. Educational philosophy is examined and models of learning are discussed. Reflective writing and related frameworks are reviewed and the use of technology (specifically, the use of reflective blogging) in the reflective process is considered. Assessment is then explored and technologies that support the assessment process are evaluated.

Chapter Three examines research studies whose objectives are closely linked to the one described in this thesis. First, articles that document the development of reflective writing assessment rubrics are discussed and the instruments are compared. Then, studies that examine the linguistic structure of reflective writing are reviewed.

In Chapter Four, the research methodology and research design used in this study are considered. Then, the individual methods used to answer the research questions are discussed. The ethical considerations of this research are also examined.
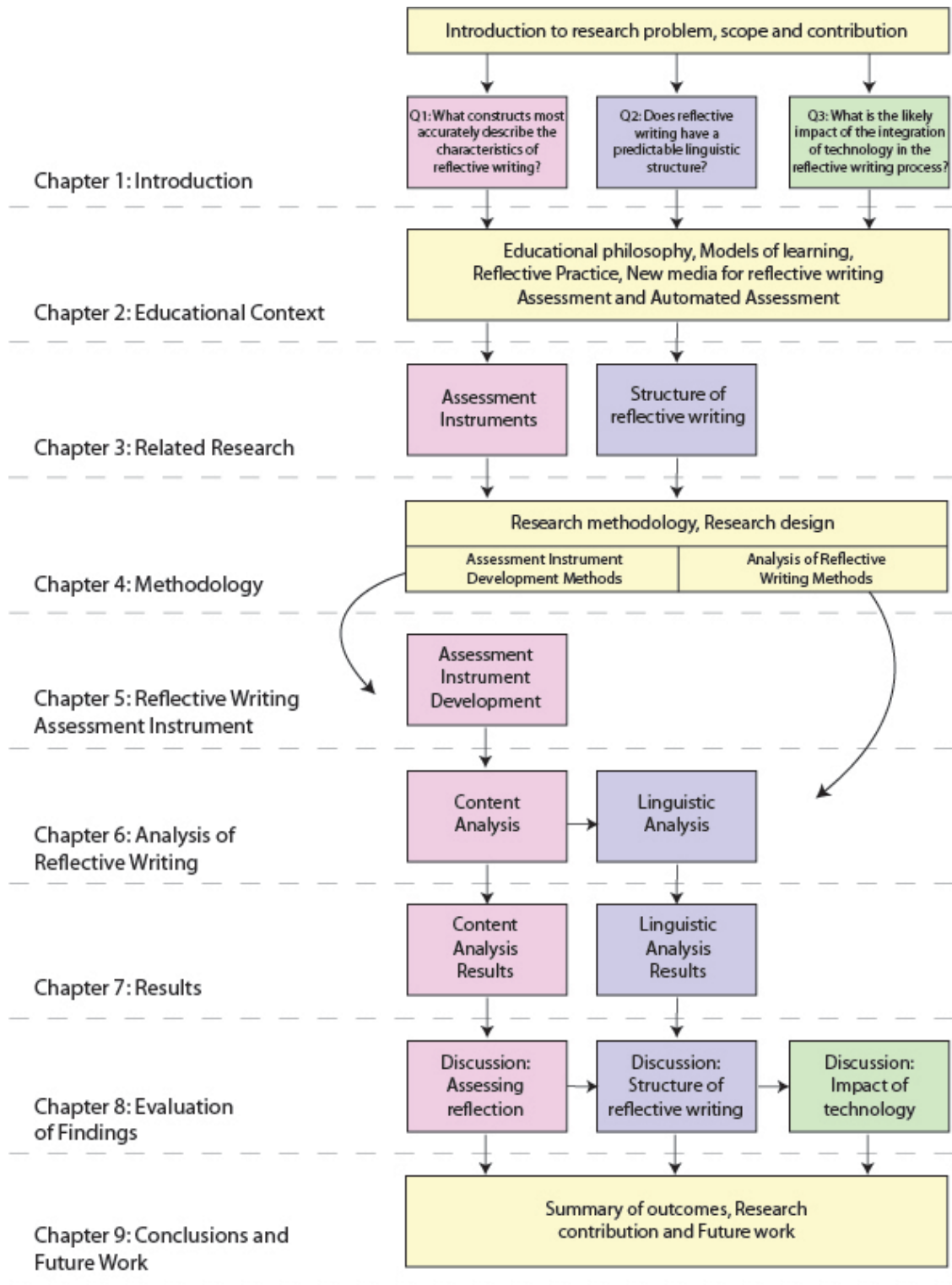
Figure 1.1: Map of thesis structure

Chapter Five focuses on the development of the Reflective Writing Assessment Instrument. The procedures used to acquire, order and weight the reflection indicators

are presented and results from this phase are set out. The development of a coding scheme based on these indicators is discussed.

Chapter Six describes how the Reflective Writing Assessment Instrument was applied to the text of reflective journals. The inter-coder reliability of the content analysis is confirmed. Excerpts from student journals that represent each type of reflection indicator and linguistic resource are presented.

In Chapter Seven, the results from the analysis of reflective writing are discussed. Findings that relate to the levels of reflection identified in reflective journals are presented and blogs and handwritten journals are compared. The results from the analysis of the linguistic structure are also set out.

In Chapter Eight, the findings from the analysis of reflective writing are examined in relation to the research questions and are also compared to the results of related studies in the literature on reflective writing. The final Reflective Writing Assessment Instrument is presented, which maps reflection indicators to linguistic resources. Also, a model that describes how technology can support the reflective writing and assessment process is proposed.

Finally, in Chapter Nine, the outcomes of the research are discussed. The theoretical, methodological and educational contributions of this research are considered and recommendations for future work in this area are made.

Chapter 2 : Educational Context

2.0 Chapter Introduction

This chapter examines the educational context that is relevant to the study. First, in Section 2.1, theoretical perspectives in education are examined and the differences between the behaviourist, cognitivist, constructivist and social constructivist approaches are expounded. Then, andragogy is examined and reflective and experiential learning are considered.

Section 2.2 examines reflective learning in more detail. It begins by defining reflection and examining the benefits of, and barriers to, reflective practice in a higher education setting. Models that depict reflection as part of a process of experiential learning are then considered, followed by frameworks that describe the reflective process itself (with a focus on those that define reflection in terms of levels of reflective 'depth').

Then, in Section 2.3, the ways in which technology can support the reflective learning process are considered. The evolution of educational technology is described and the use of Web 2.0 tools in education is examined. The educational uses of blogs are described and their ability to support reflective dialogue is considered.

Section 2.4 discusses assessment principles in relation to the theoretical perspectives in education that were set out at the beginning of the chapter. Different methods of assessing reflective writing are presented and the degree to which students and assessors should be supported with reflective guidelines is examined. The benefits of formative assessment are extolled and issues with the provision of regular feedback are discussed.

Finally, Section 2.5 considers the use of technology in the assessment process. The evolution of automated assessment technologies is examined and automated writing evaluation systems are described and compared. The degree to which these systems can effectively assess student writing is evaluated.

2.1 Educational philosophy and approaches to learning

This section compares three philosophical perspectives in education: behaviourism, cognitivism and constructivism (along with social constructivism). Andragogical approaches to learning are described. Then, links are made between reflective learning and cognitivist, constructivist and social constructivist theory.

2.1.1 Theoretical perspectives

In the last century, two major fields of psychology have influenced learning theory: behaviourism and cognitivism (Anderson, 2004). Behaviourist learning theory inherits from the related field of psychology that held a dominant position throughout the first half of the 20th century. Behaviourist psychologists focused only on observable behaviours, believing the conscious mind to be of little relevance. Much of the research in this area stemmed from experimental studies with animals where conditioning (repeated exposure to a stimulus, where correct responses are rewarded and incorrect responses punished) was found to lead to a predictable and observable change in behaviour.

In terms of education, the behaviourists' perspective is that "learning is accomplished when a proper response is demonstrated following the presentation of a specific environmental stimulus" (Ertmer & Newby, 1993, p. 55). For example, a question (stimulus) about the sum of "2 + 4" should result in the correct response "6". In the behaviourist tradition, an emphasis is placed on external, environmental conditions and internal thought processes are largely ignored (Carlile & Jordan, 2005). Behaviourist learning is related to the development of lower-order mental skills (e.g. knowledge acquisition and memorisation of facts).

Wilson and Myers (2000) note that although behaviourism is often discredited as a theoretical perspective for education this view is unfair. Mayes and de Freitas (2004, p. 8) agree and assert that behaviourism emphasises "learning-by-doing with immediate

feedback on success". Bruner (1966) states that behaviourist learning (e.g. the acquisition and memorisation of factual knowledge) is important at lower levels of education (i.e. primary education).

An alternative psychological stance, known as cognitive psychology, became prominent in the 1950s and '60s. Cognitivists were interested in subjects' internal thought processes and began to develop representations of how information is processed in the mind (e.g. Sternberg, 1966). From an educational perspective, cognitivists purport that "learning is equated with discrete changes between states of knowledge rather than with changes in the probability of response" (Ertmer & Newby, 1993, p. 58). The cognitive perspective acknowledges the internal processes involved in learning, as opposed to only focusing on the external, observable changes that may be brought about by learning. Another key difference between these two theoretical standpoints is that, with behaviourist learning, the student is viewed as a passive recipient of knowledge. Cognitivists, on the other hand, view the learner as an active participant in their learning (Ertmer & Newby, 1993).

A third school of thought on learning has emerged more recently (towards the end of the 20th century) and has been emphasised in the literature on learning theory. This approach is known as constructivism. While both behaviourist and cognitive approaches are teacher-centred, the constructive approach is student-centred (Carlile & Jordan, 2005). Constructivism is considered to be a branch of cognitivism (Ertmer & Newby, 1993; Conole, 2010) as both theories view learning as a mental process and state that the learner has an active role in this process. However, where behaviourism and cognitivism both purport the existence of an external reality that learners strive to know, constructivist theorists believe that learners construct internal representations of reality (Ertmer & Newby, 1993; Barr & Tagg, 1995).

Constructivist theory states that the way learners perceive new knowledge is affected by their previous experiences and understanding (Bruner, 1966). Rather than simply taking in knowledge and storing it, learners transform information and construct hypotheses. Constructivism asserts that learners use mental models to help them interpret

experiences and transform information into knowledge (Brandt, 1997). These mental models allow the learner to conceptualise a particular topic. When the learner receives new information about a topic, they incorporate this information with their existing mental model, thus expanding their knowledge of the topic. Educators can use the mental models possessed by students as an organising framework when teaching them a new concept. In the Constructivist paradigm, the role of the tutor changes from that of a 'lecturer' who simply dispenses information, to that of a 'coach' (Wilson, 1997). This is a supportive role, which also involves the design of authentic learning experiences that encourage students to become actively engaged in their learning. Lebow (1993) has identified seven primary constructivist values: these are collaboration, personal autonomy, generativity, reflectivity, active engagement, personal relevance, and pluralism.

A final perspective on learning that should be considered is known as social constructivism. Theorists in this area propose that a student's ability to learn can be greatly improved when 'scaffolding' is provided through the support of mentors or peers (e.g. Vygotsky, 1934). Mayes and de Freitas (2004) discuss 'situative' learning which occurs when learning is situated in the social context (e.g. practice placements); from a social constructivist's perspective, learning is enhanced when a student interacts with expert communities of practice (Lave & Wenger, 1991).

Each of the theoretical perspectives described above has its strengths. Drucker (1973, p. 4), speaking about the differences between behaviourist and cognitivist theories, suggested that both perspectives have appropriate applications in education:

> *"These old controversies have been phonies all along. We need the behaviourist's triad of practice/reinforcement/feedback to lodge learning in memory. We need purpose, decision, values, understanding – the cognitive categories, lest learning be mere behaviour, activity rather than action."*

Ertmer and Newby (1993, p. 70) echo Drucker's comments and add that there is also a need for:

> *"adaptive learners who are able to function well when optimal conditions do not exist, when situations are unpredictable and task demands [sic] change, when the*

> *problems are messy and ill-formed and the solutions depend on inventiveness, improvisation, discussion and social negotiation".*

Ertmer and Newby (1993) compare the behaviourist, cognitivist and constructivist perspectives and state that a behavioural approach can be useful for learning 'what' (i.e. mastering content); a cognitive approach enables learning 'how' (application of knowledge in different contexts); while a constructive approach can support advanced learners in solving ill-defined problems. They suggest that the approach taken also depends of the requirements of the task; for example, memorisation tasks are frequently associated with a behaviourist outlook. Tasks requiring a higher level of processing are best suited to cognitive strategies such as analogical reasoning or algorithmic problem solving. Tasks like heuristic problem solving or the monitoring of one's own cognitive processes are often best suited to strategies that take a constructivist perspective (Ertmer & Newby, 1993). To summarise, as the learner's level of knowledge and the level of processing required by a task increase, the strategies used should move from a behaviourist, to a cognitivist, to a constructivist perspective (Bruner, 1966; Ertmer & Newby, 1993; Moallem, 2001).

The following section maps specific learning approaches to the theoretical perspectives described above, with a focus on reflective and experiential learning.

2.1.2 Andragogical approaches

As this thesis examines learning in a higher education context, the focus is on andragogy, rather than pedagogy. Adults construct knowledge in a different way to children (Carlile & Jordan, 2005). Knowles (1980) described the differences between child and adult learners and state that adults are more independent, have more experience on which they can draw, are motivated to learn by an immediate need and have a desire to use the knowledge they gain from learning in real-world situations. In this context, experiential learning and reflective learning are useful strategies that allow adult learners to reflect on their experiences, combine new and existing knowledge and examine ways in which their new knowledge can be applied in practice.

Brookfield (1995) described four major areas of study in relation to adult education: self-directed learning, critical reflection, experiential learning and learning to learn. The term self-directed learning is probably self-evident, in that it describes the process by which learners take responsibility of their own learning. The meaning of the term 'critical reflection' is not immediately as clear; Brookfield (1987) defines critical reflection as the process we use to uncover our assumptions, check the accuracy of these presumptions by exploring different viewpoints and make informed decisions based on our re-examined assumptions. Experiential learning, as described earlier, is the process of learning from experience and, finally, learning to learn is the process by which adults come to understand their own learning processes and select appropriate learning strategies accordingly (Brookfield, 1995).

The focus of this thesis is reflective learning. Many authors classify reflective learning as an approach that has links with cognitivist theory (Conole *et al.*, 2006; Dyke *et al.*, 2006; Conole, 2010). These authors suggest that reflection facilitates the type of learning set out in the cognitive domain as it has a focus on the learner's internal mental structures and encourages active engagement on the part of the student.

Others would classify reflective learning as a pursuit that is underpinned by constructivist theory (Kinsella, 2006; Carlile & Jordan, 2005; 2007). Carlile and Jordan (2007, p.25) state that, from a constructivist point of view, reflection "facilitates deep learning because it makes connections between facets of experience" and suggest that reflective practice can link thoughts with feelings, connect new experiences to older ones and encourage assimilation of new knowledge.

There is no obvious consensus in the literature as to which of these two theories is the most appropriate as a background for reflective learning activities. However, as noted earlier, constructivism is often viewed as a branch of cognitivist theory (Ertmer & Newby, 1993; Conole, 2010). The term 'cognitive constructivism' represents the overlap between these two theories and therefore seems the most appropriate label for the theory that underpins reflective learning.

It should also be noted that some types of reflective learning activity have links with social constructivism and situated learning theories. For example, reflective journal writing is often used by students who are on work placement, especially in health science domains (e.g. Chretien, Goldman & Faselis, 2008; Fischer *et al.*, 2011). In this context, situated learning theory becomes relevant. Other approaches to reflective learning utilise reflective dialogue (e.g. Laurillard, 2002; Xie *et al.*, 2008) where reflections are discussed either with a tutor or a peer. The use of reflective dialogue has links with social constructivism (Carlile & Jordan, 2005; Wise & Quealy, 2006).

Conole *et al.* (2004) developed a model that attempts to situate learning approaches in relation to the theories that underpin them. The model (as seen in Figure 2.1) maps learning approaches across three continua: (1) individual to social, (2) reflection to non-reflection and (3) information to experience.
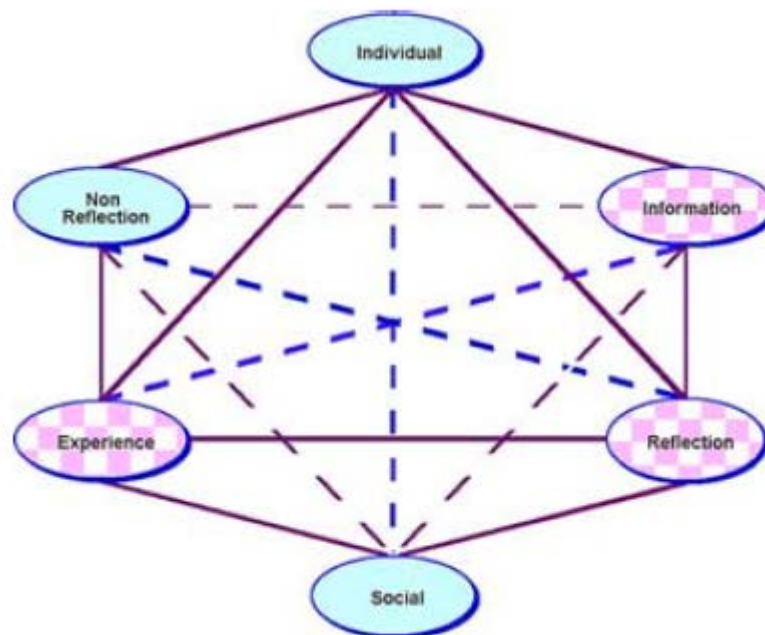
Figure 2.1: Model of approaches (reflective and experiential learning)
Reproduced from Conole *et al.* (2004)

The authors suggest that, for example, Behaviourist approaches could be located between "the individual's exposure to stimulus and response (Information) which produces a form of learning such as conditioning which is essentially pre-conscious

(Non-reflection)" (Conole *et al.*, 2004, p. 24). They propose that reflective and experiential learning both occupy the same space in this model and state that learners connect abstract concepts (Information) by observation and consideration (Reflection) of their experiences (Experience) (Conole *et al.*, 2004). However, Conole *et al.* (2004), in their examination of reflective learning as an approach, neglect to consider whether the process is an individual or social one. The individual to social continuum described in their model is considered further in Section 2.3 as part of a discussion on technologies that can be used to support reflective dialogue.

In the next section, models of reflective learning are examined; models of experiential learning that include reflection as part of a larger process of learning are also considered.

2.2 Reflective learning

This section begins by considering the meaning of the term 'reflection' in the context of reflective learning. The use of reflective learning in higher education settings is considered; its benefits are extolled, and barriers to reflection are discussed. Then, models and frameworks that describe reflective learning are presented and examined.

2.2.1 Defining 'reflection'

The use of reflection in learning has been much studied and many attempts have been made to document, explicate and clarify the process and its products. A more appropriate starting point for a discussion of reflection is Moon's common sense definition of reflection: that the word 'reflection' suggests that one is thinking deeply about something (Moon, 1999b). Much of the discussion on reflective practice stems from the seminal work of Dewey who viewed reflection as an:

> *"active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends." (Dewey, 1933, p. 118)*

Dewey purported that reflective thinking occurs when there is a problem that needs to be solved and suggested that conflict is an essential part of reflection:

> *"Conflict is the gadfly of thought. It stirs us to observation and memory. It instigates invention. It shocks us out of sheep-like passivity, and sets us at noting and contriving. […] conflict is a* sine qua non *of reflection and ingenuity" (Dewey, 1922, p. 300)*

The work of Dewey heavily influenced later work in the area of experiential and reflective learning (e.g. Kolb, 1984; Boud, Keogh & Walker, 1985) where learners are encouraged to reflect on challenging situations in order to arrive at creative solutions to problems.

Schön (1983) described a number of different types of reflection. He differentiates between reflection-in-action, where thought processes are analysed 'on the spot' and reflection-on-action, where an event is analysed after the fact (Schön, 1983). Wilson (2008) argues that Schön's view of reflection should be expanded to address reflection-on-future, where future events are planned and evaluated. Ghaye (2011) concurs that this aspect must be considered, and also describes reflection-for-action (planning what is going to be done) and reflection-with-action (conscious future action).

2.2.2 Reflection in the higher education context

This thesis focuses on reflective learning in higher education (HE) settings; this section sets out the benefits of, and barriers to, reflection in a HE context.

Reflection can take many forms. It is often a solely internal process, as described by Schön's reflection-in-action (1983). At times, it is expressed verbally as part of a reflective dialogue (Williams, 1997; Badger, 2010). However, this thesis focuses on reflection that has been recorded in writing. Hatton and Smith (1995) state that written accounts of reflection are the best way to demonstrate evidence of reflection and can

provide a record for assessment purposes in higher education. Also, the process of writing in a reflective learning journal can increase active involvement in learning, aid the development of critical thinking skills and allow students to examine their own reflective learning processes (Moon, 1999a).

Reflective writing takes place in many domains; however, it is arguably most used in the health sciences where students reflect on their practice while undertaking clinical placements (e.g. Black & Plowright, 2010; Reis *et al.*, 2010; Chretien *et al.*, 2012; Wald *et al.*, 2012; Laverty, 2012). Reflection is also frequently used a learning activity in teacher-training courses (e.g. Gordinier, Conway & Journet, 2006; El-Dib, 2007; Alvermann *et al.*, 2011), social care courses (e.g. Rutter, 2006; Baum, 2012) and engineering design courses (e.g. Reidsema & Mort, 2009; Shaheed & Dong, 2006). It should be noted that the domains listed here are not the only fields in which reflective writing is utilised, but are simply the areas that are most commonly discussed in the literature on reflection.

The literature on reflective practice extols many benefits of reflection and reflective writing. Moon (1999b) proposes that reflective practice increases active involvement in learning, enhances problem-solving skills and aids the development of critical thinking skills, all of which are important elements from a constructivist perspective. Carlile and Jordan (2007) suggest that reflective writing facilitates deep learning and self-empowerment. Reflection can also encourage metacognition by helping students to understand how the learning process works, which has a positive effect on their learning (Schön, 1987). The use of learning journals to foster metacognition has been documented in a number of studies (McCrindle & Christensen, 1995; Kunz, Destow & Moodie, 2003). Stone & Madigan (2007) state that students who continually reflect on their experiential learning will have a competitive advantage in the workplace. Schön also advocates the use of reflection as a tool for continuing professional development (1983).

Sen (2010) examined the reflective writing of 116 students who were studying management on a postgraduate course in library studies and found that reflective writing

had eight different outcomes. These were academic learning, non-academic learning, the need for self-development, actual self-development, critical review, awareness of mental functions, decision making, empowerment and emancipation (Sen, 2010). This study supports the earlier propositions that reflective writing facilitates self-empowerment, critical thinking and metacognition.

However, there are barriers to effective Reflective Practice that must be considered. Ramasamy (2002) notes that students often forego reflective practices in favour of other learning activities that may be assigned more weighting in terms of course credit. Carlile and Jordan (2007) second this and state that one means of ensuring uptake of reflective activities is use to summative assessment methods (where grades are assigned). From a student perspective, barriers to reflective writing include a lack of sufficient time for reflection (Otienoh, 2009) and a lack of understanding as to what is required (Moon, 2007; Dalley, 2009).

Davis (2003) discusses the barriers to Reflective Practice from the educator's perspective and states that staff members in higher education have become de-motivated due to lack of resources, lack of recognition and overwork caused by widening participation and lifelong learning. Davis suggests that solutions must be found to these problems before Reflective Practice can be used to its full potential in higher education (Davis, 2003). The workload involved in assessing reflective writing is considered later (in Section 2.4) as is the lack of clear guidelines for assessors.

2.2.3 Reflective learning models/frameworks

This section sets out models or frameworks that describe reflective learning, either in its own right or as part of a larger process of experiential learning. Reflective and experiential learning are underpinned by cognitivist and constructivist theory (Conole *et al.*, 2004; Carlile & Jordan, 2005; Dyke *et al.*, 2006). Conole (2010) positions the models of learning set out by Kolb (1984), Laurillard (2002) and Boud, Keogh and Walker (1985) in the cognitive/constructive domain, and also notes that Gibbs' (1988) reflective cycle is relevant in terms of reflective learning. The model of learning set out

by Jarvis (1987; 2004) is situated in the field of reflective/experiential learning by Conole *et al.* (2004). On this basis, Jarvis' model was selected for examination in this section, along with the models of Kolb, Gibbs, Laurillard and Boud, Keogh and Walker. In addition to this, frameworks that describe reflection in terms of levels of reflective 'depth' were selected as being particularly relevant to this thesis. Mezirow (1991) defined a number of types of reflection that represent varying levels of depth or quality, as did Van Manen (1977). Hatton and Smith (1995) focused on reflective writing (as opposed to other reflective activities) and described four levels of reflective depth. Moon (2004) expanded on the work of Hatton and Smith by developing a framework for reflective writing based on these four levels.

It should be noted that these models describe *learning* as opposed to *e-learning*. However, Mayes and de Freitas (2004) point out that most models do not specifically address e-learning because it is essentially no different to learning (in the general sense). E-learning does not change the way in which learning occurs, but rather enhances some aspect of the learning (for example, increasing participation opportunities for distance learners) (Mayes & de Freitas, 2004). The models discussed here are relevant to learning in general (whether it occurs face-to-face, at a distance, or in blended mode).

2.2.3.1 Reflection in the learning process

The models and frameworks discussed in this section depict the learning process; in each case, reflective learning forms at least part of this process. Kolb (1984) includes 'reflective observation' as a stage in his learning cycle. Jarvis (1987; 2004) describes three types of reflective learning, while the conversational framework set out by Laurillard (2002) depicts learning as a reflective dialogue between tutor and student.

2.2.3.1.1 Kolb's Cycle of Experiential Learning

Kolb's Learning Cycle (1984) describes four stages in a cycle of experiential learning. These stages are concrete experience, reflective observation, abstract conceptualisation and active experimentation. Kolb's Learning Cycle can be seen in Figure 2.2.

Although Kolb's model is non-linear, the 'concrete experience' stage represents a natural starting point (Carlile & Jordan, 2005). This experience is then followed by reflective observation. Reflective observation allows the student to assimilate information and use it to generate abstract concepts. These concepts are then actively tested by experimentation, which in turn results in new concrete experiences (Kolb, 1984).
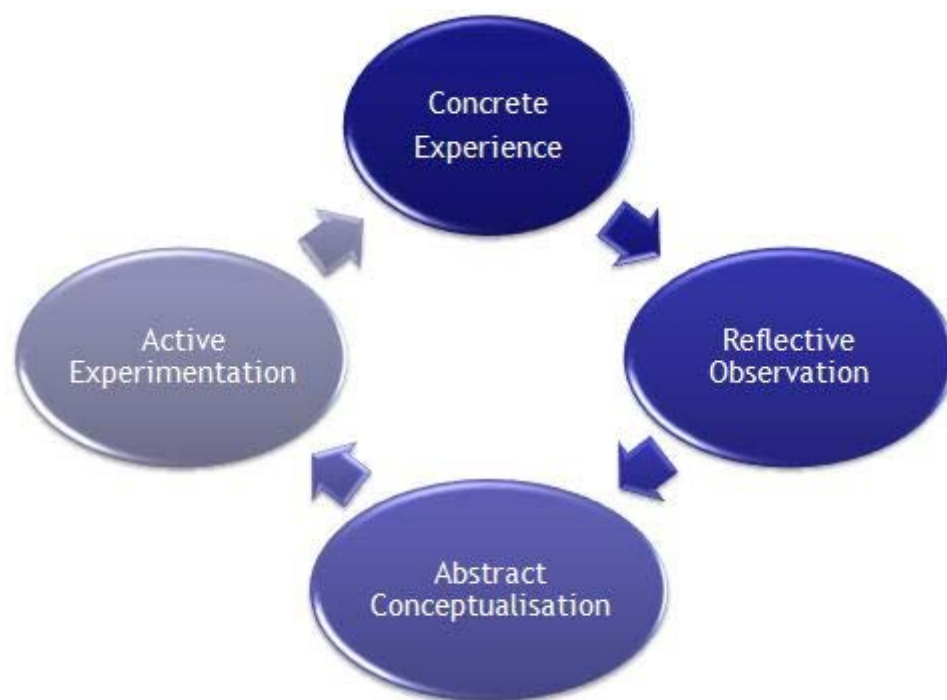
Figure 2.2: Kolb's Learning Cycle
Redrawn from Kolb (1984)

Kolb's cycle is influenced by cognitive/constructive learning theory (Conole, 2010) as it requires the learner to actively engage with the learning process. Kolb also defined four types of learners and described which parts of the cycle best support the four learning types. From a constructivist perspective it is important to consider different learning styles, and utilise different teaching strategies to cater to a variety of learners (Gardner, 1999; Carlile and Jordan, 2005).

The four learning styles described by Kolb are diverging, assimilating, converging and accommodating (Kolb, 1984). The dominant abilities of learners in the diverging style are concrete experience and reflective observation; these learners thrive at viewing a

situation from different angles and brainstorming ideas (Kolb, Boyatzis & Mainemelis, 2001). Learners in the assimilating style excel at abstract conceptualisation and reflective observation and find it important to have clear explanations of theory (rather than examples of practice). Converging learners, on the other hand, are skilled at finding practical applications of concepts and have strengths in abstract conceptualisation and active experimentation (Kolb, Boyatzis & Mainemelis, 2001). Finally, learners in the accommodating style have strong abilities in relation to the Concrete Experience and Active Experimentation stages of the cycle. These learners prefer to learn from hands-on experience and also benefit from working in teams (Kolb, Boyatzis & Mainemelis, 2001).

While Kolb's experiential learning cycle is arguably one of the most cited models in education literature (Carlile & Jordan, 2005; Dyke *et al.*, 2006) it has been criticised as being overly simple (Jarvis, 1987; 2004). In addition to this, Brookfield (1990) argues that learners often do not have sufficient time at the reflective observation and abstract conceptualisation stages of the model, which negatively impacts their reflections.

The nature of the learning styles described by Kolb has also been questioned (Tennant, 1997). Tennant notes that the neat linking of learning styles to stages of the cycle does not necessarily validate the model. Furthermore, Tennant points out that the model is not generalisable to all learning environments: for example, situations that require information assimilation or memorisation are ignored (Smith, 2001). These different types of learning are addressed in the model of learning set out by Jarvis, as discussed in the next section.

It has also been suggested that the cycle of experiential learning pays insufficient attention to reflection; although reflection is implicitly part of the cycle, the reflective process itself is not explained (Boud, Keogh & Walker, 1985). Boud and colleagues address this with their model of the reflective process (see Section 2.3.2). Gibbs (1988) developed a cyclical model, not unlike Kolb's, that is more focused on reflection as a process (as discussed later in Section 2.2.3.2.1). First, the model of learning described by Jarvis is discussed; this model builds on the work of Kolb.

2.2.3.1.2 Jarvis' model of the learning process

Jarvis (1987; 2004) suggests that Kolb's cycle of experiential learning is an over-simplification of the learning process. In a series of workshops, participants were presented with Kolb's experiential learning cycle and asked to adapt it to map one of their own learning experiences. Jarvis found that participants' learning experiences were more complex than that which could be described using Kolb's cycle. Having completed the workshop with several hundred participants, he developed a complex model of learning (Jarvis, 1987). He later revised this model to further represent the complexity of the learning process (Jarvis, 2004); the revised model is presented in Figure 2.3.
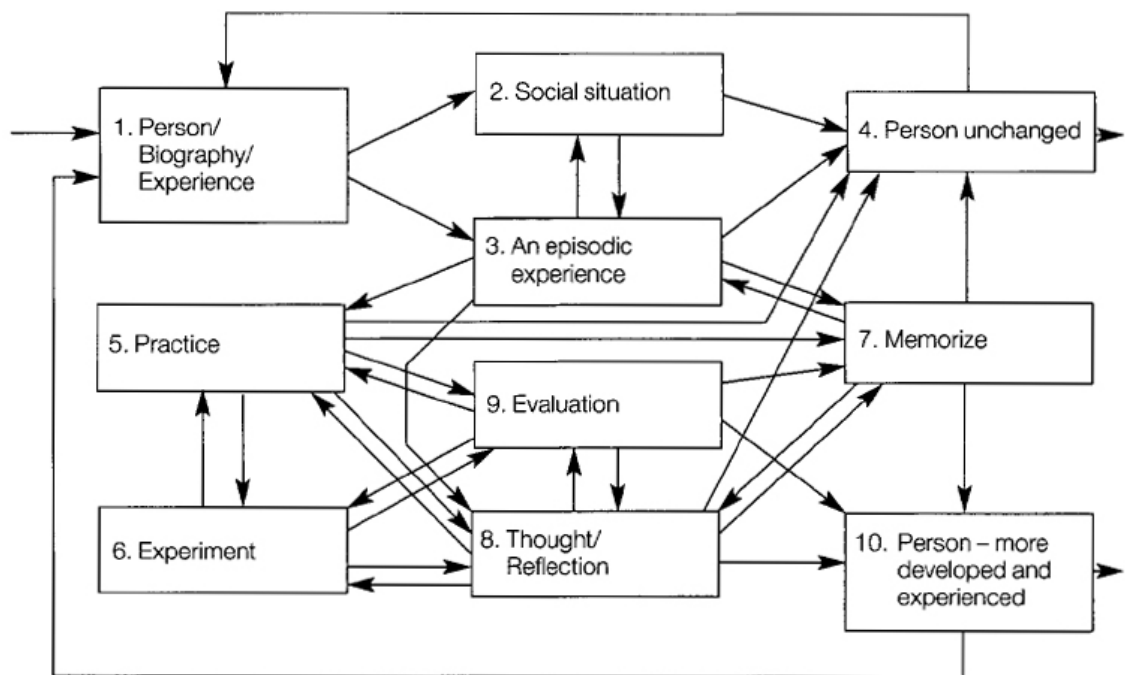
Figure 2.3: Jarvis' model of the learning process
(redrawn from Jarvis, 2004)

Jarvis suggests that a number of different paths can be taken through the learning process (Jarvis, 1987). He describes eight types of learning (and one other type of activity, non-learning), each of which represent a different path through this model.

Firstly, Jarvis describes non-learning as a state where presumptions are made (i.e. the experience is not questioned) or the learning experience is rejected. Le Cornu (2005) questions whether it is possible for non-learning to occur: she suggests that it is highly probable that, in most situations, some learning would occur (although this may be accidental).

The eight types of learning described by Jarvis move along a continuum starting with incidental learning (which he terms 'pre-conscious' learning) of knowledge and skills (Jarvis, 2004). Then, Jarvis categorises types of non-reflective learning (e.g. the learning of basic skills, memorisation). Finally, he suggests that there are three types of reflective learning: Reflective cognitive learning, practice learning and contemplation (Jarvis, 2004). The paths that these processes take through the model set out in Figure 2.3 are as follows:

- – Contemplation: 1, 2, 3, 8, 9, 7, 10
- – Reflective cognitive learning: 1, 2, 3, 5, 6, 8, 9, 7, 10
- – Practice learning: 1, 2, 3, 8, 6, 5, 9, 7, 10

While contemplation occurs after the experience, practice learning and reflective cognitive learning can occur within the experience itself (Jarvis, 2004) i.e. reflection-in-action, as described by Schön (1983).

Jarvis (2004) suggests that, even after revisions, this model is still an over-simplification of human learning. However, the complexity of the model (even as it is now) could be seen as a drawback. Miller *et al.* (2005), while approving of Jarvis' model in general, suggest that educators would need to become well informed of the processes and pathways in the model before using it for the design of learning activities.

2.2.3.1.3 Laurillard's Conversational Framework

The Conversational Framework developed by Laurillard (2002) states that learning should occur as an iterative dialogue, which must be "discursive, adaptive, interactive

and reflective" (Laurillard, 2002, p. 86) Laurillard draws on the work of Gordon Pask, who first described the learning process as a conversation in his Conversation Theory (Pask, 1975). Laurillard's work also has clear links to social constructivist theory, where dialogue is a crucial part of the learning process (Carlile & Jordan, 2005; Wise & Quealy, 2006).

Michaelson (2002) provided a critique of Laurillard's framework and suggests that it is best suited to distance learning (where a one-to-one relationship between teacher and student is common). Michaelson also notes that the model does not allow for peer-to-peer or group learning, a key aspect of social constructivism. Figure 2.4 shows the conversational framework described by Laurillard; steps 1-4 are discursive, steps 5 and 10 are adaptive, steps 6-9 are interactive and steps 11 and 12 are reflective. Subsequently, these steps are described in greater detail and it can be seen that, as pointed out by Michaelson (2002), the framework assumes a one-to-one relationship between teacher and student.
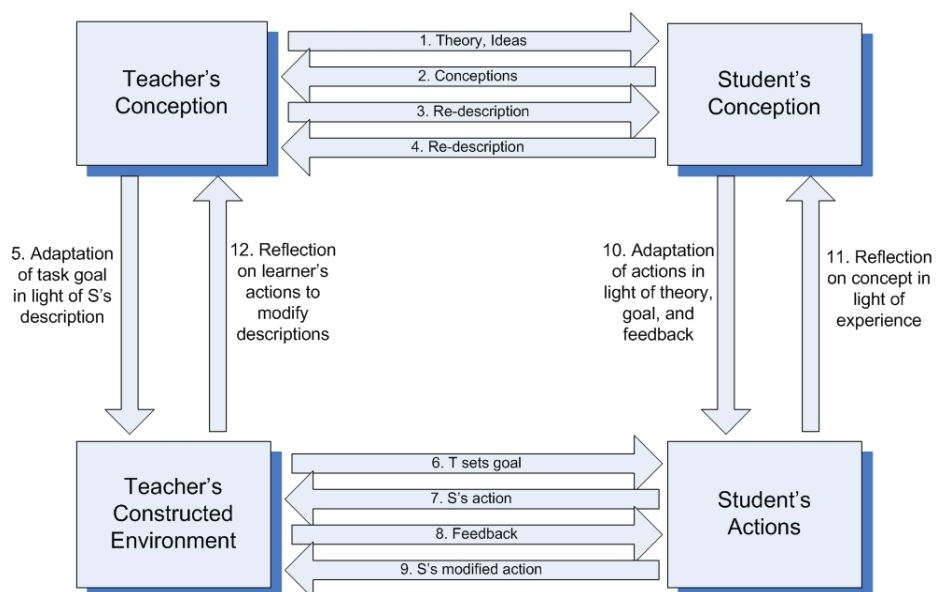
Figure 2.4: The Conversational Framework
(Redrawn from Laurillard, 2002)

In the discursive phase of the framework (steps 1-4), the topic goal is discussed between educator and student. Laurillard (2002) refers to this phase as the 'description level'. The educator gives theory or ideas relating to the topic and then, following this, the

student states her conceptions of the topic (based on the theory presented by the educator). Both educator and student then re-describe the student's conceptions of the topic in order to ensure that they share the same understanding.

The adaptive phase consists of steps 5 and 10. These activities are internal to both student and educator. In step 5, the educator may feel it is necessary to adapt the task goal based on the student's conceptions of the topic (as described by the student at the discursive level). During step 10, the student internalises the theory, goal and feedback discussed at the discursive level, and adapts her actions accordingly.

The interactive level of the Conversational Framework incorporates steps 6-9. Laurillard (2002) also calls this level the 'task level', as this is where tasks relating to the topic goal take place. First of all, in step 6, the educator sets the task goal (which relates to the overall topic in some way). Following this, the student acts to achieve the task goal (step 7). Then, in step 8, the educator gives feedback to the student based on her actions, so that the student can modify her actions if necessary (step 9).

Finally, the reflective phase consists of steps 11 and 12. In step 11, the student reflects on her understanding of the concept based on her experience with the task goal. The educator also reflects (in step 12) on the student's actions in relation to the task goal, and modifies the description of the topic goal if necessary.

The models considered thus far have included reflective learning as one part of a larger cycle or process of learning. Now, frameworks that describe the reflective process itself are considered.

2.2.3.2 Detailing the reflective process

The reflective cycle presented by Gibbs (1988) focuses on structured debriefing as a means of reflecting on experience and described the process of reflection as a series of stages. Boud, Keogh & Walker (1985) also described the reflective process in more detail.

2.2.3.2.1 Gibbs' reflective cycle

Gibbs' reflective cycle attempts to facilitate reflection more directly and uses a 'structured debriefing' approach to encourage reflection on experiences (Gibbs, 1988). A natural starting point for this cycle (see Figure 2.5) is description, where the student describes the experience or event. Next, students are asked to describe their feelings and then evaluate the experience. In the analysis phase of the cycle students are encouraged to relate the experience to external ideas (Gibbs, 1988). Students should then draw conclusions and, finally, plan their action in future scenarios.
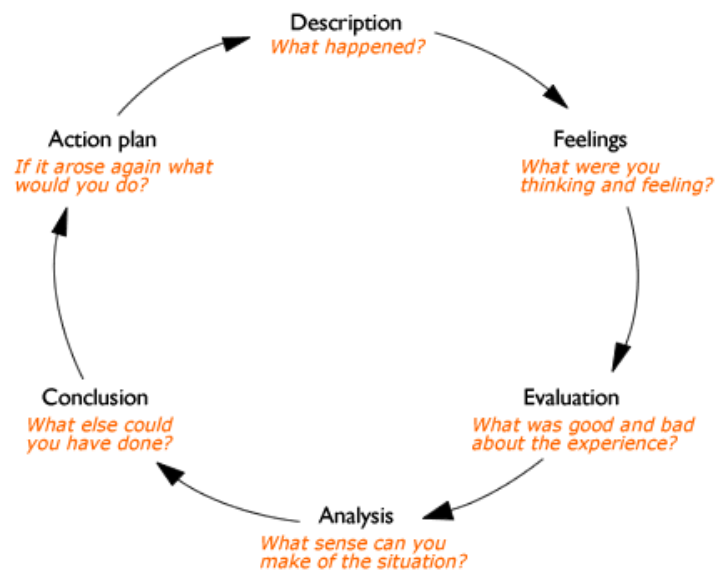
Figure 2.5: Gibbs' reflective cycle
(redrawn from Gibbs, 1988)

Gibbs notes that students have a tendency to move quickly from superficial descriptions to premature conclusions, without taking the necessary time to reflect at intermediate stages. He recommends that students should be guided through the model, ensuring that they adequately address each step (Gibbs, 1988).

One drawback of Gibbs' reflective cycle, and similar cyclical models e.g. Kolb, is that they can be overly prescriptive; Regmi (2010) suggests that the restricted set of questions may limit people's creativity. Nonetheless, the use of questions or 'prompts'

to encourage reflective thinking has been well documented in the literature on reflection (Johns, 1994; Pee *et al.*, 2002; Harrison & Fopma-Loy, 2010). Harrison and Fopma-Loy (2010) reported that reflective prompts were a useful way to stimulate reflection, while Pee *et al.* (2002, p. 583) noted that prompts "enabled the identification of gaps in students' reflective processes, which in turn suggested how the activity might be improved".

2.2.3.2.2 Boud, Keogh & Walker's reflective process

Boud, Keogh and Walker (1985) described both the process of reflection and its outcomes. The model they proposed can be seen in Figure 2.6 and includes experiences, reflective processes and outcomes.
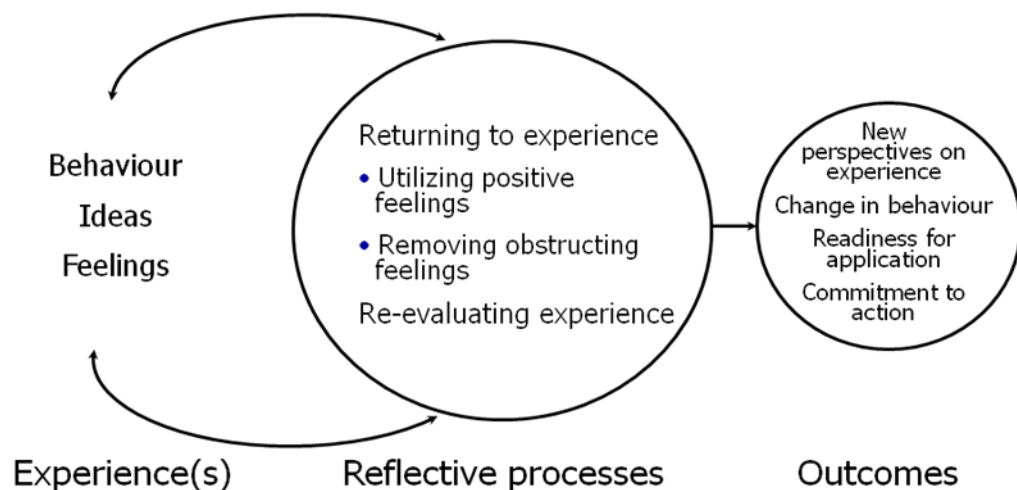
Figure 2.6: Boud, Keogh and Walker's Model of the Reflective Process
Redrawn from Boud, Keogh and Walker (1985)

Boud, Keogh and Walker (1985) described three stages of reflection (these stages are represented in Figure 2.6 as reflective processes). The first stage of reflection involves returning to an experience and recollecting the events that occurred. The second stage involves attending to feelings. This includes utilising positive feelings by identifying what can be gained from the experience and removing any obstructing feelings. The third stage involves the re-evaluation of the experience in light of reflections and integrating any new insights with existing knowledge (Boud, Keogh & Walker, 1985).

Boud, Keogh and Walker (1985) also describe the outcomes of the reflective process, which include new perspectives on experience, change in behaviour, readiness for application and commitment to action.

The work of Boud, Keogh and Walker (1985) appears to be influenced by that of Dewey (1933), as they describe a process of reflection that is internal to the student, is focused on outcomes and is also cyclical. Like Kolb's cycle of experiential learning, Boud and colleagues' model is based largely on constructivist principles where reflectors actively participate in the process and integrate new experiences with older ones (Fenwick, 2001). One drawback of this model of the reflective process is that it only allows for reflection-on-action i.e. reflection that happens after the fact (Finlay, 2008) to the exclusion of reflection-in-action as described by Schön (1983).

2.2.3.3 Levels of reflective depth

The models presented in this section describe reflection in terms of levels of reflective 'depth'. Moon (2007) relates depth of reflection to the quality of reflective writing. Levels of reflection are generally seen as a continuum from a lack of reflection to critical reflection (Van Manen, 1977; Brookfield, 1987; Hatton & Smith, 1995).

2.2.3.3.1 Mezirow's Types of Reflection

Mezirow (1991) describes a process of reflection that includes various levels such as non-reflective action, introspection, reflection and reflective action. Like Kolb, the work of Mezirow is influenced by constructivist theory (Fenwick, 2001).

Non-reflective action, as described by Mezirow, includes habitual actions (automatic processes such as walking or cycling) and thoughtful actions. Thoughtful actions are those where conscious decisions are made but the decisions are not questioned in any way (Mezirow, 1991).

Introspection involves thoughts related to the self and acknowledgement or recognition of feelings such as happiness, anger or confusion (Mezirow, 1991). Mezirow describes introspection and reflection separately, suggesting that (in his view) introspection is not a form of reflection. Other authors would disagree on this point and say that recognition of feelings or emotions does constitute reflection (Hatton & Smith, 1995; Moon, 2004).

Reflection, as described by Mezirow, can be broken down into three types: content reflection, process reflection and premise reflection. Content reflection involves acknowledgement of the way we feel about or perceive a certain event. Process reflection considers how we actually perform those functions of perceiving and feeling. Finally, premise reflection examines the reasons why we perceive an event in a certain way (Mezirow, 1991).

Finally, Mezirow states that reflective action occurs when a decision is made or action is taken following reflection (Mezirow, 1991). Mezirow's work appears to be influenced by Dewey (1933) as it views reflection as an internal process which is focused on an outcome (i.e. reflective action). It also bears similarities to the work of Kolb (1984) as Mezirow's reflective action suggests a cycle of experiential learning where action follows reflection and actions are reflected on.

2.2.3.3.2 Van Manen's Levels of Reflection

Van Manen (1977) describes three levels of reflection which are based on the work of Habermas (1971). The first level is technical reflection. This level describes the means used to achieve certain outcomes. These processes or actions are not subjected to analysis and therefore cannot be modified. In other words, tasks are performed without any consideration of the reasons for doing the task or the reasons why the task is done in a certain way.

The second level is practical reflection and at this level processes are subjected to scrutiny and reflection. The means used to achieve a task, the goals of that task and the

assumptions those goals are based on are all the subject of examination (Hatton & Smith, 1995).

The third level described by Van Manen (1977) is critical reflection. This level of reflection also requires considerations of moral and ethical criteria. Personal actions should be set in the context of wider social structures (such as history, law and politics).

2.2.3.3.3 Hatton and Smith's Reflective Practice Framework

Hatton and Smith note that the terms reflection and critical reflection, although frequently referred to in educational literature, are ill-defined (Hatton & Smith, 1995). They found that existing work on the subject of reflection provided only broad guidelines for identifying evidence of reflection. Hatton and Smith aimed to address the lack of definitive guidelines in the literature on reflective writing assessment by developing a framework that assists in the identification of reflection. They conducted a study that analysed reflective writing and classified four types of writing; descriptive writing, descriptive reflection, dialogic reflection and critical reflection. Throughout the four types of reflection in the Hatton and Smith (1995) framework there is an increasing level of depth and quality of reflection (progressing from descriptive writing to critical reflection).

> **Descriptive writing:** This is not reflective. Events are described with no added analysis. However, Hatton and Smith note that this type of writing is nonetheless important as it provides background information for subsequent reflections.

> **Descriptive reflection:** At this level, events are described but there is also some analysis and an attempt to provide reasons for events. Reflection may also refer to external sources and show evidence of consideration of one or more alternative perspectives.

Dialogic reflection: Hatton and Smith describe this type of reflection as a "stepping back" from events. It is a discourse with self which consists of a deeper analysis of events. This type of reflection examines multiple perspectives and attempts to provide a rationale for events that occur.

Critical reflection: This level of reflection, as well as exploring multiple perspectives, demonstrates an awareness of broader social structures.

Hatton and Smith (1995) state that written accounts of reflection are the best way to demonstrate evidence of reflection. Accordingly, it should be noted that the levels that they set out relate to reflective writing specifically, as opposed to other reflective activities.

The Hatton and Smith (1995) framework is, in some ways, similar to the work of Van Manen (1977). The Descriptive writing level of the Hatton and Smith framework is similar to the technical reflection level described by Van Manen while the Descriptive reflection and Dialogic reflection levels are akin to the level of practical reflection. The critical reflection level described by both Hatton and Smith (1995) and Van Manen (1977) sets reflection in a broader context.

2.2.3.3.4 Moon's Generic Framework for Reflective Writing

Moon (2004) builds on the work of Hatton and Smith (1995) and refers to their Reflective Practice framework as a tool for assessing the depth and quality of reflective writing. Although Moon clearly sees Hatton and Smith's framework as a valuable starting point, she notes that "despite the use of Hatton and Smith's framework, it was still difficult to help learners to properly understand the nature of deeper reflection" (Moon, 2004, p. 98). Moon proposes that learners who are asked to write reflectively commonly operate at the descriptive level, and recommends that a framework that describes levels of reflective depth be put in place in order to facilitate deep reflection.

The framework set out by Moon is more focused than the broad criteria presented by Hatton and Smith and contains simple yet detailed criteria for students to follow. However, as well as being useful to students, Moon notes that her framework is a suitable starting point for developing reflective writing assessment criteria (Moon, 2004).

It should be noted that, in a similar way to the work of Hatton and Smith, Moon's framework focuses on reflective writing (as opposed to other reflective activities). This is relevant to the work carried out in this thesis, which examines written modes of reflection. In addition to this, the goal of the framework set out by Moon (i.e. to develop a more detailed set of reflective writing assessment criteria) is most closely linked to the objectives of this thesis. Therefore, Moon's framework (along with the Hatton and Smith framework upon which it is based) was selected as the most appropriate model for reference in this study.

2.3 Educational technology

This section begins by discussing e-learning in the broad sense and the evolution of the types of technology used in education. It then focuses on the ways in which blogs are used in education. Specifically, the use of blogs to support reflective writing is examined and set in the context of cognitive constructivist and social constructivist approaches to learning. Finally, potential areas of concern relating to the use of blogs in education are considered.

2.3.1 E-learning and Learning 2.0

Although various types of technology had been used in education throughout the 20th century, widening access to the Internet from the mid 1990s onwards enabled the rapid expansion of the field of e-learning (Cross, 2004). Since then, e-learning has evolved from being a radical idea to a widely accepted one (Downes, 2005), with e-learning technologies gaining widespread use in higher education (Lockwood, 2007; Hung,

2012).   E-learning technologies are not seen to change the way in which learning occurs, but rather support or enhance some aspect of learning (Mayes & de Freitas, 2004). For example, e-learning can increase access to education by enabling learning at a distance (Jones, 2008; Jones *et al.*, 2009). E-learning increases convenience from a student's perspective and supports self-paced, autonomous learning (Tallent-Runnels *et al.,* 2006).   As well as being used in online courses, e-learning is often used in combination with traditional, face-to-face learning (an approach known as hybrid or blended learning) (Tallent-Runnels *et al.,* 2006).

Research in the e-learning area has moved on from an early focus on evaluating its effectiveness to an examination of how technology can support teaching and learning practices (Hung, 2012). Tallent-Runnels *et al.* (2006), in their review of e-learning research, conclude that it has been determined that e-learning approaches are as effective as traditional ones and recommend that future research should focus on best practices in the use of technology to facilitate teaching and learning.

A change in web technologies at the turn of the 21st century has dramatically influenced the way the web is used in education (Enonbun, 2010).   The new wave of web technologies has been called 'Web 2.0' and the use of these tools for learning has been given a related moniker: 'Learning 2.0' (Downes, 2005; Redecker *et al.*, 2009).

Web 2.0 technologies (which are often referred to as 'social software') offer a more participatory experience of the Internet (Crook *et al.*, 2008) encouraging users to comment, contribute and publish their own content (Churchill, 2007). The list of Web 2.0 tools, services and technologies is endless; however, Crook *et al.* (2008) defined a number of categories of use, which were further summarised by Conole & Alevizou (2010, p. 11). Descriptions of these categories, along with notable examples, can be seen in Table 2.1.

In education, Web 2.0 technologies can provide new possibilities for learning, including improved collaborative learning (Churchill, 2007), new opportunities for distance learning (Anderson, 2005) and the ability to develop online personal learning portfolios

(Tosh & Werdmuller, 2004). In a report for the Joint Research Centre: European Commission, Redecker *et al.* (2009) examined the adoption of Web 2.0 in education and training across Europe. They consulted with stakeholders to develop a database of 250 Learning 2.0 projects. They found that although:

> *"social computing applications are currently not deployed on a large scale in formal Education and Training in Europe [...] there is a vast number and variety of locally-embedded Learning 2.0 initiatives all over Europe, which illustrates the variety and scope of Learning 2.0 approaches in formal E&T". (Redecker et al., 2009, p.9)*

Table 2.1: Categories of Web 2.0 technologies (adapted from Conole & Alevizou, 2010)

Category	Description	Notable examples
Media sharing:	Creating and exchanging media with peers and wider audiences	Flickr, YouTube
Media manipulation:	Using web-accessible tools to design and edit digital media files	Prezi, Gliffy
Instant messaging, chat & conversational arenas:	One-to-one or one-to-many conversations between Internet users	MSN, Skype
Online games & virtual worlds:	Rule-governed games or themed environments that invite live interaction with other Internet users	Second Life, Games for Change
Social networking:	Websites that structure social interaction between members who form subgroups of 'friends'	Facebook, LinkedIn
Blogging:	An Internet-based journal or diary in which a user can post text and digital material while others can comment	Blogger, Edublogs
Social bookmarking:	Users submit their bookmarked web pages to a central site where they can be tagged and found by other users	Del.icio.us, Zotero
Recommender systems:	Websites that aggregate and tag user preferences for items in some domain and thereby make novel recommendations	Digg, StumbleUpon
Wikis and collaborative editing tools:	Web-based services that allow users unrestricted access to create, edit and link pages	Wikipedia, Bubbl.us
Syndication:	Users can subscribe to RSS feed enabled websites so that they are automatically notified of any changes or updates in content via an aggregator	Netvibes, Bloglines

Of the 250 Learning 2.0 projects examined by Redecker and colleagues 40% were conducted in higher education settings. 78% of the learners were involved in formal education. They found that adoption of social computing tools (their preferred term for Web 2.0 technologies) in the sample was broken down as seen in Figure 2.7. It is

interesting to note that blogs have most frequently been used in Learning 2.0 projects (41% of cases). Redecker and colleagues also note that use of blogs has a statistically significant correlation with the user group 'adult learners' (Redecker *et al.*, 2009). Discussing the adoption of blogs in education, Crook *et al.* (2008) note that several blog hosting sites have been developed specifically for students and teachers (for example, Edublogs, http://edublogs.org). Also, some higher education institutions (e.g. Warwick University, http://blogs.warwick.ac.uk) have developed institutionally managed blogs for students (Crook *et al.*, 2008).

Tools	N	% Cases	% Entries
Blogs	97	41	19
Social Networking	95	40	18
Discussion Platforms	69	29	13
Wikis	68	29	13
Photo- / Video sharing	5	23	11
Podcast / Vodcast	34	14	7
Folksonomies / Tagging	30	13	6
Virtual Realities	11	5	2
Others (e-Portfolios, Twitter, Ning, Moodle, Elgg, games etc)	55	23	11
53% combine different social computing tools.			
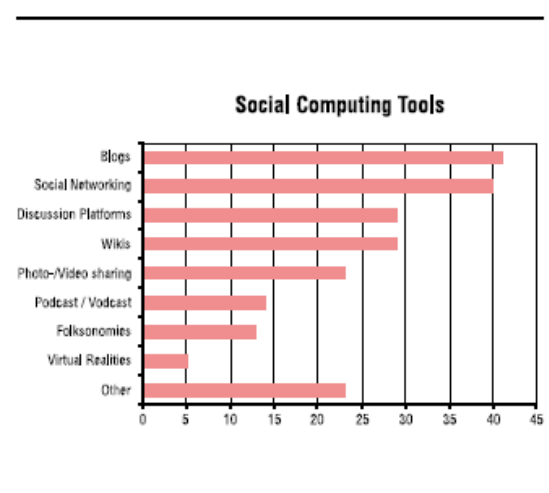
**Figure 2.7: Usage of Social Computing Tools for Learning 2.0
(reproduced from Redecker et al., 2009)**

The shift from traditional web-based learning to Learning 2.0 represents a move from content delivery to a more student-centred approach (Seely Brown & Adler, 2008; Sabin & Leone, 2009; Enonbun, 2010). Web 2.0 tools enable students to take ownership over learning content, something which is a key aspect of constructivist learning (Enonbun, 2010). From a social constructivist perspective, Learning 2.0 tools emphasise participation, conversation and situated, active learning (Seely Brown & Adler, 2008; Sabin & Leone, 2009).

Zhang and Bonk (2008) link emerging Web 2.0 technologies to the stages of learning described by Kolb (1984). They state that blogging is useful in the abstract conceptualisation and reflective observation phases and that collaborative blogs can support learning in the concrete experience and reflective observation phases (Zhang &

Bonk, 2008). Conole *et al.* (2004) note that asynchronous forms of discourse (like blogging) can be useful in supporting reflection, as they allow the necessary time and space for reflection to occur. The ways in which blogs can be used in education are now considered.

2.3.2 Educational blogging

A blog (an abbreviation of web log) is a website that contains dated entries (or posts) in reverse chronological order. Blogs are published using blogging software; this software, in most cases, is free and web-based. Kamel Boulos and Wheeler (2007, p. 5), describe blogs as:

> *"simple content management tools enabling non-experts to build easily updatable web diaries or online journals. They are published chronologically, with links and commentary on various issues of interest. Frequently, blogs are networked between several users who post thoughts that often focus upon a common theme."*

Blog authors can also make content available to their readers using syndication. RSS (Really Simple Syndication) technology allows readers to receive notification of blog updates using an aggregator. Because the information contained in the blog is described using the RSS format, an aggregator can detect changes and react appropriately (Pilgrim, 2002). This provides a means for blog readers to subscribe to the blog and receive notification when new content is added (Lindahl & Blount, 2003).

Blogs have been implemented at all levels of education from primary education (Poling, 2005) to postgraduate courses (Weller, Pegler & Mason, 2005) including doctoral level students (Sharma, 2010). In higher education, they have been utilised in a wide variety of disciplines including literacy development (Huffaker, 2005), language learning (Abidin, Pour-Mohammadi & Hamid, 2011; Hashemi & Najafi, 2011), teacher-training (Chan & Ridgway, 2005; Sharma, 2010), the health sciences (Chretien, Goldman & Faselis, 2008; Fischer *et al.*, 2011) and computer science (Du & Wagner, 2005; Robertson, 2011). In Figure 2.8 an example of a blog that has been used as a reflective journal can be seen.

There are a number of different ways in which blogs can be used in education. Sandars (2006) summarises these uses as 'Read, Write and Interact'. He suggests that students should be encouraged to read selected blogs or that an educator can use a blog as a resource for his students. Sandars suggests that the ease of publishing of blogs make them useful as journals for written reflection. Finally, he suggests that the collaborative features of blogs such as links and comments make them suitable for collaborative learning (Sandars, 2006).

Figure 2.8: Reflective blog example

Luján-Mora, like Sandars, notes that blogs are useful as learning journals, as a learning resource or as a tool for collaborative learning (Luján-Mora, 2006). Lui and colleagues (2006) also discuss three purposes for educational blogs: personal, communication and pedagogical. Under the 'personal' heading they describe blog uses such as a logbook, a

diary of learning or an electronic portfolio. For communications purposes, they state that blogs can be used for dialogue or file sharing (Lui *et al.*, 2006). The pedagogical purposes of blogs discussed by Lui and colleagues include 'peer collaboration' and 'a source of information'. Finally, Brandon (2003) also suggests that blogs can improve educator to educator communication, educator to learner communication and learner to learner communication.

In the literature on educational blogging, several benefits of blogging are commonly described. These are enumerated here; potential issues with the use of blogs in education are considered later, in Section 2.3.4.

1. Blogs support self-directed learning and give students a sense of ownership over their work (Trammell & Ferdig, 2004; Ferdig & Trammell, 2004; Robertson, 2011)
2. Blogs support collaboration (Brandon, 2003; Lui *et al.*, 2006; Sandars, 2006) and encourage students to build communities (Butler, Tatner & Tierney, 2010)
3. Blogs support reflection and deep learning (Shoffner, 2005; Tan *et al.*, 2005; Ray & Hocutt, 2006; Sandars, 2006)
4. Blogs encourage reflective dialogue i.e. collaboration in the reflective process (Chen, 2004; Nückles, 2004; Du & Wagner, 2005)
5. Blogs support peer assessment and feedback (Jones, 2006; Xie *et al.*, 2008; Lee, 2010; Olofsson, Lindberg & Hauge, 2011)

It has also been noted that the use of blogs provides a number of benefits over other types of computer-mediated communication (CMC) (Kim, 2008). Kim notes that CMC technologies e.g. discussion forums are often teacher-centred, whereas blogs are student-centred (as each student 'owns' her own blog). Management of communication is also a problem with CMC technologies; Kim states that blogs overcome this limitation by using RSS to make collection of new material convenient (Kim, 2008).

Laurillard's Conversational Framework, which was described earlier in this chapter, is a useful device for examining where various types of media can be incorporated into the

learning process (Laurillard, 2002). Blogs are useful in supporting the type of reflective dialogue described in Laurillard's framework and can provide support in both the interactive and reflective phases (Birney, Barry & Ó hÉigeartaigh, 2006). In Figure 2.9, the shaded arrows (steps 7, 8, 9, 11 and 12) represent the steps in the framework where blogs can be incorporated. In the interactive phase (which encompasses steps 6 to 9) they can be used as follows:

Step 7: Student's action: student makes a post to her blog, relating to task goal (that was previously set by the tutor)

Step 8: Feedback: tutor collects student posts using RSS aggregator, and can then provide feedback to a student via a comment on the student's blog

Step 9: Student's modified action: the student modifies her actions based on the feedback received (making an additional post to her blog if necessary)
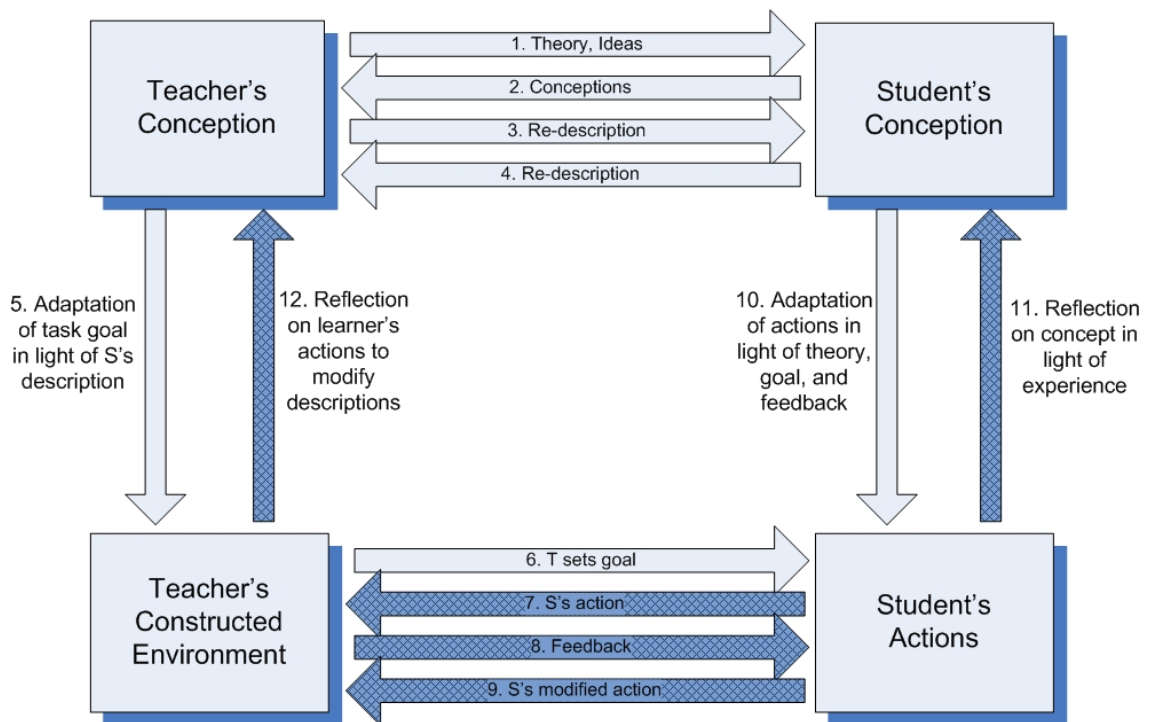
Figure 2.9: Blogs in the Conversational Framework
(Reproduced from Birney, Barry & Ó hÉigeartaigh, 2006)

In the interactive phase of the framework, students may also view one another's blogs, either to work collaboratively or to peer-review one another's work (Birney, Barry & Ó hÉigeartaigh, 2006). In the reflective phase of the framework (steps 11 and 12), blogs can be used as follows:

Step 11:   Reflection on concept in light of experience: the student uses her blog to reflect on the task and how it has helped her understanding of the concept

Step 12:   Reflection on learner's actions to modify descriptions: the tutor can review blog posts to ensure the student understands the concept; descriptions may need to be modified in order to aid better understanding

The following section focuses on the use of blogs as a reflective writing tool; the main benefit of using blogs for this purpose is that a reflective blogging activity supports reflective dialogue, as set out in the context of the Laurillard framework in Figure 2.9.

2.3.3 Reflective blogging

Traditionally, students reflected on their learning by documenting their learning experiences in a paper journal, or in a file (created by a word processor) stored on their computer (Wagner, 2003). In comparison to traditional, paper-based learning journals, the use of blogs as a tool to support reflective writing can provide significant benefits to both educators and students (Wagner, 2003). Shoffner (2005) points out that while blogs retain the positive aspects of traditional learning journals, they also offer the option of communal feedback. The commenting feature of blogs allows a student to receive feedback from his educator earlier in the reflective process, giving him an opportunity to improve and modify his thoughts and actions if necessary. Du & Wagner (2005) implemented blogs in an undergraduate Information Systems course and stated that blogs 'enhance the traditional learning log' by bringing collaboration into the reflective process. A study by West, Wright and Graham (2005) compared blogs with other educational technologies. They found that the students surveyed believed that

blogging was the most valuable technology for reflection compared to discussion boards and email. Students also preferred blogs to traditional handwritten journals (West, Wright & Graham, 2005).

Stiler and Philleo (2003), examining the use of blogs to promote reflective writing in teacher education, found that blogs promoted both depth and breadth of reflection. Tan *et al.* (2005), using blogs as a tool to support language learning, discovered that the use of blogs encouraged deep reflection on learning and that viewing other students' reflections increased student motivation. Ray and Hocutt (2006) also concluded that blogs have the potential to be useful tools for reflection. They examined the levels of reflection in student blogs on a teacher-training course and found that there was a low to medium level of reflection occurring in blogs (Ray & Hocutt, 2006). A subsequent study by Ray and Coulter (2008) further confirmed that blogs are useful in supporting reflective writing. They also noted that, in comparison to traditional learning journals, blogs were more dynamic, social and collaborative (Ray & Coulter, 2008).

The theme of blogs being utilised to encourage reflective dialogue is common to many studies (e.g. Nückles, 2004; Du & Wagner, 2005; Yang, 2009). Chen (2004) states that meaningful reflection often takes place through dialogue with a mentor or a peer and recommends that students build a personal learning portfolio in the context of a community of learners (Chen, 2004). Samuel and Betts agree, noting that "dialogue has the potential to promote deeper levels of reflection (2007, p. 271). Blogs also facilitate peer assessment, as students can easily leave feedback on one another's reflections by utilising the blog's commenting feature (Jones, 2006; MacColl, 2005; Xie *et al.*, 2008; Olofsson, Lindberg & Hauge, 2011).

Although the facilitation of reflective dialogue is widely regarded as a benefit of blogging (as described above), some feel that blogging is a personal, individual activity. In an ethnographic study, carried out by Nardi, Schiano and Gumbrecht (2004), it was concluded that bloggers preferred when their readers had limited interaction with their blog. This study analysed text taken from 23 blogs and conducted interviews with the authors of those blogs. The study concluded that bloggers "wanted to express

themselves without the 'threat' of immediate feedback", and contrasted the asynchronicity of blogging to the immediacy of email, instant messaging, phone and face-to-face communication (Nardi, Schiano & Gumbrecht, 2004, p.228). Similarly, Otienoh (2010) noted that some student teachers resented the feedback on their journal entries and found it demotivating. Another study by Herring and colleagues (2005) noted that the majority of blogs are disconnected, having very few inward or outward links (Herring *et al.*, 2005). Efimova & Hendrick (2005) state that the emergence of blog communities is paradoxical, given that blogs are generally regarded as a highly personal space. However, this paradox may be the very reason that blogs are suitable for reflective writing; they provide students with a personal space to reflect while also allowing interaction when appropriate (Suzuki, 2004). Nückles and colleagues suggest that public learning diaries enrich learning and result in deeper processing and retention of learning material (Nückles *et al.*, 2004).

Deng and Yuen (2011) have developed a framework that demonstrates how blogs can be useful both as an individual and social activity. The model (which can be seen in Figure 2.10) maps three blogging activities (writing, reading and commenting) on two dimensions; individual to community and cognitive to social/psychological.
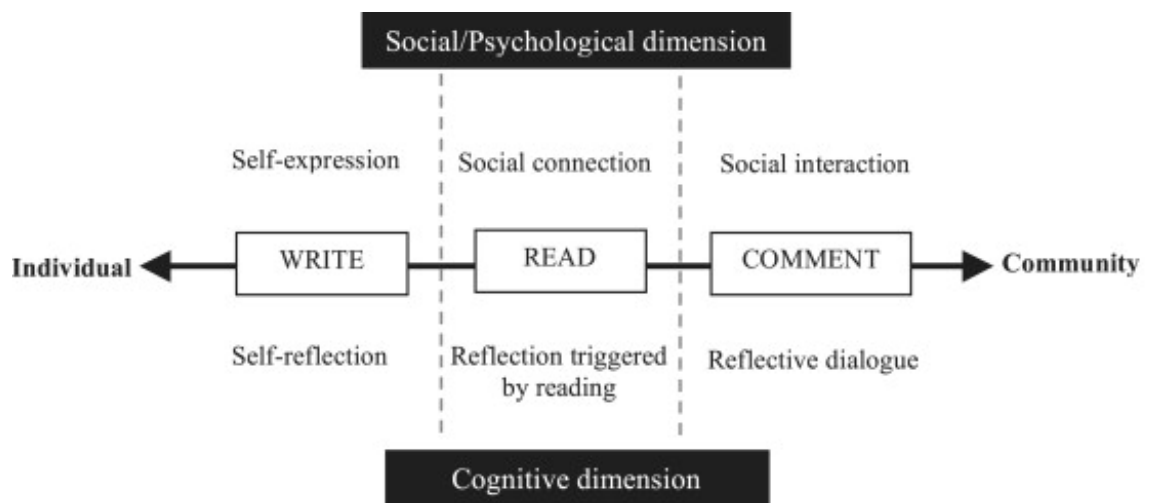
Figure 2.10: Educational affordances of blogs framework
Reproduced from Deng & Yuen (2011)

The social/psychological dimension of Deng and Yuen's model, as it progresses from individual to community-based activities, sees the student's focus change from self-

expression (writing) to social connection (reading) to social interaction (commenting) (Deng & Yuen, 2011).

In the cognitive dimension, activities also range from the individual to the community-based. Students engage in self-reflection (writing), reflection triggered by reading (reading) and reflective dialogue (commenting). Although most research into reflective blogging focuses on writing or commenting, Deng and Yuen (2011) note that reading is also a useful activity as students reflect on the material published by a wider community. Ellison and Wu (2008), who also examined a variety of blogging activities, surveyed students and discovered that students felt reading their peers' blogs was the most useful activity when attempting to gain an understanding of a topic.

Earlier in this chapter, a model developed by Conole *et al.* (2004) was presented. This model attempts to situate learning approaches in relation to their underlying theoretical perspectives and maps approaches across three continua: (1) individual to social, (2) reflection to non-reflection and (3) information to experience. Conole and colleagues proposed that reflective learning is situated in the Information, Experience and Reflection region of the model, as students connect abstract concepts (Information) by observation and consideration (Reflection) of their experiences (Experience) (Conole *et al.*, 2004). However, it was noted that this does not address scenarios where reflective dialogue is used. In this context, reflective learning is socially constructed through interaction with tutors and/or peers. Therefore, the individual to social continuum of Conole's model should be considered. Deng and Yuen's (2011) framework does this by demonstrating that activities can range from the individual to the social. It shows that blogging as a learning activity can support both cognitive constructivist and social constructivist approaches to learning, depending on the way in which blogs are used.

2.3.4 Issues with educational blogging

Privacy is an area of concern for students when using blogs. A survey carried out (by Saeed and Yang, 2008) with 105 students found that 37.5% preferred their blog posts to remain anonymous and 69.3% had a preference for private, as opposed to public, blogs.

The blogs used in the study conducted by Sharma (2010) were publicly available on the Internet, and students commented that this made them feel restricted in the topics they could openly discuss. Blogging software provides functionality that allows the blog author to password-protect posts, or to make a blog visible only to a limited group of readers; it is recommended that these features are implemented when blogs are used for educational purposes (Birney, Barry & Ó hÉigeartaigh, 2007). However, Divitini *et al.* (2005) note that limiting access reduces possibilities for knowledge sharing and communication. Therefore, the balance between accessibility and privacy must be carefully considered.

Students' willingness to participate in blogging activities was found to be linked to the amount of previous technology experience that they had: those already immersed in the use of a range of technologies were more likely to perceive blogging as something that might be useful to them (Wang, Lin & Liao, 2012). It is important to provide the necessary support and training to those less comfortable with technology.

Educators may have concerns that the use of blogs encourages informal, non-academic language (Ellison & Wu, 2008). Fischer *et al.* (2011), in a comparison of 50 reflective blogs and 45 reflective essays, hypothesised that the blogs would use more informal language and show less evidence of reflection. However, this was found not to be the case. Fischer suggests that the emergence of communication methods like micro-blogging (e.g. Twitter) has resulted in blogs being viewed as a relatively formal mode of communication (Fischer *et al.*, 2011). A number of earlier studies also found that the language used in blogs is, in general, representative of the language used in other written media (Nilsson, 2003; Nowson, 2006).

From an institutional point of view, Adenekan (2005) warns of legal and reputational issues when blogs are used for educational purposes. For these reasons, some institutions may choose to host blogs internally rather than allowing students to use public blogs.

Finally, there is a lack of scientific research that examines the use of blogs in education (Sim & Hew, 2010). The majority of research in the area uses surveys that require participants to self-report. This approach can have limitations as participants' preconceived ideas about 'correct' responses may affect the way in which they respond (Sim & Hew, 2010).

2.4 Assessment

Brown (1999a) describes five key questions that should be asked when choosing assessment methods or strategies. The structure of this section addresses each of these questions in turn.

- *Why are we assessing?* The reasons for assessing are extolled and the differences between formative and summative assessment are considered.
- *What are we assessing?* The alignment of learning outcomes to assessment tasks is considered in the context of taxonomies of learning and the importance of authentic assessment tasks is considered.
- *Who is best placed to assess?* Self and peer assessment are considered as alternatives (or supplements) to assessment by educators.
- *How are we assessing?* Types of reflective learning assignments are presented. The debate about whether reflection should be assessed is addressed, and the degree to which students and assessors should be supported with guidelines, frameworks or marking schemes is examined.
- *When should we assess?* The benefits of regular assessment are set out and issues with the provision of formative feedback are discussed.

First, assessment principles are considered and assessment is examined in the context of learning theory.

2.4.1 Assessment principles

Significant changes are being proposed for assessment in response to the shift from behaviourist to constructivist perspectives of learning (Shepard, 2000). Shepard states that the form and content of assessment should be modified to represent authentic tasks that encourage active engagement with learning. She also notes that a related change is required in student and staff perspectives of assessment and suggests that there should be a move away from rote learning, and the teaching and assessment that encourages it.

One of the goals of constructivism is constructive alignment (Carlile & Jordan, 2005). Biggs (1999, p. 11) defines constructive alignment as "a good teaching system [that] aligns teaching methods and assessment to the learning activities stated in the [curriculum] objectives, so that all aspects are in accord".

This process of constructive alignment is a key part of the standards-based (or criteria-based) model of assessment. The standards model assesses students' performance against a set of pre-defined criteria which, in turn, are closely linked to the learning outcomes of a course of study. This is the dominant assessment model in higher education (Biggs, 1999; Light & Cox, 2001). An alternative assessment model is the normative (or measurement) model, which compares students with one another. This model is generally only used where ranking of students is needed: for example, as part of a selection process (Biggs, 1999; Light & Cox, 2001).

In using the standards-based model, it has been noted that assessment tasks frequently define the teaching and learning strategies that teachers and students use (Paul, Lewis & Supon, 1994; Biggs, 1999). Students rise to meet the assessments tasks that are set; if assessments are 'bad' (i.e. they encourage rote learning or allow students to operate at a surface level of learning) then the levels of learning that occur will be poor (Biggs, 1999). Similarly, Paul, Lewis & Supon (1994) note that teachers' tendency to 'teach to the test' means that poor assessment tasks lead to poor teaching. On the other hand, if higher-order skills are assessed this will in turn encourage the teaching (and learning) of

these skills. Therefore, assessment tasks should encourage active, deep learning (Biggs, 1999).

However, it has been suggested that constructive alignment and the standards movement poses challenges to the value of meaningful reflection, with several authors expressing concern that too much emphasis is placed on the outcomes of learning (Ward & McCotter, 2004; Clouder, 2009). Clouder (2009) argues that when the focus of assessment is on the product, assessing reflection (where much of the value comes from engaging with the process) becomes difficult. Nonetheless, she states that it is important for academics to add value to reflective learning activities by making formal links between learning and assessment. Ward & McCotter (2004) recommend that engagement with the reflective process should be assessed as a learning outcome in itself.

2.4.2 Why are we assessing?

There are many reasons why assessment is important in a higher education setting. From an institutional point of view it is necessary to classify or grade student achievements for the purpose of accreditation (Brown, 1999a). From the students' perspective, assessment provides them with feedback so that they can learn from mistakes, helping them to improve and develop their skills. Assessment also encourages students' motivation to learn and assists them in making informed decisions about future subject or course choices (Race, 2007). In addition to this, assessment provides educators with feedback on how effective their teaching strategies are in the promotion of learning (Brown, 1999a).

Assessment activities are frequently placed into one of two categories: formative or summative (Brown, 1999a). Formative assessment normally happens earlier on in a course of study; its main aim is to provide students with feedback to enable them to make adjustments and improvements (Biggs, 1999). Formative assessment is not normally given a grade i.e. it does not make up part of the course credit attached to a

module. Hume and Coll (2009) refer to this as 'low-stakes' assessment, as it allows students to make mistakes without being heavily penalised. Summative assessment, on the other hand, is referred to by Hume and Coll as 'high-stakes' assessment. This type of assessment is usually assigned a quantitative grade and is used for accreditation purposes; it normally takes place at the end of a module or course of study (Biggs, 1999).

Black & Wiliam (2009, p. 8) describe formative assessment activities in more detail, and set out five strategies in this regard:

1. Clarifying and sharing intentions and criteria for success
2. Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding
3. Providing feedback that moves learners forward
4. Activating students as instructional resources for one another
5. Activating students as the owners of their own learning

Hatzipanagos & Warburton (2007) discuss the benefits of formative assessment, which include motivation and increased learning. They indicate that social software technologies (including blogs) may be valuable for formative assessment purposes (Hatzipanagos & Warburton, 2007).

Summative assessment, as noted earlier, is an overall judgement of achievement, which is most likely to occur at the end of a semester or year (Black, 1999). This type of assessment is important for the purposes of final accreditation and providing a record of student achievement (Biggs, 1999). Light and Cox (2001) argue that almost any summative assessment task is at least partially formative (and *vice versa*). Brown (1999a, p. 7) concurs, saying that:

> *"a summative final year exam result gives students realistic [formative] feedback about their likelihood of getting funding for a higher degree and formative feedback usually contains [summative] language of judgement".*

Biggs (1999) notes that, in terms of summative assessment, there is often a need to turn qualitative evaluations into quantitative figures for the purposes of final accreditation. In the next section this is considered further, using an example from Biggs' work that shows how holistic judgements about levels of learning can be converted to summative grades.

2.4.3 What are we assessing?

Constructive alignment is the principle that learning outcomes, teaching strategies and assessment tasks should be closely related to one another (Biggs, 1999). Biggs underlines the importance of 'authentic' assessment tasks, which allow the learner to demonstrate the skills they have learned, rather than merely describing them. Drawing on constructivist principles, he recommends activities like problem-based learning to encourage students to become active learners, resulting in deep (rather than surface) learning and suggests that, in order to develop learners' higher-order thinking skills, these higher-order skills must be effectively assessed.

The taxonomy of educational objectives set out by Bloom (1956) describes learning objectives on a continuum from lower-order to higher-order skills. Bloom's taxonomy includes three domains: cognitive (mental skills), affective (emotions/feelings) and psychomotor (manual skills). The six levels that form the cognitive domain can be seen in Figure 2.11.

Along with each level, a list of verbs is provided[1] to assist the educator in writing learning outcomes (and related assessment tasks) that correspond to that level of the taxonomy (Kennedy, 2007). Progressing from lower-order to higher-order mental skills, the levels are:

1. Knowledge: the ability to remember and recall facts
2. Comprehension: the ability to understand these learned facts
3. Application: the ability to apply learned information in different contexts

---

[1] In Figure 2.11 the list of verbs shown is a subset of those described by Bloom; verbs summarised by Wood (2009).

4. Analysis: the ability to examine relationships between ideas

5. Synthesis: the ability to amalgamate ideas

6. Evaluation: the ability to assess the value of these ideas
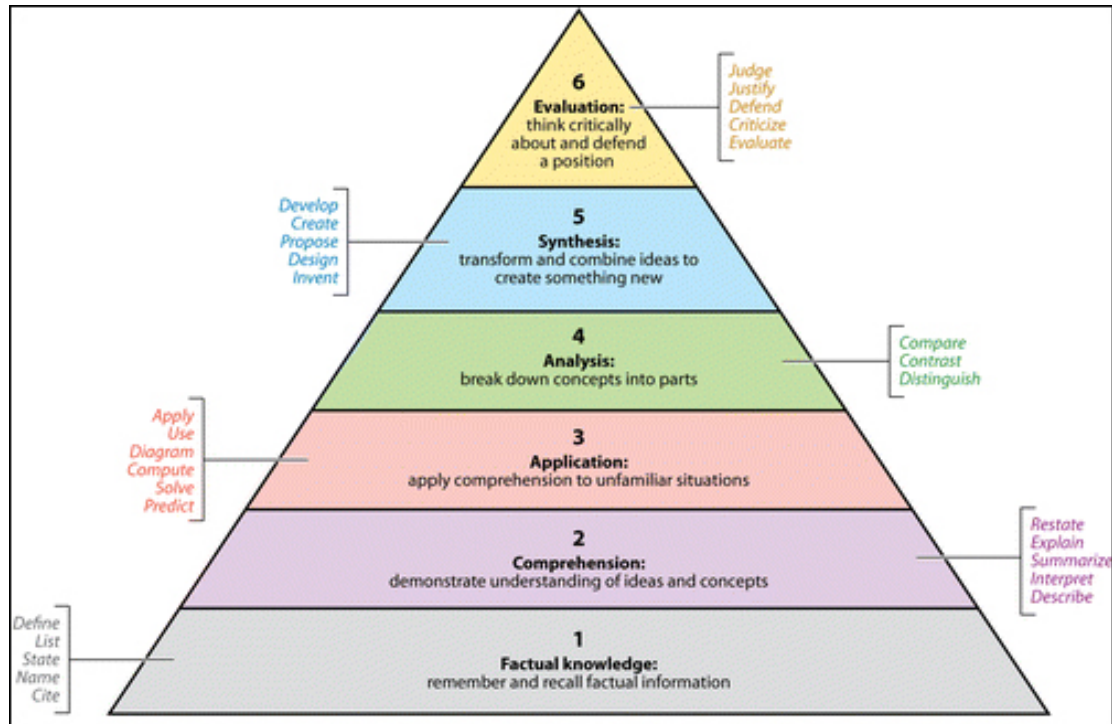
Figure 2.11: Bloom's taxonomy of educational objectives (cognitive domain)
Reproduced from Wood (2009)

Anderson and Krathwohl (2001) later recommended changes to the structure of Bloom's taxonomy and proposed that the top two levels should be switched (with evaluation becoming the fifth level, instead of the sixth) and that synthesis should be renamed 'creating' (to signify that, as well as synthesising existing ideas, new ideas may be created).

Another instrument that can be useful in the identification of levels of learning (and can therefore assist in writing learning outcomes and assessment tasks that address these levels) is the SOLO (Structure of Observed Learning Outcomes) taxonomy developed by Biggs & Collis (1982). The SOLO taxonomy (seen in Figure 2.12) describes five levels of sophistication which can be used to classify student learning; prestructural, unistructural, multistructural, relational and extended abstract. In a similar way to

Bloom's taxonomy, a list of verbs is provided in relation to each level. The levels described in the taxonomy are incremental in the level of understanding they represent, from prestructural (which constitutes a lack of understanding) to extended abstract (which represents the highest level of understanding).

1. Prestructural: The student demonstrates a lack of understanding ('misses the point')

2. Unistructural: The student identifies one issue (as part of a more complex case)

3. Multistructural: The student identifies and describes a collection of items/issues

4. Relational: The student links these issues and identifies relations between them

5. Extended abstract: The student demonstrates the ability to generalise and go beyond the issues described earlier to examine a wider context
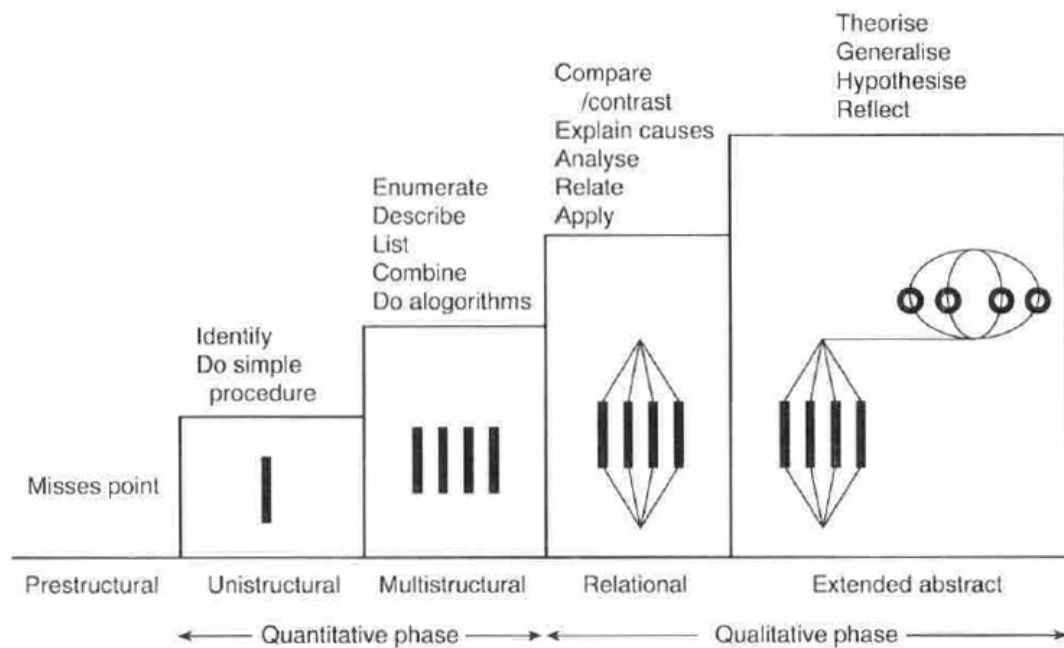
Figure 2.12: Biggs and Collis' SOLO Taxonomy
Reproduced from Biggs (1999)

Biggs (1999) notes that it is often required that relatively subjective judgements (like whether a student's learning belongs in the multistructural or relational category of the SOLO taxonomy) be turned in quantitative grades for the purpose of summative assessment and final accreditation. He gives an example of how the levels of the SOLO

taxonomy can be mapped to quantitative grades and suggests that five points be ascribed to each level of the taxonomy as follows:

Prestructural: 0 marks
Unistructural: 1 – 5 marks
Multistructural: 6 – 10 marks
Relational: 11 – 15 marks
Extended abstract: 16 – 20 marks

Biggs (1999, p.198)

Biggs states that the need to report student results in numerical form for accreditation purposes is problematic; nonetheless, he notes that the conversion of holistic judgements into quantitative grades is a necessity. Therefore, he suggests the use of a structured model (like the SOLO taxonomy) to support and facilitate this process (Biggs, 1999).

2.4.4 Who is best placed to assess?

Biggs (1999) describes three processes that are involved with assessment (in the standards-based model):

1. Setting the criteria for assessment
2. Deciding what constitutes evidence that the criteria have been met
3. Making a judgement about the degree to which criteria have been met

The educator traditionally held complete responsibility for all three of these steps (Biggs, 1999). However, students can become involved in one or all of these processes using self or peer assessment. Self and peer assessment most frequently occur at the third stage, where students assess their own work or one another's work, respectively. However, Biggs (1999) suggests that students can also be involved at the first and second stages, in deciding what the assessment criteria should be and how they should be assessed.

Self assessment occurs when a student evaluates his own work against a set of pre-defined criteria. Watts & Lawson (2009) examined the use of self-assessment. In their

study, students training to be teachers examined their own reflective journals in relation to a reflective framework and evaluated the degree to which their reflections had met the guidelines set out by that framework. The activity was found to increase levels of critical reflection in subsequent work. Samuel and Betts (2007) support this finding and also claim that self assessment leads to reflection. Citing Brew (1999, p. 160), they say that "all self-assessment involves reflection, but not all reflection leads to self-assessment".

Using peer assessment, students assess one another's work by comparing it to a set of pre-defined criteria. In discussing the benefits of peer assessment, Falchikov (1995) states that feedback is useful to students but notes that time constraints can prevent educators from doing this on a regular basis. She suggests that peer feedback is a useful replacement and reports that, in a comparison she performed, the marks given by peer-assessors and educators were similar to one another. In terms of reflective writing, peer feedback can be used to encourage reflective dialogue; in the previous section, it was noted that blogs can facilitate peer assessment by allowing students to easily leave feedback for one another using the commenting feature of blogs (MacColl, 2005; Xie *et al.*, 2008; Olofsson, Lindberg & Hauge, 2011).

However, Xie *et al.* (2008) reported that feedback from peers may not be as reliable as that from a tutor, as students are either not able or unwilling to give each other critical feedback; they recommend that peer assessment should be monitored by a tutor. Also, Harris (2008) noted that students who were asked to self-evaluate their own reflective journal writing wanted follow-up evaluation from their tutor. It is important, therefore, that the educator remains involved (at least to some extent) in peer and self assessment.

2.4.5 How are we assessing?

This section examines assessment methods; specifically, methods that are used to demonstrate evidence of reflective learning. Then, a number of issues with reflective writing assessment are considered. First, the debate on whether reflection should be

assessed at all is addressed. Second, the amount of support (in the form of a reflective framework) that should be given to students and assessors is considered.

2.4.5.1 Reflective learning assessment methods

Brown (1999b, p. 95) states that "in order to establish if a student is a competent practitioner in a professional context it is essential to use experiential approaches for the testing of skills". In terms of assessing reflection, Brown describes a number of types of assignment including logs, diaries, reflective journals and critical incident accounts. Other types of reflective writing assignments described in the literature include reflective essays (e.g. Fischer *et al.*, 2011) and reflective blogging (e.g. Ray & Coulter, 2008). Types of assignments are listed here (adapted from Brown (1999b), unless otherwise indicated):

- Log: a log consists of a checklist of activities; reflective commentary on this checklist may/may not be provided
- Diary: a diary generally contains a more personal narrative of an activity
- Reflective journal: a reflective journal tends to be more selective in the narrative introduced (in comparison to a diary)
- Critical incident account: using this type of assignment, students are asked to select a number of critical incidents from their journal; these may be subjected to further reflection. The critical incident account is submitted for assessment (rather than the whole journal being submitted).
- Reflective essay: this is similar to a critical incident account and selects one or more issues for discussion and presentation for assessment (Fischer *et al.*, 2011).
- Reflective blog: a reflective blog is similar to a reflective journal, except that it is web-based. As discussed earlier, blogs can be made available to one or more readers, which can encourage reflective dialogue (Ray & Coulter, 2008; Deng & Yuen, 2011).

2.4.5.2 Whether or not reflection should be assessed

Some believe that assessment is not relevant or appropriate in terms of reflective writing and that assessment may even act as a barrier to reflection. Others advocate reflective writing assessment and believe it to be an integral part of the process. Both sides of this argument are now considered.

Those who oppose the assessment of reflective writing express concerns that assessment will affect the authenticity of reflection. These authors recommend that reflective activities should not utilise high-stakes (i.e. summative) assessment methods as they believe this will encourage 'strategic' students to match their reflective writing to the (perceived or real) expectations of their educator, thus creating a barrier to honest reflection (Hargreaves, 2004; Hobbs, 2007). Boud (2001) states that the assessment of reflective journals encourages students to display what they know and cover up what they do not know. Boud argues that this is the opposite of what reflection should be (Boud, 2001). Dewey (1933) viewed reflection as a problem to be considered. However, according to Boud, if journals are assessed, students may attempt to conceal the fact that they have problems with the learning material, rather than reflecting on the problems and attempting to solve them (Boud, 2001). Formative, low-stakes assessment methods may discourage this practice as the incentive to conceal problems would be removed.

Other barriers to the assessment of reflection include a lack of guidelines about what constitutes reflection (from a student's point of view) and how reflection should be assessed (from an educator's perspective). These issues are discussed in the next section.

Some educators feel that the assessment of reflection is essential to ensure participation in the reflective journaling activity (George, 2002). Carlile and Jordan (2007) note that it is important that assessment of reflective writing is constructively aligned (i.e. that there is a clear link between learning outcomes and assessment) so that students do not see it as an unnecessary burden. They point out that the use of summative assessment is

one way to guarantee uptake of a reflective learning activity. Similarly, Philip (2006) notes that many students will not take part in activities that do not have course credit attached to them.

Often, the assessment of reflection is required as a way to show that the learning outcomes of a course have been met. If a learning outcome of a course is that the student should demonstrate evidence of reflective thinking, then this must be assessed in some way (Bourner, 2003). McGuinness & Brien state that assessment "…offers a concrete means of conveying the effects of instructional interventions to institutional administrators and other relevant stakeholders" (McGuinness & Brien, 2007, p. 22).

2.4.5.3 The provision of reflective guidelines for students and assessors

Another issue with the assessment of reflective writing is a lack of guidelines with regards to the definition of reflection (Hargreaves, 2004; Hobbs, 2007). The HE Academy 'Assessing Reflection' Special Interest Group (2005) states that there is a lack of clarity about what constitutes reflection. This can lead to confusion and uncertainty as students are not aware of what is required of them in relation to a reflective writing assignment.

Moon (2007), as well as noting difficulties in informing students how to reflect, suggests that academics may be unsure of what to look for when assessing reflection. Sumison & Fleet (1996) state that "until more is known about reflection, identification and assessment are problematic" (Sumison & Fleet, 1996, p. 128). Hargreaves (2004) also points to a lack of guidance in the literature on how best to assess reflective writing.

Dalley (2009) examined reflective writing and its assessment and found that both students and staff were frustrated by the process. Students felt unsure about what they were supposed to be doing and staff were disappointed because the students were not engaging in reflection as much as they had expected them to. A reflective framework which guided both the reflective writing activity and its assessment was introduced.

The use of the framework improved student performance and also aided assessors' understanding of what was required. However, Dalley (2009), although favouring the use of a reflective framework on the whole, suggests that this approach may curtail the creativity of some students. Similar concerns about the use of reflective prompts were raised by Regmi (2010).

Moon (1999a) states that for a reflective journaling task to be effective it is necessary for the educator to have a clear understanding of what constitutes a good performance and suggests that this understanding can be gained by using or developing a set of assessment criteria. Buchanan agrees that there is an onus on educators to develop clear and unambiguous reflective writing assessment criteria (Buchanan, 2003). However, it has been noted that the development of such criteria can be challenging. Edwards & Cunningham (2009) investigated the development of reflective writing assessment criteria with a group of assessors and acknowledged how difficult it is to articulate the "warm, fuzzy feeling which some of [them] had when [they] read particular essays" (p. 65). They state that while some assessors wanted broad, open criteria other preferred detailed and very specific criteria. Toms (2009) also examined the degree to which assessors found criteria helpful when assessing reflective writing. Assessors were provided with a pack that included an assignment brief, guidelines, marking criteria, an annotated sample paper and a marking sheet. Toms reported that assessors found the marking criteria to be the most helpful item in the pack, and noted that some assessors requested weighted criteria.

2.4.6 When should we assess?

Brown (1999a) recommends regular assessment and notes that it is important that students are allowed to make mistakes in 'rehearsal' stages i.e. during low-stakes, formative assessment, on which students then receive feedback. Ertmer and Newby (1993) note that the provision of feedback plays a central role in all three major philosophical positions: behaviourism, cognitivism and constructivism. In other words, no matter what learning approach is taken or what underlying theoretical perspective is

ascribed to, the provision of regular feedback is a crucial part of the assessment process (Shepard, 2000). Race (2007) also discusses the importance of regular feedback and states that quality feedback should be timely, individual, empowering, and manageable (for both students and assessors).

However, there are a number of issues with the provision of regular feedback. Race (1995; 2007) recommends that the time interval before feedback is given should be reduced, and that feedback should be immediate if possible. However, in reality, the provision of feedback on reflective activities is time-intensive (Stanley, 2004; Harrison & Fopma-Loy, 2010). Chen and colleagues noted the challenge in reading and commenting on the large quantity of work produced weekly by students (Chen *et al.*, 2005). A study by Jenkins (2004) recommends that regular feedback is possible only with small groups of students (between 10 and 30). Buchanan (2003) also states that reflective journal assessment can be time intensive with large groups.

MacColl *et al.* (2005) found that an average of seven hours of a tutor's time per week was required to read reflective journal entries and comment on them. They noted that the use of blogs aids this process to some extent due to ease of collection (compared to paper journals) and the built-in commenting feature provided by the blogging software (MacColl *et al.*, 2005). Jones (2006) also noted that blogs provide improved opportunities for feedback.

Although the use of blogs can reduce the workload involved in feedback provision to some degree they do not fully address the problem, particularly in the case of larger groups. In discussing the need for regular, prompt feedback, Brown (1999a) suggests the use of computer-based testing (CBT). She states that this type of assessment is useful for providing early feedback at rehearsal stages (i.e. that it should not necessarily be used for high-stakes, summative assessment, but rather that it can provide feedback in a formative manner). Brown specifically mentions methods that assess multiple choice questions; however, automated assessment has come a long way since 1999 and more complex written material can now be assessed. The next section considers the

evolution of automated assessment technologies and considers their suitability for the assessment of (and provision of formative feedback on) students' writing.

2.5 Automated Assessment

This section begins by examining the educational foundations of automated assessment and describes the evolution of this type of assessment. The use of automated assessment technologies for both formative and summative purposes is considered and links are made between intelligent tutoring systems and constructivist learning theory. Automated writing evaluation and its benefits are discussed and the issues with automated assessment are considered. Then, the capabilities of systems that automate the assessment of writing are described and these systems are compared and evaluated.

2.5.1 Educational foundations of automated assessment

The ways in which technology can be used to support assessment have changed dramatically in recent years (Shermis & Burstein, 2003; Pérez-Marín, Pascual-Nieto & Rodríguez, 2009). Early research in this area focused on the analysis of multiple-choice questions (MCQs). However, while MCQs are still frequently used, and are no doubt easier to mark, most educators feel that questions of this type promote recall rather than higher-order thinking (Dreher, Reiners & Dreher, 2011). Williamson, Mislevy and Bejar (2006) note that although MCQs do have several advantages they do not enable assessment of real-world tasks. From a constructivist perspective, authentic assessment tasks are important (Biggs, 1999; Carlile & Jordan, 2005).

Freeform, open-ended responses can be used to assess learning that occurs at the higher levels of Bloom's taxonomy (Valenti, Neri & Cucchiarelli, 2003; Pérez-Marín, Pascual-Nieto & Rodríguez, 2009). The value of this type of assessment has led to an area of research that attempts to automatically evaluate students' freeform responses. Research into automated writing evaluation began in the 1960s (Page, 1966); since then, this type

of assessment has been "used widely […] at the university level" (Shermis & Burstein, 2003, p. *xi*). Technologies in this area have evolved to be able to evaluate and measure specific aspects of writing (e.g. its organisation or style). There is a growing interest in automated feedback, with many authors stating that formative assessment (and the provision of regular, prompt feedback) is the ideal use for automated systems (Shermis & Burstein, 2003; Sukkarieh, Pulman & Raikes, 2003; Warschauer, 2010). Pérez-Marín, Pascual-Nieto & Rodríguez (2009) conducted a survey that asked students and staff about what they most wanted from an automated system; feedback was the answer given by the majority of both staff and students.

A study by Katz, Allbritton and Connelly (2003) compared the effect of feedback given to students via a human tutor with that provided by an automated system. A third group of students received no feedback. The authors reported that the media used for feedback had no significant effect on student learning; however, not receiving any feedback (from either source) had a negative impact on learning (Katz, Allbritton and Connelly, 2003). Watts (2007) examined the effect of media used to provide feedback (email vs. voicemail) and, similarly, found that there was no significant difference in the effectiveness of those media for feedback provision.

Systems that provide formative feedback via a dialogue with the student are often referred to as 'intelligent tutoring' systems. He, Hui and Quan (2009) suggest that intelligent tutoring systems can encourage active engagement with learning by attempting to elicit constructive responses from students. Mayes and de Freitas (2004) also note that intelligent tutoring systems facilitate formative assessment and dialogue and suggest that they support cognitive/constructivist approaches to learning. Another benefit of intelligent tutoring systems is that feedback can be tailored to the student based on their preferences and learning styles (Gogoulou, Gouli & Grigoriadou, 2008; Calvo & Ellis, 2010); personalised learning is also important from a constructivist perspective (Gardner, 1999; Carlile and Jordan, 2005).

Automated assessment systems are also useful from a staff perspective, mainly as a means of reducing the workload involved with regular assessment (Mitchell *et al.*,

2003; Higgins & Bligh, 2006). Higgins and Bligh (2006, p. 98) note that automated assessment technologies developed from the need to manage "an increasingly large workload of assessment within the context of providing higher education to a larger proportion of the population without proportionately higher resources". In a university course in medicine, Mitchell *et al.* (2003) implemented an automated writing evaluation system for the purpose of assessing a progress test (which included open-ended questions). The previous paper-based marking system was so time-intensive (requiring 800 scripts with 270 items each to be marked, and taking an estimated 30 man-days) that students did not receive feedback on the test until after their final exam, too late for the feedback to be useful. The introduction of the automated system reduced the time needed for marking from days to hours; assessors closely monitor the marks given by the system to ensure that they are accurate (Mitchell *et al.*, 2003).

In Section 2.5.3, automated writing evaluation systems are described and compared. First, areas of concern in relation to the use of automated assessment are considered.

2.5.2 Issues with automated assessment

Page (2003) discusses a number of common concerns with automated assessment. He addresses the 'humanist' objection (that a computer system cannot understand or appreciate an essay in the same way that a human would) and notes that automated systems often have better rates of agreement with human assessors than human assessors have with one another. Page also notes that educators are often concerned that students will 'cheat the system', but points out that most systems contain subroutines that attempt to flag such efforts (Page, 2003). In addition to this, most applications of automated assessment still involve human assessors to some degree; for example, in the study described earlier (Mitchell *et al.*, 2003) students' responses were closely moderated by assessors.

Student and staff perspectives of automated assessment must be considered when implementing an automated system. Dreher, Reiners and Dreher (2011) surveyed both staff and students and asked about their understanding of the use of technology to

support assessment. They found that the majority believed automated assessment to be useful in assessing things like multiple choice questions; only a few realised that automated assessment technologies can be used to evaluate written essays. Developments in the area need to be effectively communicated to staff and students in order to close the gap between "current praxis and potential benefits" (Dreher, Reiners and Dreher, 2011, p. 178).

Finally, the initial investment in automated assessment, both in terms of cost and the time taken to develop or implement a system, could be prohibitive. For this reason Heinrich *et al.* (2006) state that automated assessment is most valuable when used with large classes and where the same assessment is repeated with a number of cohorts.

2.5.3 Automated writing evaluation systems

This section examines the types of technology used to automate the evaluation of writing. Five types of technology are examined: Natural Language Processing (NLP), Information Extraction (IE), Latent Semantic Analysis (LSA), Bayesian networks and machine learning techniques (which include neural networks). Seventeen systems are evaluated and are compared later in Table 2.2. The type of content assessed by these systems can be grouped into one of two categories: essay-type responses or short, freeform responses. The analysis of short responses requires the answer to be objective and demands that clear-cut right/wrong criteria are available (Sukkarieh, Pulman & Raikes, 2003; Siddiqi & Harrison, 2008). Essay-type assessment, on the other hand, can deal with more subjective, complex subject matter (Pérez-Marín, Pascual-Nieto & Rodríguez, 2009). The types of content assessed, along with the subject domains examined, are noted throughout the following discussion.

2.5.3.1 Natural language processing (NLP)

Natural language processing (NLP) is the application of computational methods to examine the features of text (Burstein, 2003). The features of the language used can be examined at varying levels of depth. For example, the Project Essay Grade (PEG)

system was the first to automate the assessment of essays (Page, 1966; 2003) and analysed surface features of text such as essay length and counts of particular words. The e-rater system (developed by Burstein *et al.*, 1998) assesses more complex features like syntactic variety and discourse structure.

PEG and e-rater have been used to assess essay-type responses for the purpose of assigning a summative grade. Both systems require a large corpus of graded essays to be analysed before testing begins. This analysis allows the system to determine the features of a successful essay, against which student essays are then compared (Burstein, 2003).

NLP techniques have also been used to assess short, freeform responses. For example, keyword analysis can be used to match the words present in a student answer with those found in a model answer. This type of keyword analysis can be supplemented with techniques that compare strings of consecutive words (Pérez-Marín *et al.*, 2006). The Willow system (Pérez-Marín *et al.*, 2006) uses this method to compare student answers to a reference answer written by a tutor. The c-rater system (developed by Burstein, Leacock and Swartz, 2001) operates on a similar principle; the system does not require training with a large corpus of text but does require a model answer to be developed by a human expert. The Auto-marking system (Sukkarieh, Pulman & Raikes, 2003) used a comparable approach to assess students' short, freeform responses to biology questions.

The MarkIt system developed by Williams and Dreher (2004) assesses essays (like PEG and e-rater). However, unlike PEG and e-rater, the MarkIt system requires only one model answer. MarkIt grades students based on similarity with that answer; other equally correct answers may score poorly.

A final example of a system that utilises NLP to assess essays is the PS-ME (Paperless School Marking Engine) system. The creators of PS-ME claim that it can evaluate three different levels, based on Bloom's taxonomy: knowledge, understanding and evaluation (Mason & Grove-Stephenson, 2002). At the lower levels of the taxonomy, the system checks to see if surface features, like words that relate to the domain, are present. At

higher levels (i.e. evaluation) the system examines the number of adjectives/adverbs used; this is then further refined by analysing syntactic patterns and considering context and correctness.

2.5.3.2 Information extraction (IE)

Information extraction (IE) is a form of NLP where, rather than attempting a full analysis of the language used, the text is scanned for evidence of specific concepts. Automark is an example of a system that uses information extraction methods. The system examines short, free-text responses and compares them to a set of correct and incorrect responses that have been developed by human experts. The Automark system has been used to test knowledge of scientific concepts in primary education (Mitchell *et al.*, 2002) and medical knowledge in higher education (Mitchell *et al.*, 2003).

2.5.3.3 Latent Semantic Analysis (LSA)

Latent Semantic Analysis (LSA) is a natural language processing technique that is used for document similarity comparisons (Landauer *et al.*, 1997). LSA operates by using a word-by-context matrix. It takes in a large corpus of text and records in the matrix the number of occurrences of each word in each context (i.e. sentence, paragraph or document) (Kakkonen et al., 2006). The LSA algorithm can then identify similarity between words based on their context (rather than simple word matching alone). The system must be trained using relevant texts in order to mimic a human understanding of that subject area (Landauer *et al.,* 1997).

The Automatic Essay Assessor (AEA) developed by Kakkonen *et al.* (2004; 2005; 2006) used LSA to assess essays in a range of subjects: education, marketing and software engineering. Before testing, the system was trained with relevant textbook passages and lecture notes. AEA was used to assign a summative grade to the essays. Similarly, the JESS (Japanese Essay Scoring System) was used to assign a summative grade to essays based on its readability, organisation and contents (Ishioka & Kameda, 2004). However, systems based on LSA can also be adapted to provide students with

feedback (as well as a quantitative grade). This is the case with the Intelligent Essay Assessor (IEA) developed by Landauer *et al.* (1997). IEA has been used to essays in the domains of psychology, medicine and history; it can provide students with feedback by identifying subtopics (within the domain of the overall essay topic) that the student may have omitted. The system also notifies the tutor if a student essay is notably different from the others, so that it can be checked manually (Landauer, Laham & Foltz, 2003).

2.5.3.4 Bayesian networks

A Bayesian network is a graphical representation of the probabilistic relationships between a set of variables (Heckerman, 1995). Bayesian networks have been applied to the assessment of essays in the domains of biology (Rudner & Liang, 2002), social studies, physics and 'general opinion' (Larkey, 1998).

Rudner and Liang (2002) calibrated their system, BETSY (Bayesian Essay Test Scoring System), with 462 essays that had been classified (by humans) as either an appropriate, partially appropriate or inappropriate response to the question asked. The system identified features such as specific words/phrases, the order of concepts and specific noun-verb pairs. Then, probabilities were calculated to indicate the likelihood that these features would appear in an essay that constituted an appropriate, partially appropriate or inappropriate response. A similar system, developed by Larkey (1998), used Bayesian classifiers to categorise essays as either 'good' or 'bad' based on the presence of eleven features of the text (and the related probabilities that these features would occur in a good or bad essay). Larkey (1998) used between 223 and 586 essays for training with her different datasets, a comparable figure to the 462 essays used by Rudner and Liang (2002). Other methods (e.g. LSA) need a much larger dataset for system calibration, generally requiring thousands of graded essays in the training phase; the use of Bayesian networks provides some benefits in this regard (Rudner & Liang, 2002). Rudner and Liang claim that a second benefit of this technique (over others like LSA) is that it can assess shorter essays (whereas LSA is less able to assess essays that do not meet a minimum word count). However, a drawback of the Bayesian network

method is that, although essays can be classified as good or bad, there is no evidence that the system can be adapted to perform either summative assessment (by assigning a grade) or formative assessment (by providing feedback).

2.5.3.5 Machine learning/Neural networks

The Open Comment system developed by Whitelock *et al.* (2008) used machine learning classification methods to examine students' short, freeform responses to history and philosophy questions in a higher education setting (Whitelock *et al.*, 2008; Whitelock & Watt, 2008). The Open Comment system classifies a piece of text as being evidence of a particular concept; it then uses this to provide feedback to students and suggest related concepts that they may have overlooked in their answers. Similarly, the CarmelTC system (Rosé *et al.*, 2003; Rosé and VanLehn, 2005) assessed short, freeform responses in the physics domain using machine learning classification methods. Initially, the system was used to classify a student response as being somewhere between fully correct and completely incorrect (on a six-point scale) (Rosé *et al.*, 2003). However, it was later adapted to provide formative feedback to students. The system uses what the authors call a 'Knowledge Construction Dialogue' to prompt the students to think about concepts they may not have addressed in their answers (Rosé & VanLehn, 2005).

Another system that provides formative feedback is the commercial product 'MyAccess' from Vantage Learning (2006). This system uses the IntelliMetric engine which is based on "a blend of artificial intelligence, natural language processing and statistical technologies" (Vantage Learning, 2006, p. 3). The system requires training with a large corpus of graded essays; once this has been completed, it can evaluate students' writing skills and provide them with suggestions for improvements.

Another machine learning approach that has been taken in the assessment of essays is the use of neural networks. Neural networks can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques (Stevens & Casillas, 2006; Haykin, 2008). They do this by acquiring knowledge from

their environment through a learning process. A neural network that has been trained correctly is an "expert" in the category of information it has been given to analyse (Stergiou & Siganos, 1996). Ming, Mikhailov and Kuan (2000) developed a system based on neural networks, known as the Intelligent Essay Marking System (IEMS). The IEMS was used both to assign a summative grade and to provide students with formative feedback on their writing.

2.5.3.6 Summary of AWE systems

The automated writing evaluation systems that were discussed above are summarised here in Table 2.2. The table indicates the type of technology used in the system, the type of writing assessed (essay or short, freeform answer), the type of assessment (formative or summative), the domain assessed and the reliability of the system. Although Pérez-Marín, Pascual-Nieto & Rodríguez (2009) suggest that the majority of automated assessment systems are used for formative purposes this may be an idealisation as it does not appear to be the case with the systems examined here. Almost half of the systems provide only a summative grade (8 out of 17) while only two systems focus solely on the provision of formative feedback. Five systems perform both summative and formative assessment. Finally, two of the systems classify essays (as good/bad or appropriate/inappropriate) rather than performing either formative or summative assessment *per se*.

2.5.3.7 Evaluation of AWE systems

Many systems require a large corpus of graded essays to be available for training (e.g. PEG, e-rater, AEA, IEA and JESS); it can be difficult to accumulate appropriate training materials (Valenti, Neri & Cuchiarelli, 2003). Moreover, it is assumed that a student essay will have similarities to the essays on which the system was trained; the system can fail to assess an essay that is too different from the rest (Burstein *et al.*, 1998; Landauer, Laham & Foltz, 2003).

Table 2.2: Summary of automated writing evaluation technologies

System	Author(s), Year	Type of technology	Domain assessed	Type of assessment	Output (grade/feedback)	Operation/features	Reliability
AEA (Automatic Essay Assessor)	Kakkonen *et al.,* 2004; 2005; 2006	LSA (and variations)	Education, marketing, software engineering	Essay	Grade (Summative)	Trained with textbook passages, lecture notes etc.	0.75
Automark	Mitchell *et al.*, 2002; 2003	Information Extraction	Science/Medical knowledge	Short freeform answers	Grade (Summative)	Compares student answer with correct/incorrect model answers developed by human expert	0.95
Auto-marking	Sukkarieh, Pulman & Raikes, 2003	NLP/Pattern-matching	Biology	Short freeform answers	Grade (Summative)	Patterns developed by tutor, student answers compared. Not suited to subjective general opinions	0.88
BETSY (Bayesian Essay Test Scoring System)	Rudner & Liang, 2002	Bayesian networks	Biology	Essay	Classification (appropriate, partial or inappropriate response)	System calibrated using 462 essays; calculates set of probabilities for each text feature depending on whether or not response is appropriate. Can assess shorter essays	0.77
CarmelTC	Rosé *et al.*, 2003	Machine learning classification	Physics	Short freeform answers	Grade (and feedback later in Rosé & VanLehn, 2005)	Assesses each sentence for correct features. Suited to causal domains where word order is important	0.85
C-rater	Burstein, Leacock & Swartz, 2001	NLP	Reading comprehension/ algebra	Short freeform answers	Grade (Summative)	Compares with reference model built by experts; students' understanding of content assessed	0.83
E-rater	Burstein *et al.*, 1998	NLP	GMAT	Essay	Grade (Summative)	Analyses stylistic features, discourse structure and lexical complexity. Cannot score essays that are too short or too different from the rest	0.93
IEA (Intelligent Essay Assessor)	Landauer *et al.*, 1997	LSA	Psychology, medicine, history	Essay	Provides both feedback and summative grade	Assesses knowledge conveyed (not style/syntax). Cannot take word order into account	0.85

System	Author(s), Year	Type of technology	Domain assessed	Type of assessment	Output (grade/feedback)	Operation/features	Reliability
IEMS (Intelligent Essay Marking System)	Ming, Mikhailov & Kuan, 2000	Pattern Indexing Neural Network	Biology, psychology, history, anatomy	Essay	Provides both feedback and summative grade	Performs pattern recognition (based on patterns of words). Can analyse shorter essays	0.80
JESS (Japanese Essay Scoring System)	Ishioka & Kameda, 2004	LSA	General topics	Essay	Grade (Summative)	Trained with editorials and columns taken from Mainichi daily newspaper	0.84
Larkey	Larkey, 1998	Bayesian classifiers	Social studies, physics, general opinion	Essay	Classifies essay as 'good' or 'bad'	Essays are assigned probability of belonging to good/bad category; also assesses some surface features of text	0.55
MarkIt	Williams & Dreher, 2004	NLP/LSA	General topics	Essay	Provides both feedback and grade	System trained with 50-200 graded essays	0.75
MyAccess	Vantage Learning, 2006	Intellimetric engine	Writing skills	Essay	Feedback (formative)	System trained with graded essays	0.91
OpenComment	Whitelock *et al.*, 2008	Machine learning classification	History	Short freeform answers	Feedback (formative)	Experts develop a set of statements that constitute both correct and incorrect answers; students answers evaluated and classified accordingly	-
PEG (Project Essay Grader)	Page, 1966	Surface features (NLP added later)	Non-factual disciplines	Essay	Grade (Summative)	Assessed only style (surface features) in the beginning but now assesses content also	0.87
PS-ME (Paperless School Marking Engine)	Mason & Grove-Stephenson, 2002	NLP	GCSE study topics	Essay	Provides both feedback and grade	Trained with texts that were assigned high/low marks. Assesses three levels (Bloom): knowledge, understanding and evaluation	-
Willow	Pérez-Marín *et al.*, 2006	Shallow NLP	Computer science concepts	Short freeform answers	Grade (Summative)	Compares student answer to references written by teacher	0.54

Other systems only require one model answer (or set of correct/incorrect responses) to be developed by a human expert (e.g. Willow, c-rater, Auto-marking, MarkIt and Automark). However, these types of systems can only compare student responses against that model answer; other equally correct (but different) answers may be poorly rated by the system (Williams & Dreher, 2004).

Systems that utilise Bayesian networks require less training than systems based on LSA (Rudner & Liang, 2002). A second benefit of the Bayesian network approach is the ability to deal with a variable word count (Rudner & Liang, 2002). However, it is unclear whether these systems can be adapted to provide formative feedback, rather than simply classifying essays into a limited number of categories.

Machine learning classification methods appear to be useful in the provision of formative feedback, as seen in the OpenComment, CarmelTC, MyAccess and IEMS systems. However, these systems experience many of the same issues as those using NLP/LSA techniques. The systems that assess essay-type responses (MyAccess and IEMS) require a large corpus of essays for training, and assume that student essays will have similarities with this corpus. OpenComment and CarmelTC assess short, freeform responses, and operate on the principle that student responses will be comparable to a model answer; correct responses beyond the remit of the model answer may receive poor scores.

It can be seen that all of the systems described here assume that the writing in a 'correct' student essay will have similarities either with a model answer or other highly-scored essays. In all cases, the judgement that the system makes is based on the features evident in the text of the essay. Therefore, it is important to know the likelihood that one student essay and another will use similar linguistic features when discussing a given topic. In domains like Physics or History this seems likely, given the success of the systems described in this section. However, when considering writing that is done for the purpose of reflection, this is less clear; more needs to be known about the features used in reflective writing (Reidsema & Mort, 2009; Ryan, 2011).

There is a limited body of research that examines the linguistic structure of reflective writing; this research is evaluated in the forthcoming chapter.

2.6 Chapter Review

This chapter began by examining theoretical perspectives in education and argued that reflective learning supports a cognitive constructivist approach to learning. Furthermore, it was proposed that learning activities that involve reflective dialogue can facilitate learning from a social constructivist perspective. Models that depict reflection as part of an experiential learning process were presented and frameworks that define reflection in terms of levels of reflective 'depth' were examined. While each of these models provides a valuable insight into the processes of reflection, Hatton and Smith's (1995) reflective framework is one that attempts to provide more detailed criteria for the assessment of reflection. These criteria were later expanded further by Moon (2004) in her Generic Framework for Reflective Writing. The objectives of these authors are the most closely aligned with the objectives of this study. Therefore, the Hatton and Smith (1995) and Moon (2004) models have been selected as those most suitable for consultation at a later stage.

Next, the evolution of the types of technologies used in education was examined and it was noted that Web 2.0 tools can support constructivist and social constructivist approaches to learning. Blogs were reported (by Redecker *et al.*, 2009) to be the most widely used Web 2.0 tool in higher education settings. Reflective blogging was examined in the context of Laurillard's conversational framework and it was noted that blogs are useful in both the interactive and reflective phases of the framework. In particular, it was argued that blogs support a social constructivist approach to reflective learning as they facilitate reflective dialogue.

Then, assessment principles were reviewed and it was noted that constructivist approaches to assessment stress the importance of authentic tasks that encourage active engagement and deep learning. Summative assessment was discussed and the

pragmatic view that it is often necessary to convert holistic judgements to quantitative grades was considered; an example using the levels of the SOLO taxonomy was presented. The benefits of regular, formative assessment were extolled, although it was noted that time constraints often prevent educators from providing prompt feedback. The assessment of reflective writing was discussed and it was noted that both students and assessors can benefit from the provision of clear, unambiguous reflective writing assessment criteria.

Finally, the use of technology in the assessment process was considered and systems that automate the evaluation of writing were examined. Although this area has experienced great advances in recent years, each of the systems that were presented in this chapter has a number of drawbacks. Moreover, all of these systems rely on a 'correct' student essay sharing textual features either with a model answer or other highly-scored essays. It is not possible to say whether this applies to reflective writing, as little is known about its linguistic structure. The forthcoming chapter examines the research in this area and also reviews studies that have developed reflective writing assessment instruments.

Chapter 3 : Related Research

3.0 Chapter Introduction

This chapter reviews research studies with similar goals to the ones set out in this thesis. First, studies that develop reflective writing assessment instruments are discussed and their results are compared. It is noted that each instrument is based on an existing model or framework of reflection taken from the literature on reflective practice. Then, research on the linguistic structure of reflective writing is examined and the background theory guiding these studies (namely, systemic functional linguistics) is set out. A model of the linguistic resources used in academic reflective writing (developed by Ryan, 2011) is presented.

3.1 Assessment instruments

In this section, studies that describe the development of a reflective writing assessment instrument are discussed in detail. These studies have implications for this thesis, both in terms of the methods used and the results found. They are discussed here and are summarised later in Table 3.4 for ease of reference. Instruments have been grouped by the model(s) of reflection on which they are based.

3.1.1 Instruments based on Boud, Keogh and Walker (1985)

Williams *et al.* (2000) established criteria for grading depth of reflection based on the work of Boud, Keogh and Walker (1985). Boud's model of the reflective process was discussed in Chapter 2, but is summarised here for ease of reading. Boud, Keogh and Walker described reflection as a set of experiences, processes and outcomes. The processes of reflection involve attending to feelings and re-evaluating experiences (Boud, Keogh and Walker, 1985). The outcomes of reflection described by Boud

include a change in behaviour and an intention to apply learning in future situations (Boud, Keogh & Walker, 1985).

Table 3.1: Williams *et al.* (2000) Coding Scheme

	Criteria for Grading Reflective Journal Writing
1	Describes the learning event, issue or situation. Describes prior knowledge, feelings or attitudes with new knowledge, feelings or attitudes.
2	Analyses/re-evaluates the learning event, issue or situation in relation to prior knowledge, feelings or attitudes.
3	Verifies/confirms the learning event, issue or situation in relation to prior knowledge, feelings or attitudes.
4	Relates 1, 2 and 3 above to gain a new understanding of the learning event, issue or situation.
5	Indicates how the new learning event, issue or situation will affect future behaviour. Determines the clarification of an issue, the development of a skill, or the resolution of a problem.
Non-reflection	Is descriptive in nature reporting on what is happening rather than analysing the learning event, issue or situation.

The instrument developed by Williams *et al.* (2000) was adapted from the work of Boud, Keogh and Walker, and consists of five reflective criteria (as seen in Table 3.1). The first criterion involves the student describing the event, prior knowledge and feelings. Subsequently, the student may re-evaluate the event in relation to prior knowledge and gain a new understanding of the situation (criteria 2-4). These criteria are comparable to the reflective processes describe by Boud, Keogh and Walker (1985). Finally, the student may indicate how the learning event will affect his future behaviour, in a similar way to the outcomes of reflection described by Boud. Williams and colleagues also added a category called 'non-reflection' to capture instances where none of the reflective criteria had been achieved (Williams *et al.*, 2000).

Williams and colleagues assessed 58 journals based on these criteria and had an inter-rater reliability score of 0.68. They also examined whether there was an improvement over time by giving the first half of the journal a score and comparing this with a score given to the second half of the journal (Williams *et al.*, 2000). The mean score for the first half of the journals was 2.48 while the mean score for the second half was 2.55 (out of 5, in each case). Therefore there was no significant difference over the course of the reflective journal assignment. Williams and colleagues recommend 'interactive journaling' (where students are regularly provided with feedback) as a way to improve reflective writing skills over time (Williams *et al.*, 2000).

A study by Wessel and Larin (2006) implemented Williams' instrument in an analysis of reflective writing done by 15 physiotherapy students. The mean score for reflection achieved by students on reflective writing for their first clinical placement was 2.02 and the mean score on their third clinical placement was 2.21 (out of 5, in each case). This demonstrates a small improvement in reflection but not a significant one (Wessel & Larin, 2006).

3.1.2 Instruments based on Mezirow (1991)

A number of reflective writing assessment instruments have been derived from the work of Mezirow (1991). One such instrument was developed by Kember *et al.* (1999). The types of reflection set out by Mezirow were discussed in Chapter 2, but are revisited here briefly. Mezirow's definition of reflection includes four stages or levels: non-reflective action, introspection, reflection and reflective action. Non-reflective actions include habitual actions that do not require thought (e.g. walking) and thoughtful actions where decisions are made (but not evaluated or questioned). Introspection refers to the acknowledgement of the self and recognition of one's own feelings (Mezirow, 1991). The level of 'reflection' is divided further into three types: content (the way we feel about a certain event), premise (the reasons why we feel this way) and process (how the functions of feeling or perceiving are performed). Finally, reflective action occurs when a decision is made or some action is taken following reflection (Mezirow, 1991).

The coding scheme developed by Kember and colleagues utilises Mezirow's types of reflection, and employs seven coding categories (Kember *et al.*, 1999). The seven coding categories can be seen in Figure 3.1. The first level is habitual action. Kember *et al.* combine both introspection and thoughtful action in a second level. Both of these levels are considered to be non-reflective (represented by the shaded grey area). The subsequent levels are both reflective (according to Mezirow, 1991 and Kember *et al.*, 1999). Kember and colleagues place content and process reflection on the same level, as they view these as being equal, and provide an additional category for occasions

where content and process reflections occur together. Finally, they suggest that premise reflection represents the highest level of reflection (Kember *et al.*, 1999).

	7. Premise Reflection	
4. Content Reflection	5. Process Reflection	6. Content & Process Reflection
2. Introspection		3. Thoughtful Action
	1. Habitual Action	
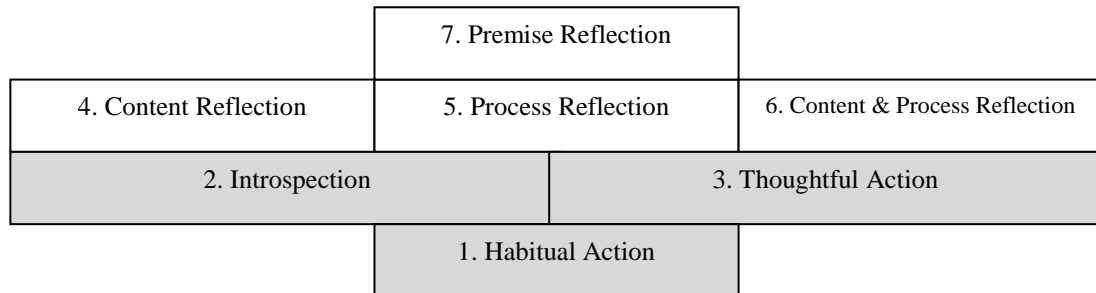
Figure 3.1: Kember *et al.* (1999) Coding Scheme

In an initial test using this coding scheme Kember and colleagues coded three journals that were divided into shorter text segments, based on the ideas they contained (i.e. each separate idea in its own text segment). They achieved reliability of only 0.65, less than the acceptable level of 0.70 they had prescribed for this study (Kember *et al.*, 1999). They attribute the poor reliability score to difficulties in determining the significance of statements made by students (Kember *et al.*, 1999). Following further discussions on the instrument they achieved an inter-rater reliability score of 0.74 in an assessment of nine journals. However, in the second test they coded journals at 'journal' level rather than text segment level. They suggest that it is easier to achieve agreement if the judgements made are based on a broader context. (Kember *et al.*, 1999).

Kember and colleagues later refined their instrument to have only four categories: habitual action, understanding, reflection and critical reflection. This instrument was trialled on a sample of four papers and a high level of agreement was reported between the four assessors (Kember *et al.*, 2008). However, reliability results for this instrument were not reported.

Chretien, Goldman and Faselis (2008) also developed a rubric based on Mezirow's levels of reflection. This adaptation consisted of three levels: non-reflective, reflection on experience and reflection on awareness. They assessed the reflective blog posts of 91 students on a four-week medicine clerkship rotation. They do not report on the

levels of reflection identified in these blog posts, although they do mention that all but eight blog posts (out of 177) showed evidence of at least some reflection. Most blog posts demonstrated reflection on experience, rather than the higher level of 'reflection on awareness' (Chretien, Goldman & Faselis, 2008). The inter-rater reliability of this study is not reported.

The rubric created by Chretien, Goldman and Faselis was later employed by Fischer *et al.* (2011). However, it was adapted slightly, with the reflection on experience level split into two categories: reflection on experience: low and reflection on experience: high.

Fischer and colleagues' study compared levels of reflection in 45 reflective essays (which were followed by a group discussion) and 50 reflective blogs. Students in the blog group were required to complete two blog posts during their medicine clerkship. It was also a requirement to comment on at least one other blog post, in an attempt to simulate the 'real-life' discussion held by the other group (Fischer *et al.*, 2011). Two coders performed the analysis of levels of reflection; inter-rater agreement of 80% was reached.

Fischer and colleagues hypothesised that the informal nature of the blog medium would result in a lower degree of reflection in students' writing. However, they found that there was no significant difference in the levels of reflection identified in the blogs when compared with the reflective essays. A slight (not statistically significant) difference was noted in the type of reflection that was evident in the two groups' writing. The blog group contained more examples of the non-reflective level (14.5%, compared with 11.1% in the essay group) and the lower level of reflection on experience (24.5%, while the essay group contained only 13.3%). The essay group, on the other hand, demonstrated slightly more evidence of the reflection on experience: high level (64.4%, while the blog group had 56.4%) and the reflection on awareness level (11.1%, compared with only 4.5% in the blogs). Fischer proposes that the emergence of other methods of electronic communication, such as micro-blogging (e.g.

Twitter) has resulted in blogs being viewed as a relatively formal mode of communication (Fischer *et al.*, 2011).

3.1.3 Instruments based on a combination of Boud and Mezirow

So far, the studies examined in this section have either been based on the work of Boud, Keogh and Walker (William *et al.*, 2000; Wessel & Larin, 2006) or Mezirow (Kember *et al.*, 1999; Kember *et al.*, 2008; Chretien, Goldman and Faselis, 2008; Fischer *et al.*, 2011). Now, a number of studies that base their instruments on a combination of these models are discussed, the first of these being Wong *et al.* (1995).

Wong *et al.* (1995) developed a coding scheme based on the work of Boud, Keogh and Walker (1985) and Mezirow (1991) to assess the level of reflection in learning journals. They examined 45 journals and performed two levels of coding. First of all they coded learning journals at paragraph level, based on the model of reflection proposed by Boud, Keogh and Walker (1985). They suggested six elements of reflection based on Boud's work (see Table 3.2). These are: attending to feelings (utilising positive feelings and removing negative feelings), association (linking to prior knowledge), integration (relating old and new knowledge), validation (testing for internal consistency between new and old), appropriation (making knowledge one's own) and, finally, outcome of reflection (a change in behaviour and commitment to action) (Wong *et al.*, 1995).

Table 3.2: Wong *et al.* (1995) Coding Scheme

Code	Elements of reflective process
1	Attending to feelings
2	Association
3	Integration
4	Validation
5	Appropriation
6	Outcome of reflection

As well as coding the elements of reflection described above, Wong and colleagues also made a decision at 'student level' about whether the student was a non-reflector, a reflector or a critical reflector (based on the work of Mezirow, 1991). The category of non-reflection relates to Mezirow's definition of habitual action (automatic processes

such as walking or driving) or thoughtful action (that is, decisions that are made but not consciously evaluated). The reflection category includes content and process reflection, as defined by Mezirow, while the critical reflection category relates to premise reflection (Wong *et al.*, 1995). It was found that 13.3% of students were non-reflectors, 75.6% were reflectors and 11.1% were critical reflectors (Wong *et al.*, 1995).

Wong and colleagues (1995) found that although there was agreement (0.88) at the second level of coding (where students were put into one of three categories) the instrument was not a reliable measure in terms of the first level of coding (where paragraphs were coded as containing one of six elements of reflection). Reliability of 0.5 – 0.75 was achieved at this first level of coding (Wong *et al.*, 1995). This is a similar result to Kember *et al.,* who noted that inter-rater reliability was easier to achieve when the judgements made were based on a broader context (Kember *et al.*, 1999). In their paper, Wong and colleagues underline the need for establishing a reliable and widely accepted method for assessing reflection (Wong *et al.*, 1995).

Chirema (2007) also implemented the instrument developed by Wong *et al.* (1995). Coding was performed at the levels previously utilised by Wong and colleagues: paragraph level (six elements of reflection, based on the work of Boud, Keogh and Walker) and student level (three categories, based on the work of Mezirow). Chirema coded 42 reflective learning journals and reported that 21.4% of students were non-reflectors, 66.7% were reflectors and 11.9% were critical reflectors (Chirema, 2007). These findings are similar to those reported by Wong and colleagues, with the largest group of students falling in the 'reflector' category.

The reliability levels are also similar to those described by Wong *et al.* (1995), with poor reliability at the first (paragraph) level of coding (0.5 – 0.75) but high levels of agreement at the second (student) level of coding (0.95). Chirema suggests that future research should focus on the establishment of reliable criteria to assess reflective writing (Chirema, 2007). This is a similar recommendation to that which was made by Wong and colleagues twelve years earlier.

A similar instrument was developed by Plack *et al.* (2005). Their coding scheme was constructed of nine elements of reflection based on the work of Boud, Keogh and Walker (1985), Schön (1983) and Mezirow (1991). Three of these elements relate to the time dimension (when reflection takes place): these are reflection-in-action, reflection-on-action and reflection-for-action. These elements are based on the work of Schön (1983). Three elements relate to the content of reflection: content reflection, process reflection and premise reflection (based on the work of Mezirow, 1991). Finally, reflection was also categorised in terms of stages, based on the reflective process described by Boud, Keogh and Walker (1985). These stages are returning to experience, attending to feelings and re-evaluation (Plack *et al.*, 2005).

Plack and colleagues also identified three levels of reflection based on the work of Mezirow. These levels are the same as those seen in the Wong *et al.* (1995) study: non-reflection, reflection and critical reflection. Another similarity with the work of Wong and colleagues is the method of coding: the levels of reflection were coded at the journal level (i.e. student level), while the nine elements of reflection were coded at the text level (the words, sentences and paragraphs within the journals) (Plack *et al.*, 2005).

Plack and colleagues assessed 27 students' journals found that 14.7% of the journals contained no evidence of reflection, 43.4% showed evidence of reflection and 41.9% demonstrated evidence of critical reflection (Plack *et al.*, 2005). These results are similar to those of Wong *et al.* (1995) and Chirema (2007) in that most of the students fall into the 'reflection' category. However, Plack *et al.* report much higher incidences of critical reflection (41.9%, as opposed to 11.1% and 11.9%, respectively). The level of inter-rater reliability achieved (at the journal level of coding) was 0.74 (Plack *et al.*, 2005).

The coding of the nine elements of reflection resulted in more varied levels of reliability from only 0.03 in some cases up to an acceptable level of 0.72 in others. The authors ascribe these varied results to differences in the way the three coders applied the coding scheme (Plack *et al.,* 2005). Overall, it was reported that at least one element of

reflection was found in 95.3% of the journals analysed. Premise reflection was the least identified element, while return to experience was found most often (Plack *et al.*, 2005).

Findlay, Dempsey and Warren-Forward (2009) developed a tool for assessing reflective writing which they named the Newcastle Reflective Analysis Tool (NRAT). In a similar way to the work of Wong *et al* (1995), their work is based on that of Boud and Mezirow. The instrument assesses six elements of reflection (which they term 'deep classification') and three levels of reflection (which they call 'broad classification') (Findlay, Dempsey & Warren-Forward, 2009). The deep classification NRAT is based on Wong and colleagues' adaption of the work of Boud, Keogh and Walker (1985). It includes the following six elements of reflection: attending to feelings, association, integration, validation, appropriation and outcome of reflection. The broad classification NRAT is based on the three levels defined by Wong *et al.* (1995) which are, in turn, adapted from the work of Mezirow. These are non-reflection, reflection and critical reflection.

In a subsequent publication, Findlay and colleagues detail a study that was carried out to validate the NRAT (Findlay, Dempsey and Warren-Forward, 2010). The analysis included 97 reflective journals taken from first, second and third-year students on clinical placements.

Findlay and colleagues reported varying amounts of reflection at different levels. Overall they noted quite a lot of descriptive writing, and in a similar way to earlier studies (Wong *et al.*, 1995; Chirema, 2007), a lack of critical reflection. However, these results changed over time. There was a decrease in non-reflectors from the first to the third year students, and a corresponding increase in critical reflectors was seen (Findlay, Dempsey and Warren-Forward, 2010). However, it should be noted that the first year and third year students were different groups: in other words these were not the same students, three years later. Therefore, the results seen could be coincidental.

Agreement of 0.45 was found with the deep classification NRAT and 0.67 using the broad classification NRAT. The authors note (in a similar way to Wong *et al.,* 1995)

that it is difficult to achieve high levels of inter-rater reliability when working with a fine-grained assessment rubric (Findlay, Dempsey & Warren-Forward, 2010).

Findlay and colleagues used their findings from this study to develop a set of 'inventories', used to guide students' reflections. A further small-scale study (with six participants) compared the use of these inventories (which consist of a set of questions designed to elicit short, reflective responses) with freeform reflective journals. They found that the Newcastle Reflective Inventories resulted in higher levels of reflection than freeform reflective journal-writing (Findlay, Dempsey and Warren-Forward, 2011).

3.1.4 Instruments based on Bloom (1956)

A further study by Plack *et al.* (2007) used a coding scheme based on Bloom's (1956) taxonomy. They believe that as Bloom's taxonomy is a familiar framework, less training is required for raters of reflective journals. This coding scheme is much simpler than their earlier coding scheme, having only three levels (compared with nine elements and three levels in their 2005 study). The coding scheme was originally piloted by the research team in 2004 (Cuppernull *et al.*, 2004). Bloom's taxonomy was adapted by combining the first two levels into one level called 'Knowledge and Comprehension'. The third and fourth levels (Application and Analysis) were combined into a second level, simply called 'Analysis'. The fifth and sixth levels of Bloom's taxonomy were also combined into a third level called 'Synthesis and Evaluation' (Plack *et al.*, 2007).

Twenty-one learning journals were assessed (at the level of journal entry) by three raters. Inter-rater agreement of between 0.78 and 1.0 was achieved (Plack *et al.*, 2007). It was found that 93.5% of journals showed evidence of Level 1 (Knowledge & Comprehension), 68.9% showed evidence of Level 2 (Analysis) and 48.3% of journals demonstrated evidence of Level 3 (Synthesis & Evaluation). Plack and colleagues concluded that their method is a reliable way to establish whether learners have achieved higher-order thinking in their reflective journals (Plack *et al.*, 2007).

Dunfee *et al.* (2008) built on the work of Plack and colleagues (2007). The coding scheme used by Dunfee used a modification of Bloom's taxonomy to analyse three levels: Level I Data Gathering, Level II Data Analysis and Level III Conclusion Drawing. The sample (selected for convenience) consisted of 7 physical therapy students who used electronic discussion threads to discuss and reflect upon critical incidents (Dunfee *et al.*, 2008). In terms of the levels of reflection found in the discussion threads, 97.5% of entries demonstrated evidence of the first (and lowest, in terms of higher-order thinking) level, Data Gathering. The second level, Data Analysis, was found to be present in 84.2% of entries on the thread. Evidence of the third (highest) level, Conclusion Drawing, was exhibited in 58.8% of entries. Inter-coder agreement on these levels ranged from 68.8% to 95.1% (Dunfee *et al.*, 2008).

3.1.5 Instruments based on Hatton & Smith (1995)

A study by Pee *et al.* (2002) assessed 14 journals based on Hatton and Smith's Reflective Practice framework (1995). The framework proposed by Hatton and Smith describes four types of writing. The first level, descriptive writing, is not reflective. The subsequent levels (called descriptive reflection, dialogic reflection and critical reflection) represent varying degrees of reflection, with critical reflection being the highest (Hatton & Smith, 1995). As well as examining these levels of reflection, Pee and colleagues also examined the degree to which students utilised reflective prompts. The students were given a set of prompts, which were based on the questions developed by Johns (1994). These questions are designed to elicit reflective responses: for example, the student may be asked "What was I trying to achieve?" or "How do I now feel about this experience?" (Johns, 1994).

In the study by Pee *et al.* (2002), assessment was performed at journal level and journals were examined to determine whether students addressed the 18 reflective prompts they were given. Evidence of Hatton and Smith's levels of reflection was also sought in the journals. Pee and colleagues found that students answered between 7 and 16 of the

questions they were given. They also found that 100% of the journals showed evidence of the first two levels described by Hatton and Smith (descriptive writing and descriptive reflection). The third level of the framework (dialogic reflection) was identified in 86% of the journals and the fourth and highest level (critical reflection) was identified in 64% of the journals. It was found that there was inter-rater agreement of 72% on the identification of Johns' questions and inter-rater agreement of 86% on the identification of Hatton and Smith's levels of reflection. The researchers concluded that both Johns' questions and Hatton and Smith's levels of reflection can serve as suitable tools in the assessment of reflective writing (Pee *et al.*, 2002).

A study by Fund, Court and Kramarski (2002) also utilised the reflective framework set forth by Hatton and Smith (1995). The reflective journals of 20 science students (chosen from a sample of 65) enrolled on a teacher-training course were examined. Hatton and Smith's framework was adapted for the purpose of the study. The first level, descriptive writing, remained the same (although now simply called 'Description'). The descriptive reflection level was replaced with the term 'personal opinion' where opinions are given from the student's own standpoint. The third level, 'linking', relates to dialogic reflection, where the student links to previous knowledge or external sources. The highest level (which relates to critical reflection) is now termed 'critical bridging'. At this level it is expected that students will engage in a broader discussion, possibly referring to general educational issues (as these students were enrolled in a teacher-training course) and proposing future actions that will follow their reflections (Fund, Court & Kramarski, 2002).

Fund and colleagues analysed the students' reflective journals at four different points in time, yielding interesting results on the degree to which students' levels of reflection change over time. It was found that there was a notable decrease in descriptive (non-reflective) writing and a corresponding increase in 'critical bridging' (the highest of the four levels they examined) (Fund, Court & Kramarski, 2002). There was also a slight decrease in 'personal opinion' (relating to the descriptive reflection level of Hatton and Smith's framework) and a corresponding small increase in 'linking' (which relates to

the higher level of dialogic reflection). 98% correlation was achieved between coders (Fund, Court & Kramarski, 2002).

Duke and Appleton also measured improvement over time in an analysis of 62 journals (Duke & Appleton, 2000). They developed an instrument that described 12 elements of reflection, based on a review of the literature on Reflective Practice (see Table 3.3). They found that some reflective skills are more difficult to develop than others (Duke & Appleton, 2000). For example, they note that while students are generally able to describe practice they are less able to action plan. Duke and Appleton also state that students' reflective practices improve over time. In their study, there were 51 students who took two modules (in nursing) one semester after another. The students' reflective writing from the first semester was compared with that from the second and significant improvement was found in 7 out of the 12 elements of reflection (Duke & Appleton, 2000). Table 3.3 denotes elements that improved significantly over time.

Table 3.3: Duke & Appleton (2000) Elements of reflection

Element of reflection	Improved significantly over time (*)
Criteria description	*
Focus	
Analysis of feelings	*
Analysis of knowledge	*
Analysis of content	*
Synthesis	*
Practice implications	
Learning implications	*
Action planning	
Clarity	
Referencing	*
Self-evaluation	

The features of the studies discussed above are now compared in Table 3.4.

Table 3.4: Overview of Reflective writing assessment instruments

Author, Year	Number of journals	Unit of assessment	Coding categories	Based on which existing model	Reliability	Amount of reflection found
Williams *et al.* (2000)	58	Journal (each half scored separately)	6 elements of reflection	Boud *et al.* (1985)	0.68	First half mean score 2.49/5 Second half mean score 2.55/5
Wessel & Larin (2006)	15	Journal entry	6 elements of reflection	Implemented instrument developed by Williams *et al.* (2000)	Not reported	Mean score 2.02/5 (1st clinical placement) Mean score 2.21/5 (2nd clinical placement)
Kember *et al.* (1999)	3 (initial test) 9 (second test)	Text segment (idea) (initial test) Journal (second test)	7 levels of reflection	Mezirow (1991)	0.65 (initial test) 0.74 (second test)	Not reported
Kember *et al.* (2008)	4	Reflective essay	4 categories	Adapted from Mezirow (1991), Kember *et al.* (1999)	Not reported	Not reported
Chretien, Goldman & Faselis (2008)	91	Blog post	7 themes and 4 levels	Adaptation of Mezirow (1991)	Not reported	Not reported
Fischer *et al.* (2011)	95	Blog posts (n=50) Reflective essays (n=45)	7 themes and 4 levels	Based on Chretien (2008) and Adaptation of Mezirow (1991)	91% (themes) 80% (levels)	Non reflective (13.5%) Reflection on experience low (21.3%) and high (58.7%) Reflection on awareness (6.5%)
Wong *et al.* (1995)	45	Paragraph (1st level) and Student (2nd level)	6 elements of reflection (1st level) and 3 levels of reflection (2nd level)	Boud *et al.* (1985) (1st level) and Mezirow (1991) (2nd level)	1st level: 0.5 – 0.75 2nd level: 0.88	*At 2nd level (Student level):* 13.3% Non-reflectors 75.6% Reflectors 11.1% Critical reflectors
Plack *et al.* (2005)	27	Text and Journal	9 elements of reflection and 3 levels of reflection	Boud *et al.* (1985), Schön (1983), Mezirow (1991)	0.74	*At journal level:* 14.7% No reflection 43.4% Reflection 41.9% Critical reflection

Table 3.4: Overview of Reflective writing assessment instruments (continued)

Author, Year	Number of journals	Unit of assessment	Coding categories	Based on which existing model	Reliability	Amount of reflection found
Chirema (2007)	42	Paragraph (1st level) *and* Student (2nd level)	6 elements of reflection (1st level) *and* 3 levels of reflection (2nd level)	Implemented instrument developed by Wong *et al.* (1995)	1st level: 0.5 – 0.75 2nd level: 0.95	*At 2nd level (Student level):* 21.4% Non-reflectors 66.7% Reflectors 11.9% Critical reflectors
Findlay, Dempsey & Warren-Forward (2010)	97	Journal	6 levels of reflection (Deep classification) *and* 3 levels of reflection (Broad classification)	Boud *et al.* (1985) (6 levels) *and* Mezirow (1991) (3 levels)	Deep: 0.49 Broad: 0.67	7.8 – 14.6% Non-reflectors 76.7 – 84.4% Reflectors 4.2 – 17.2% Critical reflectors (differences noted over three years)
Plack *et al.* (2007)	21	Journal entry	3 levels of reflection	Bloom (1956)	0.78 – 1.0	93.5% (Level 1) 68.9% (Level 2) 48.3% (Level 3)
Dunfee *et al.* (2008)	7	Discussion thread entry	3 levels of reflection	Plack (2007) coding scheme (based on Bloom, 1956)	68.8% - 95.1%	97.5% (Level 1) 84.2% (Level 2) 58.8% (Level 3)
Pee *et al.* (2002)	14	Journal	18 questions 4 levels of reflection	Johns (1994) Hatton & Smith (1995)	0.72 (questions) 0.86 (levels)	7 - 16 questions addressed Descriptive writing in 100% Descriptive reflection in 100% Dialogic reflection in 86% Critical reflection in 64%
Fund, Court and Kramarski (2002)	20	Journal entry	4 levels of reflection	Adaptation of Hatton & Smith (1995)	98%	Overall levels not reported; however, increase in critical bridging and decrease in description were seen
Duke & Appleton (2000)	62	Journal	12 elements of reflection	Various	Not reported	No statistics on amount of reflection, but notes that reflections improved over time

3.1.6 Summary of reflective writing assessment instruments

Related studies that developed and implemented reflective writing assessment instruments were discussed in detail and their features were compared in Table 3.4. It is interesting to note the varying levels of reflection that were identified in these studies. Several studies found that, in terms of students, there was a low number of non-reflectors and a low number of critical reflectors, with the majority of students being somewhere in between (Wong *et al.*, 1995; Chirema, 2007; Findlay, Dempsey & Warren-Forward, 2010; Fischer *et al.*, 2011). However, others found higher levels of critical reflection (Pee *et al.*, 2002; Plack *et al.*, 2005; Plack *et al.*, 2007; Dunfee *et al.*, 2008). This variation in the results reported suggests that, as yet, there is no singular, agreed-upon way to assess reflective writing. Dyment and O'Connell recommend that the academic community "embrace a more consistent approach to assessing the quality of students' journals" (Dyment and O'Connell, 2011, p. 92).

A number of the studies discussed in this section examined the degree to which reflection improves over time. One study reported that certain elements of reflection did improve over time (Duke & Appleton, 2000). Others noted a change in the type of reflection over time, seeing a decrease in descriptive writing and a corresponding increase in critical reflection (Fund, Court & Kramarski, 2002; Findlay, Dempsey & Warren-Forward, 2010). However, others found that there was no significant increase in reflection over time (Williams *et al.*, 2000; Wessel & Larin, 2006).

Varying degrees of inter-rater reliability were also reported in relation to these assessment instruments. There are no common standards as to what constitutes an acceptable level of inter-coder reliability. Proposed levels range from 70% (Frey, Botan & Kreps, 2000) to 90% (Riffe, Lacy & Fico, 1998). The majority of the studies discussed in this section had acceptable levels of reliability. A number of studies reported greater reliability when the judgements made were based on a broader context (Wong *et al.*, 1995; Kember *et al.,* 1999; Plack *et al.*, 2007; Findlay, Dempsey & Warren-Forward, 2010).

Notably, all of these instruments were based on familiar models found in the existing literature on Reflective Practice. There have been no attempts to develop independent, updated reflective writing assessment criteria even though several of the authors call for more reliable and established criteria (Wong *et al.*, 1995; Chirema, 2007).

3.2 Structure of reflective writing

There is very little research to date on the structure of reflective writing. However, there are four papers which have dealt with this issue, authored by Shaheed and Dong (2006), Luk (2008), Reidsema and Mort (2009) and, most recently, Ryan (2011). Each of these studies examined reflective writing in the context of Systemic Functional Linguistics (SFL). Background theory on SFL is now discussed, along with an examination of how it has been applied to reflective writing by the authors listed above.

3.2.1 Systemic Functional Linguistics

Systemic Functional Linguistics (SFL) is a field of study in linguistics that focuses on the function of language, as opposed to language itself (Eggins, 2004). SFL specifies a framework of grammar within a language that constrains the choices available to a speaker when attempting to express meaning (Halliday & Matthiessen, 1999). Gardner states that "we choose from a complex web of systems or sets of choices according to our functional purposes" (Gardner, 2010, p.37)

Eggins (2004) describes Systemic Functional Linguistics as the systemic functional approach to language: 'systemic' referring to language as a system of meaning and 'functional' denoting an interest in the function of language. She proposes that systemic linguistics includes four main claims about language:

1. *that language use is functional*
2. *that its function is to make meanings*

3. *that these meanings are influenced by the social and cultural context in which they are exchanged*
4. *that the process of using language is a semiotic process, a process of making meaning by choosing.*

(Eggins, 2004, p.3)

Eggins summarises these claims (that language use is functional, semantic, contextual and semiotic) by describing the systemic approach as a *functional-semantic* approach to language (Eggins, 2004). Halliday and Hasan (1985) describe the approach as a 'social semiotic' one. Semiotics refers to the study of sign systems, which are systems of meaning. In terms of linguistics, semiotics refers to the study of the meaning of language (Halliday & Hasan, 1985). The use of the word 'social' by Halliday and Hasan refers to the relationship between social structures and language. The authors note that this social dimension is especially significant in terms of education, as learning is inherently a social process (Halliday & Hasan, 1985).

Halliday and Hasan (1985) describe three meta-functions of language: ideational, interpersonal and textual. The ideational (or experiential) meta-function is used to interpret and make sense of experience. The interpersonal meta-function is used to interact with others. The textual meta-function incorporates the expression of the ideational and interpersonal functions via texts (Eggins, 2004).

Halliday and Hasan state that when examining written language, it is important to characterise the text in terms of its context. They describe three features of the context of situation: the field of discourse, the tenor of discourse and the mode of discourse (Halliday & Hasan, 1985). Field relates to the ideational meta-function of language and refers to what is happening. It is concerned with the systems involved, including descriptions of participants, processes and situations (Martin, 1992). Tenor refers to who is taking part and is expressed through interpersonal meanings (e.g. writer/reader relationships, writer's attitude towards subject matter) (Martin, 2004). Mode refers to the role that language plays in the situation, the organisation of texts and the medium (e.g. spoken or written) (Halliday & Hasan, 1985).

There are a number of SFL systems or grammatical frameworks that set out the choices available within the different meta-functions of language. The ideational or experiential meta-function utilises the TRANSITIVITY[2] system; the MOOD system conveys interpersonal meanings; and the THEME system is used to express textual meanings (Halliday & Hasan, 1985; Eggins, 2004). An additional system of grammar, APPRAISAL, was documented by Martin (2000) and defines the choices available to speakers when evaluating a subject.

SFL theory has been applied in a number of contexts; for example, to support the learning of language (Polias, 2010; Schleppegrell, 2010) and in the analysis of the structure of reflective writing (Shaheed & Dong, 2006; Reidsema & Mort, 2009; Ryan, 2011). The studies which examine the structure of reflective writing are now discussed in detail.

3.2.2 Research on features of reflective writing

Shaheed and Dong (2006) assessed the language used in blogs written by design students. Their aim was to establish whether the students' style of writing about design would correspond with the approach they take to design. They were interested in the function of language in the design process and therefore performed their analysis within a systemic-functional linguistics framework (Shaheed & Dong, 2006). As described earlier the TRANSITIVITY system is involved when people convey experiential meaning in text (Eggins, 2004). Shaheed and Dong examined five different types of processes in the TRANSITIVITY system: material, mental, behaviour, relational and existential. In their study, they analysed a sample of four blogs (although they note that this consisted of several hundred lines of text) seeking examples of these TRANSITIVITY processes.

---

[2] The names of grammar systems are capitalised, as is the convention in this field of study

In the analysis of these processes, Shaheed and Dong identified two distinct styles of writing. Students writing in one style (which the authors termed the 'analytical' style) tended to place an object in the role of Actor in their clauses (e.g. "The *best website interactions* are the buttons"; Shaheed & Dong, 2006, p.1256). The other style, which Shaheed and Dong refer to as 'reflective', saw students place themselves as Actor of the clauses used in their writing (e.g. "*I* thought there should be a title"; Shaheed & Dong, 2006, p.1257). The authors state that while analytical bloggers concentrate on the product (i.e. the design work) reflective bloggers tend to instead focus on the process and on themselves (Shaheed & Dong, 2006). Lindsay *et al.* (2010) note that writing in the first person is an important aspect of reflective practice as it encourages students to develop narratives that describe their learning experiences.

Luk (2008) examined the discourse features in reflective writing, with a view to identifying the characteristics of 'successful' reflective reports (i.e. those that were highly graded by assessors). Luk proposed that knowledge of these features could inform students' reflective writing in the future (Luk, 2008). The sample of reflective reports (written by pre-service student teachers) examined by Luk was small (consisting of only six reports). Low and high grade reports were compared.

Luk first described the schematic structure of reflection (i.e. the overall structure, which she calls the 'macro' level) and then went on to examine linguistic devices (which she refers to as the 'micro' level). In terms of the overall structure of reflective writing, Luk concludes that successful reflective reports often address the following steps (in sequence): the students identifies a critical issue, then analyses this issue and finally suggests ways in which actions could be revised in the future (Luk, 2008).

When analysing the micro structure of reflective writing, Luk noted differences in the linguistic devices used by writers of high grade and low grade reports. Her analysis focused on three linguistic features: linking devices, hedges and intensifiers. Luk groups the reasons that students use linking devices in their writing into four categories: contrastive, causative, resultative and additive. Examples shown here are reproduced from Luk's article (Luk, 2008, p. 633).

- *Contrastive e.g. however, although, but, or*
- *Causative e.g. since, because, so*
- *Resultative e.g. therefore, thus*
- *Additive e.g. moreover, also, besides*

When comparing the use of linking devices in low and high grade reports, Luk found that higher graded reports contained more contrastive devices than lower graded reports (Luk, 2008). However, with only six reports in the sample this result may not be significant. Luk also examined the use of hedges and intensifiers: linguistic devices that, respectively, reduce or increase the impact of a statement. Luk notes that higher-graded reports used more hedging devices (e.g. stating that an approach *might* work or *could* work). She suggests that this approach may give reviewers the impression that the student is more open-minded and willing to be critical of their own work (Luk, 2008). On the other hand, lower graded reports contained fewer hedging devices and often spoke in more definite terms (e.g. the objectives of the lesson *were* reached). These statements were judged by reviewers to be 'self-congratulatory' and not representative of the critical reflection required (Luk, 2008).

Although Luk's study provides some interesting insights into the linguistic devices used in reflective writing, the sample used is too small to constitute statistical evidence of the claims made. A study of reflective writing in engineering design journals by Reidsema and Mort (2009) used a larger sample (of 20 journals) and also analysed the linguistic resources used in students' writing. Reidsema and Mort explored the question "what are the linguistic features that distinguish different levels of reflection?" (Reidsema & Mort, 2009, p.117) They examined the use of connective and appraisal resources and found that journals with a high grade tended to utilise a greater number of these resources. In other words, writing that was deemed to represent deep reflection was also linguistically richer (Reidsema & Mort, 2009).

In a similar way to the study performed by Luk (2008), Reidsema and Mort looked at the use of connective resources (termed 'linking devices' in Luk's study) such as temporal and causal connectors. Temporal connectors are used to explain a sequence of

events (e.g. then, after that) whereas causal connectors (e.g. because) are used to explain or show consequence (Reidsema & Mort, 2009). Reidsema and Mort also examined reflective writing in the context of the APPRAISAL system, which encompasses affect, judgement and appreciation. The affect sub-system incorporates the expression of emotions (e.g. happiness, anger); judgement deals with moral aspects of behaviour (e.g. kindness, honesty); and appreciation includes aesthetic evaluations (e.g. subtlety, beauty) (Martin, 2000). In addition to examining students' use of APPRAISAL resources Reidsema and Mort (2009) also recorded the polarity of statements made by students (i.e. whether their appraisal of the subject matter was positive or negative).

Out of the 20 journals examined by Reidsema and Mort, ten of these had been given a high grade (distinction or higher) and ten had been given a low grade (fail or low pass). It was found that the higher-scoring group of texts used significantly more causal and appraisal resources and slightly more temporal resources than the low-scoring group did. Causal resources, in particular, appear to have a direct relationship with grade. Judgement was the most common type of appraisal, with affect being the least common (Reidsema & Mort, 2009).

It was also found that, in general, the appraisals made by students were more positive than negative (Reidsema & Mort, 2009). However, higher-scoring texts were more likely to display examples of negative judgements. This is interesting when compared to Luk's study, where it was found that students who used hedging devices were deemed by assessors to be more critically reflective. Reidsema and Mort's finding may support the idea that students who score higher on reflective writing tasks are also students who make critical (perhaps negative) judgements of their own work.

In their study, Reidsema and Mort concluded that "good" texts were linguistically richer with more statements about complexity, challenges faced and changes in perception (Reidsema & Mort, 2009). The authors state that the linguistics features noted in their paper may be "useful for identifying the depth of learning in reflective writing" (Reidsema & Mort, 2009, p. 126) and go on to suggest that future research should correlate these linguistic features to levels of reflection.

It should be noted that the study conducted by Reidsema and Mort (2009), like those conducted by Luk (2008) and Shaheed and Dong (2006), examined a limited number of linguistic resources. A more complete model of the resources used in academic reflective writing has been put forth by Ryan (2011). Ryan has also taken steps towards mapping linguistic resources to a reflective framework: specifically, the framework proposed by Bain *et al.* (2002). However, this mapping is done loosely; the model has not yet been tested in an analysis of reflective writing, and no attempt is made to link linguistic resources to levels of reflection based on statistical evidence.

Ryan states that the aim of her study is to develop a model of linguistic resources that would serve to inform students' reflective writing. She suggests that "if students are explicitly taught key structural elements […] they will be more likely to be able to reflect critically on the professional or learning context" (Ryan, 2011, p. 101).

Ryan's model utilises a systemic functional linguistics approach and identifies eleven types of linguistic resources. These can be seen in Table 3.5. The linguistic resources are loosely linked to the framework set out by Bain *et al.* (2002). The framework consists of five stages: reporting (the student describes the situation), responding (the student reacts to an issue), relating (connections are made to experience or practice), reasoning (explanations are given) and reconstructing (conclusions are drawn, future practice is reframed) (Bain *et al.*, 2002). Ryan's model suggests that as students move through these stages of the reflective framework, different linguistic resources are required in their writing. The eleven resources identified in this model are now discussed and compared to those examined in other studies on the structure of reflective writing.

Table 3.5: Academic Reflective Writing Model (redrawn from Ryan, 2011)

Text structure	Linguistic resources
Macro-theme (key idea) *Introduce* the issue and recount a critical incident; use relevant theory to explain why it is significant; *preview* key themes of this reflective piece **Report and Respond** ↓ *Hyper-themes (supporting evidence)* Use a new paragraph for each new idea • Relate – to self and professional practice; to other similar incidents or experiences • Reason – use relevant theory to explain how and why the incident occurred; appraise what happened; and introduce multiple perspectives ↓ *Reinforce macro-theme (sum-up and plan)* **Reconstruct** – hypothesise about different possible responses/actions; reframe future practice and show new understandings	• First person voice – Use of 'I' • Thinking and sensing verbs, e.g. I believe, I feel, I question, I understand, I consider • Nominalisation – turn verbs into nouns to say more with less words, e.g. the *implementation* of explicit vocal routines • Technical/dense nouns and noun groups, e.g. use discipline and professional 'jargon' and abstract terms such as *pedagogy*, *potential*, *student-negotiated learning framework*, *preventative measures* • Language of comparison/contrast, e.g. similarly, unlike, just as…, in contrast to… • Causal reasoning and explanation, e.g. as a result of…, the consequences of…, due to…, therefore, because • Adjectival groups to appraise and show evidence, e.g. *the well-disciplined and highly motivated* class was evidence of… • Adverbial groups to show reason, e.g. *according* to Jones (2005)… • Temporal links, e.g. *after* considering… • Future tense verbs to project future practice, e.g. I intend to…, I will ensure… • Adverbial groups to consider different impacts or possibilities, e.g. *under these conditions…*

1. *First person voice – Use of 'I'*

2. *Thinking and sensing verbs, e.g. I believe, I feel, I question, I understand, I consider*

   As noted earlier, reflective writing often tends to use the first person voice (Shaheed & Dong, 2006; Lindsay *et al.*, 2010). Ryan notes that this frequently goes hand-in-hand with thinking and sensing verbs e.g. *I* believe, *I* feel. This type of language falls under the affect category of the APPRAISAL system,

which is used to express emotions (Martin, 2000). Ryan (2011) notes that, while any form of reflective writing may contain examples of first person voice and thinking/sensing verbs, academic reflection also makes use of discipline-specific language.

3. *Nominalisation – turn verbs into nouns to say more with less words, e.g. the implementation of explicit vocal routines*

4. *Technical/dense nouns and noun groups, e.g. use discipline and professional 'jargon' and abstract terms such as   pedagogy, potential, student-negotiated learning framework, preventative measures*

   The third and fourth types of linguistic resources are indicative of the technical, discipline-specific language that appears in academic reflective writing. Nominalisations and dense nouns/noun groups are used to allow abstract ideas to be stated concisely (Ryan, 2011). It should be noted that some of the examples given in the model relate to the field of Education, but needless to say, these can be substituted with other discipline-specific examples when applying the model to reflective writing from a different domain.

5. *Language of comparison/contrast, e.g. similarly, unlike, just as..., in contrast to...*

   This category of linguistic resources set out by Ryan (2011) is similar in nature to the linking devices described by Luk (2008). Luk noted that students used contrastive devices when making distinctions in their writing (e.g. however, although, but) and additive devices when grouping ideas for comparative purposes (e.g. moreover, also, besides).

6. *Causal reasoning and explanation, e.g. as a result of..., the consequences of..., due to..., therefore, because*

   Another type of linking device is seen in this category. In this case, linking resources are used for causal reasoning and explanation (Ryan, 2011). These are similar to the causative and resultative devices described by Luk (2008). Causative devices allow students to provide reason (e.g. since, because, so)

while resultative devices enable students to express outcomes (e.g. therefore, thus). This category can also be related to the causal resources described by Reidsema & Mort (2009).

7. *Adjectival groups to appraise and show evidence e.g. the well-disciplined and highly motivated class was evidence of...*

8. *Adverbial groups to show reason, e.g. according to Jones (2005)...*

The seventh and eighth types of linguistic resource described by Ryan (2011) relate to the APPRAISAL system of language (Martin, 2000). They can both be said to fall into the categories of judgement and appreciation. Judgement enables students to express their opinion of a situation (e.g. "I worked on the **wrong** problem for this phase"), while appreciation allows students to evaluate a topic (e.g. "which one is the **most important**") (examples taken from Reidsema & Mort, 2009; emphasis from the original).

9. *Temporal links, e.g. after considering...*

The temporal links linguistic resource described by Ryan (2011) can be related to the temporal resources category examined by Reidsema and Mort (2009). This type of resource allows students to set out a sequence of events and may use words like 'then' or 'after'. (Reidsema & Mort, 2009).

10. *Future tense verbs to project future practice, e.g. I intend to..., I will ensure...*

11. *Adverbial groups to consider different impacts or possibilities, e.g. under these conditions...*

The final two linguistic resources described by Ryan (2011) enable students to write about future plans and situations. The first (future tense verbs) could be seen as an extension of the temporal links resource; however, in this case, the sequence of events described has not yet taken place. The final resource also uses hypothetical language. In this case, the language used may contain elements of appraisal (e.g. evaluating the potential impact of different scenarios), but again is set apart by the fact that the events under discussion have not yet occurred.

Research into the linguistic structure of reflective writing is at a very early stage. It has been seen in this section that only a handful of authors have dealt with this subject. Only one study utilised a sufficient sample to show evidence of their claims (Reidsema & Mort, 2009); however, this study only examined three types of linguistic resources. A more complete model of the features of academic reflection was set forth by Ryan (2011) but this model remains untested in an analysis of reflective writing. Nonetheless, the linguistic resources set out in Ryan's (2011) model of academic reflective writing serve as a good starting point for work in this area.

3.3 Chapter Review

In this chapter, related studies that developed and implemented reflective writing assessment instruments were reviewed and their results were compared. It was noted that varying levels of reflection were identified in these studies. Several studies found that there was a low number of non-reflectors and a low number of critical reflectors with the majority of students being somewhere in between, while other studies identified higher levels of critical reflection. This variation in the results reported suggests that the assessment of reflective writing, to date, has not been consistent. A recent review of the research in this area recommended that the academic community "embrace a more consistent approach to assessing the quality of student journals" (Dyment and O'Connell, 2011, p. 92). Notably, all of the instruments reviewed in this chapter were based on familiar models found in the existing literature on Reflective Practice. Several authors in the area call for more reliable and established criteria (Wong *et al.*, 1995; Chirema, 2007); however, no attempts have yet been made to develop independent, up-to-date assessment criteria.

This chapter also examined the (somewhat limited) research on the linguistic structure of reflective writing. Four studies in this area were reviewed, and background theory on the systemic functional linguistics approach was provided. The studies by Shaheed and Dong (2006) and Luk (2008) provided some interesting insights; however, the sample size in these studies was too small for their results to be generalisable. A larger study

was carried out by Reidsema and Mort (2009) and concluded that texts that score high on a reflective writing task were also linguistically richer. However, only three types of linguistic resource were examined in this study. A more complete model of the features of academic reflective writing was presented by Ryan (2011). It includes eleven types of linguistic resources, which are loosely linked to a reflective framework (set out by Bain *et al.*, 2002). While this model remains untested, it provides a valuable starting point for work in this area.

Chapter 4 : Methodology

4.0 Chapter Introduction

The following research questions were posed at the outset of this study:

1. What constructs most accurately describe the characteristics of a piece of reflective writing?

2. Does reflective writing have a predictable linguistic structure?

3. What is the likely impact of the integration of technology in the reflective writing and assessment process?

This chapter describes the overarching research methodology of the thesis, the research design and the specific methods used to answer these questions. Creswell & Plano Clark (2007) provide definitions for research methodology, research design and research methods. They describe research methodology as the philosophical framework and fundamental assumptions that guide the research. Research design refers to "the plan of action that links philosophical assumptions to specific methods" (Creswell & Plano Clark, 2007, p.4). Finally, they define research methods as specific techniques of data collection and analysis. The terms used in this chapter are consistent with the definitions provided by Creswell & Plano Clark (2007).

First, the research methodology is discussed (Section 4.1) and the assumptions that were made with regard to ontology, epistemology and human nature are expounded. Next, the selection of a mixed methods approach is discussed and the research design is set out (Section 4.2). In Section 4.3, the methods used to develop the Reflective Writing Assessment Instrument are evaluated. Then, the selection of reflective learning journals is described (Section 4.4) and ethical considerations are examined (Section 4.5). Section 4.6 presents the methods used in the analysis of reflective writing.

4.1 Research Methodology

According to Cohen, Manion and Morrison (2000) there are three main research methodologies: the scientific/positivistic approach, the naturalistic/interpretive approach and the critical theory approach. The first of these methodologies (scientific and positivistic) can be seen as a largely objective approach to research and is often associated with quantitative methods (Creswell & Plano Clark, 2007). The second approach (naturalistic and interpretive) is a more subjective one and frequently employs qualitative techniques (Creswell, 2009). The third approach, critical theory, involves the study of human phenomena through an ideological perspective e.g. feminism (Teddlie & Tashakkori, 2009).

This thesis does not make any attempt to examine reflective writing or its assessment through an ideological lens. Critical theory, as discussed by Teddlie & Tashakkori (2009), would therefore be an inappropriate methodology to use. Another approach that, like critical theory, aims to effect change in the environment under examination is action research (Robson, 2002). Action research can be used by educators to examine, and subsequently improve, teaching methods and learning strategies (Cohen, Manion & Morrison, 2000). It is habitually carried out by practitioners who themselves become participants in the research (Kemmis & McTaggart, 1988). In this thesis, a decision was made (for ethical reasons, as discussed in Section 4.5) to collect data from students who had already completed their studies. Therefore, it was not possible to use an action research methodology where the researcher could become actively involved with students. The goal of the study was not to improve students' reflective writing, or to change assessment practices, but to examine the criteria used for assessment and the content and structure of reflective writing.

The two methodologies considered for this study were the scientific/positivistic approach and the naturalistic/interpretive approach. For simplicity the scientific/positivistic methodology will be referred to hereafter as the 'objective'

approach and the naturalistic/interpretive methodology will be referred to as the 'subjective' approach.

The objective and subjective approaches both make assumptions about ontology, epistemology, human nature and methods (Cohen, Manion & Morrison, 2000). These assumptions are compared in Table 4.1.

Table 4.1: Objectivist vs. Subjectivist assumptions
(Adapted from Burrell & Morgan, 1979)

Objectivism	*← assumption →*	*Subjectivism*
Realism	*← ontology →*	*Nominalism*
Positivism	*← epistemology →*	*Anti-positivism*
Determinism	*← human nature →*	*Voluntarism*
Nomothetic	*← methods →*	*Idiographic*

Creswell & Plano Clark (2007) define ontology as the nature of reality. The objectivist view of reality is that there is a single, shared and tangible reality (Teddlie & Tashakkori, 2009). This is referred to as realism. The subjectivist view of reality, also known as nominalism, is that there are multiple, constructed realities which are unique to the individual (Teddlie & Tashakkori, 2009).

Epistemology is the nature of knowledge (Creswell & Plano Clark, 2007). The contrasting assumptions of the objectivist and subjectivist approaches in relation to epistemology are positivism and anti-positivism (Cohen, Manion & Morrison, 2000). Positivists believe that knowledge is hard and tangible and that the researcher must take an observer role. Anti-positivists see knowledge as personal and unique and believe that researchers must have a level of involvement with their subjects (Cohen, Manion & Morrison, 2000).

The objectivist and subjectivist approaches also make assumptions about human nature. These are referred to as determinism and voluntarism respectively (Burrell & Morgan, 1979). Determinism states that humans will generally respond to their environment in a certain way; in other words, that it is possible to determine what course of action a person will take when presented with a particular situation (Cohen, Manion &

Morrison, 2000). Voluntarism, on the other hand, has "a perspective where free will occupies centre stage" (Burrell & Morgan, 1979, p.2). Voluntarism states that, as all humans are different, they will respond differently when presented with similar circumstances.

Burrell and Morgan (1979) also compare the assumptions about research methods made by objectivists and subjectivists. The idiographic approach seeks to fully describe a single artefact or case and to connect aspects of this case with more general truths. Nomothetic studies, on the other hand, seek to identify generalisable findings from multiple cases (Neuendorf, 2002).

This thesis makes assumptions that fit with the objectivist approach to research. While this approach may seem to conflict with the nature of reflective writing, it fits with the aspects of reflective writing and its assessment that were examined in this thesis. The research questions were concerned with defining the characteristics of reflective writing (and identifying the degree to which these characteristics relate to 'depth' of reflection) and determining whether this type of writing contains patterns of linguistic features. In order to answer these questions, an objective approach is required, using largely quantitative methods. The stance taken in this thesis is now discussed in terms of ontology, epistemology, human nature and methods.

First of all, with regard to ontology, this thesis assumes that there is a shared, tangible, accessible and measurable reality. In particular, it asserts that it is possible to identify a set of generalisable characteristics of reflective writing.

Concerning epistemology, this thesis assumes that reflection (in terms of reflective writing) is something that is tangible and therefore can be measured. This fits with a positivistic epistemology. Positivism strives for measurability, predictability and patterning (Cohen, Manion & Morrison, 2000).

In terms of human nature (as described by Burrell & Morgan (1979)) this thesis aims to determine whether students use common linguistics features when writing reflectively.

In other words, it examines the degree to which there are determinable patterns in students' reflective writing. This corresponds with the determinist view of human nature.

The methods used in this thesis were largely quantitative (although some qualitative methods were utilised). The thesis examined multiple student journals for the purpose of identifying generalisable findings about reflective writing (its characteristics and linguistic structure). Therefore it can be said that the perspective of the thesis was nomothetic (as opposed to idiographic).

Overall, a mixed methods approach was taken. The rationale for mixed methods research is that "the use of both quantitative and qualitative analysis provides a better understanding of research problems than either approach alone" (Creswell & Plano Clark, 2007, p.5). Creswell and Plano Clark state that mixed methods research can be used when a need exists to explore a phenomenon qualitatively before it can be measured quantitatively. This is applicable to this thesis. In the instrument development phase, it was necessary to firstly use qualitative methods to identify indicators of reflection which could then be ordered and weighted to form a quantitative instrument. In the analysis of reflective writing, qualitative data was collected; quantitative methods were then used to analyse this data. The following section on research design discusses the mixed methods approach in greater detail.

4.2 Research Design

Creswell (2009) describes a number of strategies that are suitable for mixed methods research. These can be grouped into three categories: concurrent strategies, transformative strategies and sequential strategies.

Firstly, a concurrent strategy is one where both qualitative and quantitative data are collected simultaneously. In terms of concurrent strategies, a triangulation or embedded strategy can be taken:

1. Concurrent triangulation strategy:

    Using this strategy, both quantitative and qualitative data are collected in tandem and then compared.

2. Concurrent embedded strategy:

    This is similar to the concurrent triangulation strategy. However, using this strategy one of the types of data (qualitative or quantitative) is the main focus of the research while the other plays a supporting role.

In this thesis it was necessary to first identify characteristics of reflective writing (using a qualitative approach) and then to rank these (using a quantitative approach). The first set of data had to be collected and analysed before the second phase of collection and analysis could begin. Therefore a concurrent strategy would not have been appropriate.

A further approach for research design is the transformative strategy. This aligns itself with the methodological approach of 'critical theory' which studies human phenomena through an ideological perspective (Teddlie & Tashakkori, 2009). The phases in a transformative strategy can be concurrent or sequential.

3. Concurrent transformative strategy:

    This strategy has the features of the concurrent triangulation strategy. However, as with the sequential transformative strategy it uses an additional theoretical lens to view the data.

4. Sequential transformative strategy:

    This strategy consists of sequential phases, where a quantitative phase follows a qualitative one (or vice versa). However, this strategy has an additional theoretical lens (e.g. gender or race).

This thesis does not attempt to view reflective writing or its assessment through an ideological lens and therefore the critical theory methodology (and related transformative strategies) is not applicable.

Finally, Creswell (2009) discussed sequential research design strategies, where data is collected and analysed in a number of phases. Sequential strategies can be explanatory or exploratory.

5. Sequential explanatory strategy:

   The first phase of this strategy collects and analyses quantitative data. The subsequent second phase collects and analyses qualitative data to provide additional clarification of the quantitative data.

6. Sequential exploratory strategy:

   The strategy also consists of two phases. In the first, qualitative data is collected and analysed, while in the second phase quantitative data collection and analysis takes place.

The work in this thesis is of an exploratory nature. Information was sought on the characteristics of reflective writing (using qualitative data collection and analysis). This led to a quantitative phase where these characteristics were ranked and weighted. Creswell & Plano Clark (2007) state that a sequential exploratory design is often useful when the researcher needs to develop an instrument because existing instruments are either not available or unsatisfactory (which is the case in this thesis, as discussed in Section 3.1). Therefore, a sequential exploratory strategy was employed in this research. There are also two distinct phases, which are now discussed.

In this study, an instrument for the assessment of reflective writing was developed. A Delphi study was used for this purpose, where qualitative data was collected from participants in the first round. This qualitative data was then analysed and 12 indicators of reflection were identified. In a second, quantitative round of the Delphi study the indicators were returned to participants for ranking using pairwise comparisons. These comparisons were then analysed quantitatively, resulting in a final list of ordered, weighted reflection indicators. Therefore, the instrument development phase of this research followed a sequential exploratory design as described by Creswell (2009). Figure 4.1 summarises the research design used in Phase One.
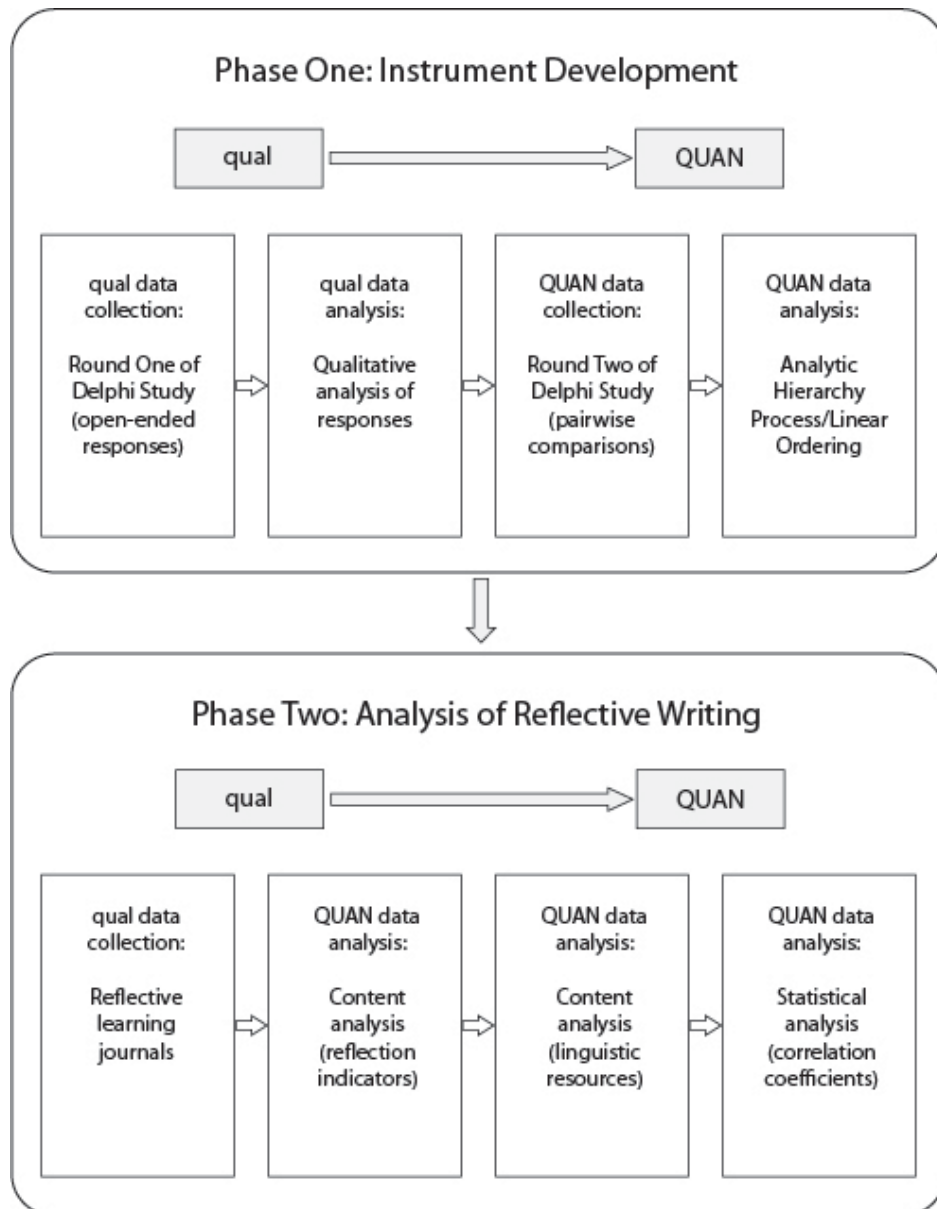
Figure 4.1: Research Design

The second phase of this research, which implemented the Reflective Writing Assessment Instrument, also followed a sequential exploratory design, as can be seen in Figure 4.1. The purpose of this phase was to identify levels of reflection in students' writing (based on the 12 reflection indicators identified in the first phase) and to examine the linguistic features of the writing. The data collected was qualitative (students' reflective journals) but the methods used for its analysis were quantitative (a content analysis followed by statistical tests to determine correlations between reflection indicators and linguistic resources).

The specific methods used to achieve the research objectives are now discussed in detail. The methods are divided into two sections which correspond to the two phases. Section 4.3 describes the methods used in the instrument development phase. Section 4.6 details the methods used in the analysis of reflective writing. The intervening sections (4.4 and 4.5) discuss the selection of the sample of reflective learning journals and the ethical considerations of the research (respectively).

4.3 Instrument Development

In Section 3.1, instruments that assess reflective writing were examined. Many of these instruments were based on Boud's model of the reflective process (Williams *et al.*, 2000; Wessel & Larin, 2006), Mezirow's definition of types of reflection (Kember *et al.*, 1999; Kember *et al.*, 2008; Chretien, Goldman & Faselis, 2008; Fischer *et al.*, 2011) or a combination of both of these (Wong *et al.*, 1995; Chirema, 2007; Plack *et al.*, 2005; Findlay, Dempsey & Warren-Forward, 2009). Other researchers utilised Bloom's taxonomy of educational objectives as the basis for their assessment instrument (Cuppernull *et al.*, 2004; Plack *et al.*, 2007; Dunfee *et al.*, 2008). The levels of reflection defined by Hatton and Smith formed the foundation of the instruments developed by Pee and colleagues (2002) and Fund, Court and Kramarski (2002).

When examining the related research on instruments that assess reflective writing it was noted that all of these instruments were based on well-known models found in the literature on Reflective Practice. While these models can provide a solid framework for the examination of reflective writing, the degree to which educators make use of these models (in practice) was unknown. A decision was made to garner the opinions of educators who are knowledgeable about reflective writing and its assessment, and to determine the criteria that they use to assess reflective writing.

For this purpose, a Delphi study was conducted with international Reflective Practice experts. In this section, the Delphi method is explained further and the selection of expert participants is discussed. The methods used to analyse the Delphi study

responses, and ultimately develop the Reflective Writing Assessment Instrument, are also set out. The development of the instrument and coding scheme are discussed in greater detail in Chapter 5: Reflective Writing Assessment Instrument.

4.3.1 Delphi Study

The Delphi method is used to gather opinions from a group of experts and can be used to establish facts, generate ideas or aid decision-making (Stewart, 2001). A Delphi study consists of a number of rounds of data collection and analysis. The Delphi study has, at times, been used in the field of education. For example, Zawacki-Richter (2009) used a Delphi study to identify research areas in distance education. Another study that examined distance education using the Delphi method was conducted by O'Neill, Scott and Conboy (2011), this time analysing the factors that affect collaborative learning. A recent study utilised the method to develop a set of research priorities for video-sharing technologies from an academic perspective (Snelson, Rice & Wyzard, 2012).

Stewart (2001) states that "although an interpretive analysis of qualitative data happens in the first stage, the Delphi is fundamentally reductionist in nature" (Stewart, 2001, p.922). This fits well this study's philosophical approach. It is necessary to identify reflective writing assessment criteria qualitatively in the first instance; however, the ultimate goal of the research is to reduce this data to a quantitative measure that can be used to assess depth of reflection.

Other techniques, such as Focus Groups and the Nominal Group technique were considered. A Focus Group is a group interview, in which a group of participants discuss a topic provided by the researcher. The data arises from the interaction between group members (Cohen, Manion & Morrison, 2000). However, according to Krueger (1994) Focus Groups are generally more suitable for use with user groups (e.g. customers) than with groups of experts. He states that Focus Groups are "not intended to develop consensus, to arrive at an agreeable plan or to make decisions about which course of action to take" (Krueger, 1994, p.19).

The Nominal Group technique is another way to elicit information from a group. Using this technique, individual responses are collated and displayed to the entire group. Then the group members are asked to identify clusters of related responses and thereby develop a list of responses for the group. However, the Nominal Group technique requires all members of the group to meet face-to-face (Cohen, Manion & Morrison, 2000).

Cohen, Manion and Morrison (2000) state that the Delphi method does not require participants to meet together as a whole group. They describe the following steps normally undertaken in a Delphi study:

Stage 1: Leader asks participants to respond to a series of questions and statements in writing (done on an individual basis).

Stage 2: Leader collates written responses and assembles them into clusters of issues and responses. Participants are presented with a group response and asked to react to it.

Stage 3: This process repeated as necessary (leader must decide an endpoint).

In this study, the international nature of the participants selected made it impossible to arrange a face-to-face group meeting. Also, the data to be collected (i.e. qualitative followed by quantitative) was a good match with the *modus operandi* of the Delphi method. For these reasons, the Delphi method was selected. The use of the Delphi study for the purposes of this thesis is now described.

4.3.1.1 Number of rounds

A Delphi study traditionally consists of a number of rounds (Keeney, Hasson & McKenna, 2006). In this study it was decided that two rounds would be used: one to identify the criteria that experts use to assess reflective writing and a second to assign an order and weighting to these criteria.

4.3.1.2 Selection of experts

The nature of the Delphi study means that participants cannot be selected randomly, and must instead be selected based on their expertise (Keeney, Hasson & McKenna, 2006). It was planned to select between eight and ten experts for this Delphi study. Fourteen potential participants were contacted initially (by email), and ten responses were received. These ten experts participated in Round One. However, only eight experts continued into Round Two of the Delphi study. It is the nature of this type of method that there will be 'dropouts' over the course of the process and accordingly some non-responses had been anticipated. Two reminder emails were sent to each non-responsive expert in order to encourage continuance with the study.

To qualify as an 'expert' the participant was required to have a recent record of publication in the area of reflective practice and be involved in the teaching and assessment of reflective writing. Other activities that related to reflective practice were also taken into account (e.g. consultancy work, position on editorial board of relevant journal).

In order to identify these experts, searches were performed in relevant conferences and journals. To begin with, these included all AACE (Association for the Advancement of Computing in Education) publications and the journals *Reflective Practice* and *Teaching & Learning: Journal of Natural Inquiry & Reflective Practice*. Any authors that were identified in this search were examined further by locating their profile on their university's website. These profile pages provided details of further publications. Additional journals and conferences in which experts had published were then also included in the investigation, to expand the search and identify further potential participants.

Experts who had five publications that related to reflective practice in the period from 2003 to 2008 were selected. Those who listed Reflective Practice as a teaching interest or who were involved in other activities related to Reflective Practice were also

selected. Experts were later asked to identify whether they considered themselves a teacher of Reflective Practice. All eight experts who completed both rounds of the study answered this question in the affirmative.

The selected experts all had a recent record of publication in the area of reflective practice and also identified themselves as teachers of reflective practice. Therefore, all participants met the criteria for qualification as an 'expert' in terms of this study.

4.3.1.3 Anonymity

Another feature of the Delphi study is that participants retain their anonymity. This has been termed 'quasi-anonymity' as although the participants are not known to one another their identities are known to the research team (Keeney, Hasson & McKenna, 2006).

4.3.1.4 Consensus

The purpose of a Delphi study is to achieve agreement between the participating experts. Agreement can be determined through consensus, voting or mathematical averaging (McMurray, 1994). In the case of this Delphi study a number of mathematical techniques were used to analyse Round Two responses. This resulted in an overall order and weighting of indicators which represents the agreement of Delphi experts.

Keeney and colleagues note that, even if agreement is reached there is no guarantee that the 'right' answer has been found (Keeney, Hasson & McKenna, 2006). Kennedy (2004) states that it is important to test the results of a Delphi study. As noted earlier, the instrument developed in the Delphi study will be tested in the second phase of this research.

4.3.2 Pre-Delphi study

In advance of Round One of the Delphi study, interviews with local reflective practice teachers and researchers were conducted to identify the questions that should be asked in Round One.

4.3.2.1 Interviews

Informal, conversational interviews were held with five local Reflective Practice experts. Among those interviewed were senior members of W.I.T. staff (from the Education and Nursing departments) and staff from the National Adult Literacy Agency (NALA). The purpose of these interviews was to establish the most appropriate way to elicit the required information from the Delphi study experts. These interviews provided the researcher with an insight into the way Reflective Practitioners were likely to think about Reflective Practice. Interviewees were unanimous in their opinion that the required information (criteria for assessment of reflective writing) would be best elicited using a single open-ended question, thereby allowing the Delphi study experts maximum freedom to express their opinions. However, interviewees also suggested that a number of closed questions asking how the Delphi study experts use Reflective Practice (either themselves or with their students) may provide useful additional information.

4.3.2.2 Questionnaire

A semi-structured questionnaire was administered to Delphi study experts. The questionnaires were administered to participants via email. Part A of the questionnaire consisted of preliminary questions that aimed to determine the way in which the experts use Reflective Practice. These preliminary questions consisted of a mixture of open and closed questions. The questionnaire administered to Delphi study experts can be seen in Appendix A: Delphi Study Questionnaire.

Part B of the questionnaire was used as the first round of the Delphi study. This consisted of an open-ended question which asked experts about the criteria they use to assess reflective writing. Although open-ended questions are more difficult to analyse than closed questions they were deemed the most appropriate way to elicit the required information.

4.3.3 Delphi Study Round One Analysis

NVivo, a software package for analysing rich text, was used to aid the analysis of Round One responses. NVivo aids the management of large amounts of text by simplifying the coding of text to categories. Qualitative analysis was performed by the researcher to identify and categorise reflective writing assessment criteria in experts' responses. Each unique assessment criterion identified in the experts' responses was coded to an individual category (or node) in NVivo. This initial analysis resulted in a large number of assessment criteria or 'indicators' of reflection. These were then examined in more detail. Any indicators that were very similar to one another were removed. Also, indicators that were the opposite of one another were removed. This refinement process is discussed in detail in Chapter 5.

4.3.4 Delphi Study Round Two Analysis

The remaining 12 reflection indicators were then returned to the Delphi study experts. Experts were asked to compare the indicators in pairs and on a scale. This demonstrated which indicator they preferred in each case and also the degree to which they preferred it. The pairwise comparisons were then analysed using the Analytic Hierarchy Process (AHP). This process is now described in detail.

4.3.4.1 Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) is a technique used to aid decision-making (Saaty, 2000). Users of the technique evaluate the items under comparison by

comparing them in pairs and on a scale, thereby indicating which item they prefer in each case and the degree to which they prefer it.

The AHP recommended scale for comparing two items extends from -9 (on the left, indicating an extreme preference for Item A) to 9 (on the right, indicating an extreme preference for Item B). A score of 1, in the middle of the scale, represents an equal preference for both items. In the Analytic Hierarchy Process (AHP) this is known as the fundamental scale (Saaty & Vargas, 2001).

AHP allows the researcher to convert evaluations into numerical values. The resulting value is known as the priority vector (Saaty, 2000). Sorting the priorities or weightings also gives the order of items in terms of preference. In terms of the reflection indicators that were identified in Round One of the Delphi study, this second round allowed these indicators to be ranked and weighted. Experts were asked to compare reflection indicators (one pair at a time) and specify which indicator they believed was representative of a deeper level of reflection. Therefore, the result of this round of the Delphi study was that indicators were ranked according to the depth of reflection that they represent.

AHP also allows the researcher to check that each participant's responses are consistent. For example if a participant prefers A to B and prefers B to C, logically, he/she should also prefer A to C. AHP uses a Consistency Index and a Consistency Ratio to determine the degree to which a participant's responses are consistent (Saaty, 2000). Saaty (2000) recommends that there should be no more than 10% inconsistency in a participant's responses. However, Bhushan & Rai (2004) suggest that up to 20% inconsistency can be tolerated when using abstract parameters. Therefore, the tolerance for inconsistency in this study was 20%.

4.3.4.2 Linear Ordering

The Linear Ordering technique was also considered in addition to the Analytic Hierarchy Process. Linear Ordering is an alternative way to obtain an ordering of items

from pairwise comparison. The AHP Fundamental Scale was adapted for use in the Linear Ordering problem and experts' responses were ordered using the XpressMP optimiser. This allowed for comparisons between the AHP ordering and the Linear ordering. The Linear Ordering approach provided an additional consistency check, along with representation of responses using dendrograms. A dendrogram is a valued, hierarchical tree diagram that is used to illustrate clusters in data (Barthélemy & Guénoche, 1991). This analysis is discussed in detail in Chapter 5: Reflective Writing Assessment Instrument.

4.3.5 Post-Delphi study

In Round One, experts were asked to identify the criteria they use to assess reflective writing. These responses were analysed and after a process of refinement, twelve reflection indicators were identified. These indicators were returned to experts in a second round, where they were asked to compare reflection indicators in pairs, identifying in each case the indicator that represented a deeper level of reflection. The analysis of pairwise comparisons from Round Two resulted in a list of reflection indicators that were ordered and weighted according to depth of reflection. After both rounds had been completed, the responses from Round One and Two were used to develop a coding scheme, which formed the basis of the Reflective Writing Assessment Instrument. This coding scheme was then used to assess reflective writing in 27 reflective journals, as described in Section 4.6. The development of the instrument and coding scheme are discussed in full in Chapter 5: Reflective Writing Assessment Instrument.

4.4 Selection of sample

The scope of the study was to examine reflective writing that was done as part of an assessment in a higher education setting. It was also desirable to compare the media used for reflection. Therefore two groups were selected: one group that used a

traditional 'offline' medium (handwritten journals) and another who had used an online format (blogs), both in a higher education setting.

Twenty-one students who had used blogs for reflective writing were asked for permission to use their blogs in the study; 17 gave their consent (see Appendix B: Analysis of Reflective Learning Journals – Consent Form). Twenty students who had written reflective journals by hand were contacted; 10 of these agreed to take part in the study. Out of a total of 41 students contacted, 27 agreed to take part. In Section 3.1, related studies that developed and tested reflective writing assessment instruments were examined. The average size of the sample in the studies set out in Table 3.1 was 40.3 students. The median sample size in the studies reviewed was 27. Therefore, the size of the sample in this study was comparable to the others reviewed in Section 3.1.

A decision was made, for ethical reasons, to only examine the writing of former students. Ethical considerations are discussed further in Section 4.5. The blog group examined was made up of two cohorts studying the same module in consecutive years; these students completed their assignments in 2007 and 2008, respectively. The handwritten journal group completed their reflective writing assignment in 2009.

The blogs were completed by students who were studying a module entitled 'Cognitive Science & Human-Computer Interaction (HCI)' on the Higher Diploma in Business Systems Analysis. This course is part of the Computing, Mathematics and Physics department at the Waterford Institute of Technology. This one-year course is at Level 8 on the NQAI framework and ran in part-time mode in the academic years 2006/2007 and 2007/2008. The Cognitive Science and HCI module takes place in the second semester. The reflective writing assignment given to students can be seen in Appendix C: Reflective Writing Assignments. The objective of the assignment was to encourage students to reflect on their classroom learning and link theoretical concepts covered in the Cognitive Science section of the module to practical situations that occurred in the workplace (all of the students enrolled on this course were employed in the IT industry). The reflective blog assignment was worth 25% of students' overall grade for the module.

The handwritten reflective journals were completed by students taking the Applying Caring in Practice 2 module of the Bachelor of Science (Honours) in General Nursing. This full-time course is part of the Department of Nursing at the Waterford Institute of Technology and is also a Level 8 course. The Applying Caring in Practice 2 module is practice-based and occurs while students are on work placement in the second semester of their third year. The students used their journals to reflect on incidents that occurred during their work placements. The journals were part of the coursework for this module and accounted for 25% of the total grade in the academic year 2008/2009. The reflective writing assignment that was given to students can be seen in Appendix C: Reflective Writing Assignments.

There are several similarities between the two groups of students examined. All of the reflective writing was undertaken as part of an assessment in a higher education setting. The duration of the reflective writing assignments was the same (over the course of one semester); in both cases the journals accounted for 25% of the total grade. Both courses were at Level 8 of the NQAI framework. English was the first language of all the students who took part in the study.

However, there were also several differences between the two groups. For example, one group of students was reflecting on classroom learning while the other group was reflecting on practice. The students were studying in different domains (Nursing and Computing). The Nursing students had completed other reflective writing assignments over the duration of their studies, whereas the Computing students had not. Also, the students in the blog group received feedback on their reflective writing (if they completed their blog posts in a timely manner, which nine students did) as the lecturer could access their reflective blog posts on a regular basis. The Nursing students, on the other hand, did not receive feedback on their writing as the handwritten journals were not submitted until the work placement was finished (and there was no mechanism for lecturers to view students' writing in the interim).

The difficulty of comparing groups of students in educational research has been discussed by a number of authors in the field (Clark, 1983; Tallent-Runnels *et al.*, 2006; Sim & Hew, 2010). Even when one cohort of students is split into a test group and a control group there are likely to be many variables that affect the outcome, making it difficult to measure the effectiveness of any intervention. In the studies examined in Section 3.1, only one compared the media used for reflective writing using two groups of students on the same course (Fischer *et al.*, 2011). The cohort of students was split into two groups; one completed two reflective blog posts and the other wrote a reflective essay. As the learning activities given to the two groups were different, it is not possible to determine whether the medium used for reflective writing was responsible for any variations seen between the two groups.

As the writing examined in this thesis was done by former students, it was not possible to take an experimental approach (i.e. splitting a cohort into groups and having each group use a different medium for their reflective writing). In addition to being impractical in this case and ineffective in other cases (e.g. Fischer *et al.*, 2011) an experimental approach could be seen to be unethical. This is particularly true if a significant difference was seen between the media under examination; students who were placed in the group that used the less effective medium for reflective writing may have had an unfair disadvantage. Sim and Hew (2010) recommend that research in the uses of new educational media (such as blogs) should focus on the identification of best practices, rather than controlled comparisons.

Nonetheless, the differences between the two groups (students who had used reflective blogs and students who had written reflective journals by hand) were examined in this thesis. Although it was not possible to attribute variations in results to the medium used for reflective writing, some interesting results were seen, particularly in relation to the effect of feedback on reflection.

4.5 Ethical Considerations

As this thesis dealt with students, certain ethical considerations were taken into account. The Waterford Institute of Technology Research Ethics Policy sets out guidelines for performing research with WIT students. These guidelines state that students should not be put under pressure to participate. For this reason, students were not asked to participate in the research until they had already completed their studies at WIT. The students whose blogs were used finished the Cognitive Science & HCI module of the Higher Diploma in Business Systems Analysis course in 06/07 and 07/08 respectively; this data was collected in 2009. The Nursing students whose journals were examined had completed their Applying Caring in Practice 2 module in the academic year 08/09; these journals were collected in 2010.

Informed consent was obtained from 27 students who took part in the study. The consent form administered to participants can be seen in Appendix B: Analysis of Reflective Learning Journals – Consent Form. Students were assured anonymity. Some excerpts from blogs and journals were used in this thesis and may be used in other publications but no identifying characteristics were (or will be) used. Students were also made aware of their right to withdraw from the study at any time.

Anderson & Kanuka (2002) state that where information is publicly available on the Internet, informed consent for its use may not be needed (provided that no personal details are used). However, in the case of the Cognitive Science & HCI students the blog entries were password-protected. Therefore, the material was not publicly available and informed consent was needed.

As students had already finished their studies at WIT at the time when they were asked to participate in the study, some consent forms were obtained via email. Kanuka and Anderson (2007) discuss guidelines for obtaining electronic consent. They state that, unless "the participants have an incentive to misrepresent themselves, electronic consent forms are acceptable" (Kanuka & Anderson, 2007, p.9). A checkbox was provided on

the consent form in place of a signature (see Appendix B: Analysis of Reflective Learning Journals – Consent Form).

This research project has been approved by the WIT Ethics Committee.

4.6 Analysis of Reflective Writing

This section discusses the selection of methods used for the assessment of reflective writing and describes these methods. The analysis of reflective writing that was undertaken is set out in greater detail in Chapter 6.

4.6.1 Content Analysis

In the first phase of this study, 12 indicators of reflection were identified. The second phase of the study aimed to analyse reflective writing by seeking evidence of these reflection indicators in students' reflective journals. For this analysis, a number of methods were considered.

An experimental approach could be taken to compare the differences in the media used for reflective writing. However, as noted in Sections 4.4 and 4.5, this was ruled out for ethical reasons. Another problem with the experimental approach is that it requires an intervention to occur (e.g. the introduction of a different medium for reflective writing). When participants become aware that they are being tested, they sometimes change their behaviour, affecting the outcome of the analysis (Krippendorff, 2004). In this study, reflective journals were collected after the students had completed their studies, preventing this problem from occurring.

Another approach that was considered for the analysis of reflective writing was concept mapping. Concept mapping is an interesting method that involves a team of sorters

organising open-ended responses into categories (Novak & Musonda, 1991; Jackson & Trochim, 2002). Analysis of the sorted responses reveals clusters of responses that are related, allowing the researcher to identify categories or themes. However, it is only useful on sparse qualitative data (e.g. short open-ended responses). With more complex data, for example where sentences form part of a longer discussion or process of reasoning, the method is not suitable (Jackson & Trochim, 2002). Also, as it relies on sorters to organise statements into groups, it works best where there are 200 or less statements to sort: any more than this is unmanageable. This makes the concept mapping method unsuitable for analysis of the learning journal data.

There are many qualitative approaches to the analysis of writing e.g. rhetorical analysis, discourse analysis, interpretative analysis or narrative analysis (Hijmans, 1996). These methods largely involve the identification of themes or codes as the analysis progresses (Neuendorf, 2002). In this study, a clearly defined set of codes (the reflection indicators) existed before the analysis of reflective writing began. Therefore, methods that take a grounded or 'bottom-up' approach to coding were ruled out.

A content analysis was decided upon as the most suitable approach for the identification of the reflection indicators in students' reflective writing. In comparison to an experimental approach, a content analysis is unobtrusive as it allows data to be collected after the fact (Krippendorff, 2004). Also, a content analysis can handle unstructured data e.g. long, open-ended responses (Krippendorff, 2004). This makes it more suitable for the purposes of this study than concept mapping, where only short questions can be compared and no more than 200 discrete statements can be sorted (Jackson & Trochim, 2002).

Content Analysis is the "systematic, objective, quantitative analysis of message characteristics" (Neuendorf, 2002, p.1). According to Neuendorf, one of the defining features of a content analysis, in comparison to more qualitative analyses, is that it tries to meet the standards of the scientific method. Gunter (2000) states that a content analysis fits with the positivist paradigm of research as it strives for objectivity, reliability, validity, generalisability and replicability. The content analysis works well

with a nomothetic approach as it summarises and generalises without looking at specific cases in detail (Neuendorf, 2002).

The content analysis methodology also follows an *a priori* design, meaning that the variables to be studied are identified beforehand. The coding scheme must be clearly defined before any observations begin (Neuendorf, 2002). This approach fits well with the design of this research study, as the reflection indicators were defined in advance of the content analysis phase of the research.

Using the content analysis method, a number of factors must be considered: the use of software to aid coding; the units of data collection and analysis; the application of a coding scheme; the methods used for coding; and the reliability and validity of the analysis. These issues are now discussed in the following sections.

4.6.1.1 CAQDAS

Computer Assisted Qualitative Data Analysis Software (CAQDAS) can be useful in the analysis of qualitative data (St. John & Johnson, 2000). The most frequently cited benefit of using this type of software is efficiency and convenience, as it assists the categorisation of large amounts of text into categories (St. John & Johnson, 2000; Garrison & Anderson, 2003; Saldaña, 2009). As well as aiding the coding of text to various categories, QDAS programs can also enable the sorting of codes for presentation or analysis (Garrison & Anderson, 2003). In addition to this, it is often possible to link annotations (memorandums or notes made by the researcher) to specific pieces of text.

QDAS programs sometimes have the functionality to perform "auto-coding", where particular words are automatically assigned to certain categories. However, this function does not consider the context in which a certain word appears; instead, all instances of that word are blindly coded to a category. While there are situations where this might be useful, it was not appropriate in this study. Instead, it was important to identify the context in which words were used in order to determine their meaning,

something that Richards (2005) refers to as 'analytic' coding. Nonetheless, CAQDAS plays an important role in supporting the coding process by organising and managing codes in order to "enable human analytic reflection" (Saldaña, 2009, p.22).

Several QDAS programs are available including ATLAS.ti, MAXqda, NVivo and XSight. These programs have many common features, and choosing among them can be difficult (Lewins & Silver, 2007; di Gregorio & Davidson, 2008). Di Gregorio and Davidson (2008) state that a major influencing factor in the selection of software may be the availability of a site license at an institution (and whether or not there is an existing community of users at the institution). WIT has a site license for NVivo software. In addition to this, regular NVivo training sessions are held. Therefore, NVivo was selected for use in the content analysis. One important feature of NVivo software is that it supports fine-grained coding (e.g. words) whereas some other programs do not (Gibbs, Friese & Mangabeira, 2002). For the purposes of this study it was important that individual words could be coded to categories when necessary.

4.6.1.2 Unitisation & Sampling

A unit is an identifiable message or message component (Neuendorf, 2002). There is a distinction in Content Analysis methodology between the units used in data collection, the units identified when coding data and the units examined when analysing that data. The unit of sampling (or data collection) in this study was the journal entry (i.e. a single blog post or a single entry in a handwritten journal). The unit of coding was the text excerpt. Each section of text that represents an example of one of the 12 reflection indicators was coded to the corresponding node using NVivo. The unit of analysis was also the text excerpt. Coded text excerpts were later analysed to determine overall levels of reflection in students' writing.

Twenty-seven journals (17 blogs, 10 handwritten journals) were collected, each consisting of six or more entries. The first and sixth journal entries from each journal were analysed. The sixth journal entry was chosen as all journals had at least a sixth entry (some journals had up to ten entries). Any additional entries were not analysed. It

was desirable to control the sampling (by deliberately choosing the first and sixth posts) so that any improvements in depth of reflection could be identified over the course of a journal. It was hypothesised that there would be more instances of the indicators which represent deeper reflection in the sixth journal entry, when compared to the first entry in a journal.

4.6.1.3 Coding Scheme

Section 4.3 described the methods used to develop an instrument that assesses reflective writing. The Reflective Writing Assessment Instrument consists of 12 indicators of reflection. These indicators are ordered and also weighted in terms of the depth of reflection that they represent. Chapter 5 details the development of this instrument and describes the formation of a related coding scheme. This coding scheme was then used to examine the writing in students' journals in the content analysis phase of the research.

The purpose of the content analysis is to identify examples of the 12 indicators in the text of reflective journals. Each indicator was assigned a corresponding node in NVivo; text that related to that indicator was assigned or 'coded' to that node. Coding was performed at text excerpt level. A text excerpt can be coded to more than one node; in other words, a text excerpt can be linked to more than one reflection indicator. The coding scheme used can be seen in Appendix D: Coding Scheme. According to the guidelines discussed by Maykut & Morehouse (1994) a rule for inclusion was defined in relation to each reflection indicator. For an excerpt of text to be coded as an example of a reflection indicator it must meet at least one of the conditions of that indicator, based on the coding scheme. The approach of using a coding scheme (or set of rules) for the analysis of reflective writing has been used in many studies similar to this one. These include the work of Wong *et al.* (1995), Kember *et al.* (1999), Williams *et al.* (2000), Pee *et al.* (2002) and Plack and colleagues in both 2005 and 2007.

4.6.1.4 Coding methods

Saldaña (2009) discusses a number of coding methods which he describes as 1st cycle methods and 2nd cycle methods. First cycle methods include exploratory methods; for example, hypothesis coding (Saldaña, 2009). Hypothesis coding is the application of a list of pre-determined, researcher-generated codes to a body of text (Saldaña, 2009). The hypothesis coding approach was selected as the most suitable approach for this study as the reflection indicators were clearly defined before the analysis of reflective journals began.

Saldaña (2009) also discussed 2nd cycle coding methods, which re-examine the codes used in the 1st cycle and sort or re-categorise those codes. The codes used in this study were clearly defined before the study began. While many studies that take a 'bottom-up' approach to coding (e.g. grounded research) would redefine codes at this stage, this study took a 'top-down' approach to coding. The purpose of the study was to identify samples of text that relate specifically to the reflection indicators developed in the Delphi study. Therefore it would be inappropriate to make changes to the codes (indicators) in a second phase of coding.

While coding the text of the reflective blogs, analytic memos were used. Analytic memos can be used to document the process of coding and the coding decisions made (Stacey & Gerbic, 2003; di Gregorio & Davidson, 2008; Saldaña, 2009). In this study, an analytic memo was created each time a text excerpt was coded to a reflection indicator. This was done using an annotation in NVivo (a note that can be linked to the text to which it refers). The use of analytic memos meant that the researcher's coding decisions were explicit and tangible. As a result, the coding decisions made are available for examination at a later date by the researcher or by others.

4.6.1.5 Reliability

The term 'reliability' refers to consistency and replicability of research results over time (Cohen, Manion & Morrison, 2000). In terms of a Content Analysis, there are three types of reliability: stability, reproducibility and accuracy (Krippendorff, 2004).

Stability is the degree to which a procedure is unchanging over time (Krippendorff, 2004). This is also known as intra-observer agreement and states the researcher should repeat the same coding decisions over time, when examining the same data. In this thesis a test-retest protocol was followed, where the researcher re-examined a sample of data a second time to ensure the coding procedure was consistent with the first set of coding decisions made. The use of analytic memos also helped to ensure that the same decision-making process was utilised throughout the coding of journals.

Reproducibility is the degree to which the process can be replicated by different individuals using the same instrument or coding scheme (Krippendorff, 2004). This is known as inter-observer agreement and is a stronger measure of reliability than stability. To measure reproducibility at least one other individual must code the same data as the researcher using the same instrument. Inter-coder reliability was determined in this study using paired t-tests which compared the judgements made by two coders. The results of these paired t-tests are set out in Section 6.1.1.

Krippendorff (2004) defines accuracy as the degree to which coding conforms to a given standard. For example, typographical errors are easily identifiable as errors when compared to existing spelling standards (Krippendorff, 2004). However, in the case of this study, there is no existing standard for coding the text of reflective learning journals. It is not possible, therefore, to confirm accuracy as defined by Krippendorff.

4.6.1.6 Validity

Validity is the extent to which the analysis has measured what it set out to measure (Robson, 2002). In relation to this study, a Reflective Writing Assessment Instrument which aims to measure depth of reflection evident in the text of learning journals was developed. The reflection indicators used in this instrument were developed using a Delphi study with a group of Reflective Practice experts. A great deal of consideration went into the selection, refinement, ordering and weighting of these indicators.

Through this process it has been determined that the instrument itself represents the characteristics of reflective writing as accurately as possible.

However, the validity of the Content Analysis must also be ensured. There are a number of ways in which the validity of this study must be assessed. Krippendorff (2004) discusses face validity, which is the 'obvious' or 'common truth'. The results of an analysis should be obviously true, sensible and plausible (Krippendorff, 2004). Krippendorff also discusses content validity, which he divides into two kinds of validity: sampling validity and semantic validity (Krippendorff, 2004). The first, sampling validity, refers to the extent to which the sample of learning journals used in this study accurately represents learning journals in general. Semantic validity is "the degree to which analytical categories accurately describe the meanings and uses in the chosen context" (Krippendorff, 2004, p.319). A great deal of deliberation went into the development of the reflection indicators (see Chapter 5: Reflective Writing Assessment Instrument). This process of deliberation ensured that the reflection indicators accurately describe the characteristics of reflective writing, thus ensuring the semantic validity of the study.

Triangulation (that is, the use of more than one method of data collection or more than one set of observations) can help to confirm the validity of results (Robson, 2002). In order to verify the reflective scores assigned by the Reflective Writing Assessment Instrument, they were compared with the original grades given to students. A Pearson's *r* correlation coefficient was used for this purpose.

4.6.2 Analysis of levels of reflection

Upon completion of the coding process, the levels of reflection found in journals were analysed. The frequency of coding to each reflection indicator was assessed and the overall amount of reflection found was examined.

In addition to this, the Reflective Writing Assessment Instrument was used to assign a reflective score to each journal based on the amount of reflection it contained. This was

done by taking into account the frequency of each reflection indicator in a journal and the weightings assigned to those indicators during the analysis of the Delphi study responses. The full method used for calculating a journal's reflective score is elucidated in Chapter 6, and in Chapter 7 the results in relation to scores and levels of reflection are set out.

4.6.3 Analysis of linguistic structure

Following the content analysis, which assessed levels of reflection, an additional analysis was performed to examine the linguistic structure of students' reflective writing. For this purpose, a subset of reflective journals was selected. In these journals, ten types of linguistic resource were coded based on the model proposed by Ryan (2011). The sample selection and linguistic resources are now discussed.

4.6.3.1 Sampling

Related studies that examined the structure of reflective writing were reviewed in Section 3.2.2. Two of these studies used only a very small sample of reflective journals; Shaheed and Dong (2006) analysed four blogs while Luk (2008) examined six reflective journals. Ryan (2011) proposed a model of the linguistic resources used in academic reflection but did not test the model in an analysis of reflective writing.

The study by Reidsema and Mort (2009) is the most comparable to the one performed in this thesis in terms of sample size (although Reidsema and Mort only examined three types of linguistic resources). Reidsema and Mort analysed 20 reflective journals; ten that had received high scores and ten that had received low scores. Similarly, in this thesis, 18 out of 27 journals were selected for the linguistic analysis; the nine highest-scoring and the nine lowest-scoring. The total word count examined was 14,100 words (compared to 11,689 words analysed by Reidsema and Mort, 2009).

4.6.3.2 Linguistic resources

The linguistic resources examined in this study are based on a model of academic reflection put forth by Ryan (2011), which was discussed in Section 3.2.2. In her framework, Ryan proposes 11 features of academic reflective writing. These linguistic resources can be seen in Table 4.2.

Table 4.2: Linguistic resources and related word lists

Code	Linguistic resources (adapted from Ryan, 2011)	Sample word list (non-exhaustive)
SFL01	• First person voice – Use of 'I'	(Singular) I, me, myself, mine, my (Plural) we, our, ours, ourselves, us
SFL02	• Thinking and sensing verbs, e.g. I believe, I feel, I question, I understand, I consider	believe, feel, consider, decide, guess, imagine, know, notice, realise, remember, see, suppose, think, understand, wonder, question
SFL03	• Nominalisation – turn verbs into nouns to say more with less words, e.g. the *implementation* of explicit vocal routines	failure, investigation, movement, reaction, refusal, destabilization, demonstration, indication, analysis, implementation
SFL04	• Technical/dense nouns and noun groups, e.g. use discipline and professional 'jargon' and abstract terms such as *pedagogy, potential, student-negotiated learning framework, preventative measure*	(Cognitive Science & HCI) information technology, web accessibility, biometrics, interface design, usability, artificial intelligence (Nursing) preceptor, cross-infection, decontaminate, hygiene, *compos mentis*, physiotherapist
SFL05	• Language of comparison/contrast, e.g. similarly, unlike, just as…, in contrast to…	likewise, also, while, in the same way, like, unlike, just as, similarly, but, still, although, on the other hand, in contrast to, however, yet, otherwise, even though
SFL06	• Causal reasoning and explanation, e.g. as a result of…, the consequences of…, due to…, therefore, because	so, therefore, consequently, hence, because, an effect of, caused by, otherwise, in that case, as a result of, yet, still, though, due to, despite this, however, even though, all the same, nevertheless, accordingly
SFL07	• Adjectival groups to appraise and show evidence, e.g. *the well-disciplined and highly motivated* class was evidence of… • Adverbial groups to show reason, e.g. *according* to Jones (2005)…	thorough, elaborate, consistent, remarkable, repetitive, compelling, boring, innovative, mediocre, vague, successfully, suddenly, unexpectedly, deliberately, doubtfully, easily, questioningly, effectively
SFL08	• Temporal links, e.g. *after* considering…	while, first, meanwhile, soon, then, after, second, today, later, next, tomorrow, afterward, as soon as, before, now, when suddenly, during, until, yesterday, finally
SFL09	• Future tense verbs to project future practice, e.g. I intend to…, I will ensure…	am going to, intend, will ensure, mean to, propose that, plan to, aim to, aspire to, will try, will endeavour
SFL10	• Adverbial groups to consider different impacts or possibilities, e.g. *under these conditions…*	under these conditions…, in view of, taking into account, considering, if…, alternatively, differently, correspondingly, depending on, conditionally

For the purposes of this analysis, the resources "adjectival groups to appraise and show evidence" and "adverbial groups to show reason" have been combined into one group (SFL 07). It was found that when students were 'appraising', that is, writing about their evaluation of a particular topic, they used both adjectives and adverbs; they did not use only adjectival groups for appraisal, as suggested by Ryan (2011), but also used adverbial groups. The same was found to be true for reasoning; both adjectival groups and adverbial groups were used. Therefore, these resources were combined and examined together. In Section 6.3.2 examples of each linguistic resource are presented.

As a guide for the linguistic analysis, the examples given by Ryan were expanded and lists of words that relate to each linguistic resource were developed. Though these lists are non-exhaustive, they were nonetheless helpful as a reference when conducting the linguistic analysis. These word lists are shown alongside the linguistic resources in Table 4.2.

4.6.3.3 Correlation with reflection indicators

Following the content analysis and linguistic analysis, statistical tests were performed to identify correlations between reflection indicators and linguistic resources. The Pearson's *r* correlation coefficient was used for this purpose. This test measures both the strength and direction of relationship; a subsequent test indicates whether or not this relationship is significant (Muijs, 2011). Muijs suggests the following standard cut-off points in Pearson's *r* value when determining the strength of a relationship:

> *<0.±1 weak*
> *<0.±3 modest*
> *<0.±5 moderate*
> *<0.±8 strong*
> *≥±0.8 very strong*
>
> *(Muijs, 2011, p. 145)*

Correlations between reflection indicators and linguistic resources are presented in Section 7.2.1 and are discussed in Section 8.2.3, where examples of each relationship are presented.

4.7 Chapter Review

This chapter set out the research methodology and argued that, in order to answer the research questions, an objective methodology was the most appropriate approach. In terms of ontology, the thesis takes a realist view, in that it assumes that it is possible to develop a shared, agreed-upon set of reflective writing assessment criteria. From an epistemological standpoint the thesis takes a positivistic view, as it presupposes that reflection is something that is tangible and can therefore be measured. The view of human nature espoused by this thesis is a deterministic one, as it hypothesises that there may be determinable patterns of linguistic features in students' reflective writing.

In terms of methods, a nomothetic approach was taken, where multiple cases were examined to identify generalisable findings. A sequential exploratory research design was utilised; qualitative methods were used to explore a phenomenon that was subsequently analysed using quantitative methods.

The first phase of the research aimed to develop a reflective writing assessment instrument. A Delphi study was selected as the most appropriate method to determine the criteria that assessors use when examining reflective writing; international experts were chosen as participants. Experts' responses were examined qualitatively and 12 indicators of reflection were identified. Then, quantitative methods (specifically, pairwise comparisons followed by the use of AHP and Linear Ordering) were utilised to rank these indicators in terms of the depth of reflection that they represent.

The instrument developed in the first phase of the research was used in a second phase to analyse students' reflective writing. A content analysis was selected as the most appropriate method for this purpose. Twenty-seven reflective blogs and journals were obtained and analysed by two coders (to assess the reliability of the instrument). A subset of these (18 out of 27) was selected for additional analysis based on the linguistic features set out by Ryan (2011). Quantitative analysis was performed to determine

levels of reflection in students' writing, the number of linguistic resources used and the correlation between linguistic resources and reflection indicators.

Chapter 5 : Reflective Writing Assessment Instrument

5.0 Chapter Introduction

This chapter describes the development of an instrument that assesses depth of reflection in the text of learning journals. This was done using a Delphi study, which was conducted with a group of Reflective Practice experts to determine the criteria they use to assess reflective writing (Round One) and to rank these criteria according to depth of reflection (Round Two).

In the first round of the Delphi study, experts were asked an open-ended question about the criteria they use to assess reflective writing and how they identify that a particular level of reflection has been reached. Responses from Round One were analysed using NVivo. Thirty-eight indicators of reflection were coded initially. Further evaluation reduced the number of indicators to 12.

The 12 indicators identified in Round One were returned to experts for ranking. They were asked to compare indicators in pairs and on a scale, thereby identifying which indicator they preferred and also the degree to which they preferred the chosen indicator.

Responses from Round Two of the Delphi study were analysed using both the Analytic Hierarchy Process (AHP) and the Linear Ordering technique. Experts' responses were represented using dendrograms as a consistency measure.

Finally, the list of 12 ordered, weighted reflection indicators was used as the basis for a coding scheme that can be used in a content analysis of reflective writing. The development of this coding scheme (based on Delphi study responses and examination of Reflective Practice frameworks) is described in this chapter.

5.1 Interviews

In advance of the Delphi study, interviews were conducted with five WIT staff involved in the teaching and assessment of Reflective Practice. The purpose of these interviews was to identify issues that may influence the way in which the Delphi study experts view reflective writing assessment and to determine the type of questions that experts should be asked.

Interviewees suggested a number of factors that may influence the way in which Delphi study experts view Reflective Practice and its assessment. These factors include the following:

1. Organisational Culture: Is Reflective Practice part of the culture of the organisation as a whole?

2. Reflective Practitioner: Does the expert engage in Reflective Practice him/herself?

3. Isolated vs. Collaborative: Does the expert view Reflective Practice as an isolated process or a collaborative one?

4. Benefits of reflection: What does the expert perceive to be the benefits of Reflective Practice?

5. Barriers to reflection: What does the expert perceive to be the barriers to Reflective Practice?

Interviewees also proposed a number of features of a Reflective Practice learning journal assignment. The utilisation of these features in an assignment may give further indication of how experts and their students use Reflective Practice. These features are as follows:

6. Learning vs. Practice: Is Reflective Practice used to reflect on learning or to reflect on practice?

7. Framework/Guidelines: Are students given guidelines (e.g. a Reflective Practice framework) as part of their learning journal assignment?

8. Assessment: Is Reflective Practice assessed? If so, is the assessment formative or summative?

9. Feedback: Do students receive feedback on their learning journals? If so, when do they receive feedback and how often do they receive it?

10. Medium: What medium do students use to reflect?

These questions were posed to Delphi study experts at the outset of the study. The main purpose of Round One of the Delphi Study was to identify the criteria that experts use to assess reflective writing and to identify how these criteria differ at varying levels of reflective depth. Interviewees were unanimous in their opinion that a single open-ended question would be the optimum way to garner this information.

Appendix A: Delphi Study Questionnaire contains both the preliminary questions which were posed to experts and the open-ended question used in Round One of the Delphi study.

5.2 Delphi Study Round One

In Round One of the Delphi study, experts were asked to answer an open-ended question about the criteria they use to assess reflection. This can be seen in Appendix A: Delphi Study Questionnaire but is also included here for ease of reference.

> *Q1: What criteria enable you to identify that a particular level of reflection has been reached? Please discuss these criteria in terms of different levels of reflection. The following levels described by Hatton & Smith (1995) may provide some guidelines if necessary:*
>
> - *descriptive writing,*
> - *descriptive reflection,*
> - *dialogic reflection and*
> - *critical reflection.*

The open-ended responses collected from Round One of the Delphi Study were coded using NVivo. Each reflective writing characteristic mentioned by experts was coded to its own individual category. Thirty-eight characteristics were identified in total. These will be referred to as 'indicators' hereafter. These 38 indicators can be seen in the 'Unrefined List' column of Table 5.1.

5.2.1 Refinement of Round One responses

In the unrefined list of 38 indicators, there are several indicators which are very similar to one another and therefore warrant deletion. The duplicates which were identified (and subsequently removed) can be seen in the 'Duplicates identified' column of Table 5.1.

As the experts were asked to discuss the criteria they use to assess reflection in terms of different levels of reflection, there are several cases where the indicators identified are actually opposites of one another e.g. 'Limited reference to literature' and 'Reference made to literature'. This frequently occurred as experts identified, for example, 'reference to literature' as indicative of deeper reflection when compared with 'limited reference to literature' (which they associate with a lesser degree of reflection). However, these indicators represent different points on the same scale i.e. 'Reference to literature'. Therefore, the inclusion of the negative indicator is unnecessary as it can just as easily be identified by the absence of the positive indicator. At this stage of the refinement process, opposites were identified and only the positive indicators were retained. The negative indicators (which were subsequently removed) can be seen in the column 'Opposites identified'.

Table 5.1: Refinement of Indicators gives an overview of the refinement process. Indicators that were eliminated are represented in grey. The outcome in relation to each indicator is noted in the right-most column.

Table 5.1: Refinement of indicators

	Unrefined List (n=38)	Duplicates identified	Opposites identified	Outcome (Retained/Removed)
1	Analysis occurs	16. Evaluation of issues	26. Little or no analysis 37. Superficial comments	1. Analysis is evident (Retained) 16. Evaluation of issues (Removed, duplicate) 26. Little or no analysis (Removed, opposite) 37. Superficial comments (Removed, opposite)
2	Applies reflective criteria	32. Reflective framework is utilised	33. Reflective framework not utilised	2. Applies reflective criteria (Removed, duplicate) 32. Reflective framework is utilised (Retained) 33. Reflective framework not utilised (Removed, opposite)
3	Changes in beliefs or understanding	29. Provides rationale for changes	None	3. Changes in beliefs or understanding are evident (Retained) 29. Provides rationale for changes (Removed, duplicate)
4	Changes practice	34. Revises practice	None	4. Changes practice (Removed, duplicate) 34. Practice is revised (Retained)
5	Clear description of context	38. Writing is descriptive	None	5. Clear description of context is given (Retained) 38. Writing is descriptive (Removed, duplicate)
6	Connection with external elements	10. Considers other perspectives	18.Focus on self 20. Identifies personal responses 36. Some connections single perspective	6. Connection with external elements (Removed, duplicate) 10. Multiple perspectives are considered (Retained) 18.Focus on own perspective (Removed, opposite) 20. Identifies personal responses (Removed, opposite) 36. Some connections single perspective (Removed, opposite)
7	Connects ideas	11. Construction of meaning 13. Creative synthesis	14. Disjointed reflection 15. Does not make connections	7. Connects ideas (Removed, duplicate) 11. Construction of meaning (Removed, duplicate) 13. Creative synthesis is evident (Retained) 14. Disjointed reflection (Removed, opposite) 15. Does not make connections (Removed, opposite)
8	Considers alternative approaches	None	None	8. Alternative approaches are considered (Retained)

	Unrefined List (n=38)	Duplicates identified	Opposites identified	Outcome (Retained/Removed)
9	Considers implications of actions	30. Questions behaviour	None	9. Implications of actions are considered (Retained) 30. Questions behaviour (Removed, duplicate)
10	Considers other perspectives			See 6
11	Construction of meaning			See 7
12	Corrects misinterpretations			See 17
13	Creative synthesis			See 7
14	Disjointed reflection			See 7
15	Does not make connections			See 7
16	Evaluation of issues			See 1
17	Evidence of learning	12. Corrects misinterpretations	23. Limited evidence of learning	12. Corrects misinterpretations (Removed, duplicate) 17. Learning is evident (Retained) 23. Limited evidence of learning (Removed, opposite)
18	Focus on self			See 6
19	Identifies issues	21. Identifies problems	None	19. Issues are correctly identified (Retained) 21. Identifies problems (Removed, duplicate)
20	Identifies personal responses			See 6
21	Identifies problems			See 19
22	Insightful understanding	None	27. Misinterpretations evident	22. Insightful understanding is evident (Retained) 27. Misinterpretations evident (Removed, opposite)
23	Limited evidence of learning			See 17
24	Limited reference to literature			See 31

	Unrefined List (n=38)	Duplicates identified	Opposites identified	Outcome (Retained/Removed)
25	Links with broader social structures	None	None	25. Links are made to broader social structures (Retained)
26	Little or no analysis			See 1
27	Misinterpretations			See 22
28	No self-awareness			See 35
29	Provides rationale for changes			See 3
30	Questions behaviour			See 9
31	Reference made to literature	None	24. Limited reference to literature	24. Limited reference to literature (Removed, opposite) 31. Reference made to literature (Retained)
32	Reflective framework is utilised			See 2
33	Reflective framework not utilised			See 2
34	Revises practice			See 4
35	Self-awareness is evident	None	28. No self-awareness	28. No self-awareness (Removed, opposite) 35. Self-awareness is evident (Retained)
36	Some connections single perspective			See 6
37	Superficial comments			See 1
38	Writing is descriptive			See 5

To summarise, Table 5.2 shows the 15 indicators that remained once all of the duplicates and negative indicators had been removed[3].

Table 5.2: Refined List of Indicators

1	Alternative approaches are considered
2	Analysis is evident
3	Changes in beliefs or understanding are evident
4	Clear description of context is given
5	Creative synthesis is evident
6	Implications of actions are considered
7	Insightful understanding is evident
8	Issues are correctly identified
9	Learning is evident
10	Links are made to broader social structures
11	Multiple perspectives are considered
12	Practice is revised
13	Reference made to literature
14	Reflective framework is utilised
15	Self-awareness is evident

5.2.2 Further analysis and comparison with Reflective Practice models

At this juncture it was decided to re-examine existing models of Reflective Practice in order to further refine the list of indicators. This analysis aimed to examine the indicators identified in Round One in the context of Hatton & Smith's Reflective Practice Framework (1995) and Moon's Generic Framework for Reflective Writing (2004). These frameworks were discussed in Chapter 2: Educational Context. The criteria detailed at each level of the Hatton and Smith (1995) and Moon (2004) frameworks were re-examined at this point in this analysis. This examination gave an insight as to how the Delphi study indicators could be implemented at each of the levels

---

[3] The indicators are listed in alphabetical order here, but will be ranked according to depth of reflection in the second round of the Delphi study.

described by Hatton and Smith (1995). It also provided a way of identifying any indicators which may have been missing from the Delphi experts' responses.

First, indicators were grouped into categories. It was hoped that examining them in related groups would highlight any remaining indicators that were too similar to one another. Later, in Table 5.3, groups of indicators were examined in the context of Hatton & Smith's levels of reflection, to ensure that each level of reflection was adequately represented. First, the grouping of indicators into five categories is discussed.

Student gives clear description of context

The indicator 'Clear description of context' was retained as it was in the original list and will not be grouped with any other indicator. This indicator has an implementation at each of the levels of reflection. At the Descriptive writing level the student does give a description of the event, but it tends to be unfocused (Moon, 2004). The account describes the event as it happened and does not attempt to highlight particular issues. This is the only indicator that can be implemented at the level of Descriptive writing. The presence of any of the other indicators suggests some amount of reflection and therefore they relate to the reflective levels described by Hatton and Smith (Descriptive reflection, Dialogic reflection or Critical reflection) (Hatton & Smith, 1995).

However, the indicator 'Student gives clear description of context' also has an implementation at the reflective writing levels. This can be seen in Moon's framework (2004). At the level of Descriptive reflection the description provided by the student may identify points where reflection could occur (even though not much reflection takes place). At the level of Dialogic reflection the description provided by the student is more focused. It is no longer an unexamined account of events and may group ideas by meaning rather than describing them sequentially (Moon, 2004). Finally, at the level of Critical reflection, description is fully integrated with reflection and provides the necessary context and background for reflective writing.

Student shows evidence of analysis

The following three indicators which resulted from the Delphi study can be grouped into one category 'Student shows evidence of analysis'.

- – Analysis is evident
- – Implications of actions are considered
- – Issues are correctly identified

Each of these three indicators suggests that some amount of analysis is taking place. The amount of analysis determines the indicator's level of reflection. Firstly, the indicator 'Analysis is evident' is retained as it was in the original list.

Secondly, the indicator 'Implications of actions are considered' is deemed to be a form of analytical thinking. In her Reflective Practice framework, Moon describes reflection at the Dialogic level, stating that "the account shows some analysis and there is recognition of the worth of exploring motives or reasons for behaviour" (Moon, 2004, p. 215). This indicates that if a student is considering the implications of her actions, she is being analytical. Therefore, it is appropriate to include the 'Implications of actions are considered' indicator under 'Student shows evidence of analysis' at the level of Dialogic reflection.

The presence of the third indicator 'Issues are correctly identified' also suggests that analysis is taking place. At the level of Descriptive reflection the student may be aware that there are issues which require attention. However, issues are not fully explored at this level. At the level of Dialogic reflection, the student identifies issues and discusses them in more detail.

Finally, there is also an implementation of the 'Student shows evidence of analysis' indicator at the level of Critical reflection. Moon (2004) discusses that, at this level, self-evaluation and the analysis of one's own actions in comparison to those of others

occur. Self-evaluation has been included under the 'Student shows evidence of analysis' indicator at the Critical reflection level.

Student examines multiple perspectives

The following indicators taken from Round One of the Delphi study can be grouped into one category 'Student examines multiple perspectives'.

- – Multiple perspectives are considered
- – Alternative approaches are considered
- – Reference made to literature
- – Links are made to broader social structures
- – Creative synthesis

The first indicator above 'Multiple perspectives are considered' was retained as it was in the original list. The second indicator 'Alternative approaches are considered' and the third indicator 'Reference made to literature' are essentially different ways of saying that the student is examining external perspectives. Therefore, these indicators have been eliminated and no reference to these is made in Table 5.3. They are instead included under the indicator 'Multiple perspectives are considered'.

The 'Student examines multiple perspectives' category can be implemented at all levels of reflection. At the level of Descriptive reflection, the student may refer to one or more external perspectives (e.g. related literature, alternative approaches or attitudes of others) but does not explore these in detail. At the level of Dialogic reflection one or more external perspectives are examined in detail and subjected to reflection. It is important to note that the depth of examination undertaken by the student is the distinguishing feature between 'one or more external perspectives' at the level of Descriptive reflection and at the level of Dialogic reflection.

The 'Student examines multiple perspectives' category can also be implemented at the level of Critical reflection. The two remaining indicators, 'Links are made to broader social structures' and 'Creative synthesis', are examples of reflection at the Critical

level. 'Links are made to broader social structures' is frequently referred to at the highest levels of reflection (Hatton & Smith, 1995; Moon, 2004). This discussion may set the event in a historical, ethical or legal context. Creative synthesis is also seen as a high-level activity. Synthesis is the 5th level (6 being the highest) of Bloom's taxonomy (Bloom, 1956). As synthesis involves the combination of two or more alternative perspectives at a high-level, it is appropriate to include this as part of the 'Student examines multiple perspectives' category at the level of Critical reflection.

Student demonstrates growth of understanding

The four indicators below can be merged into one category 'Student demonstrates growth of understanding'.

- – Learning is evident
- – Changes in beliefs or understanding are evident
- – Insightful understanding is evident
- – Practice is revised

The very definition of learning is a growth or changes in understanding. Therefore, the 'Learning is evident' indicator can be included as part of 'Student demonstrates growth of understanding'. This also applies to 'Changes in beliefs or understanding are evident'. The indicator 'Insightful understanding is evident' is a component of the statement 'Student demonstrates growth of understanding' if implemented at the level of Critical reflection. Finally, the indicator 'Practice is revised' also suggests that the student has come to a new understanding which caused him to reconsider and revise his practices.

At the level of Descriptive reflection, the student may recognise that there is an opportunity for learning but may not necessarily pursue that opportunity (Moon, 2004). At the level of Dialogic reflection, it is evident that learning has occurred. Also the student may discuss changes in her beliefs or understanding. The indicators 'Insightful understanding is evident' and 'Practice is revised' represent the level of Critical reflection. These indicators were noted by Delphi experts to be indicative of a high

level of reflection. Therefore it is appropriate to include them at the Critical level of the 'Student demonstrates growth of understanding' category.

Student shows evidence of self-awareness

The indicator 'Student shows evidence of self-awareness' was retained as it was in the original list and will not be grouped with any other indicator. Self-awareness is an important part of the reflective process. Moon's Generic Framework for Reflective Writing (2004) demonstrates that there is an implementation of this indicator at all of the levels of reflective writing.

At the Descriptive reflection level, the student may note her emotional reactions to an event. However, these reactions are not explored nor are their implications considered. At the level of Dialogic reflection the student may begin to question motives or reasons for her behaviour. Emotional reactions are noted and their influence is assessed. At the Critical reflection level of 'Student shows evidence of self-awareness' the student functions at a metacognitive level and is aware of her own thought processes.

Reflective framework is utilised

Finally, the indicator 'Reflective framework is utilised' was removed. This indicator is dependent on whether the student has been instructed to utilise a reflective framework as part of the assignment. In other words, this is something that is assignment-dependent and therefore may not always be part of the reflective process.

Following the grouping of reflection indicators into categories, three further indicators were removed. This resulted in 12 remaining indicators which are deemed to accurately cover all elements of reflection at both the Dialogic and the Critical levels. The wording of each of these indicators was fixed at this point, in advance of Round Two of the Delphi study. The final wording of the 12 indicators is shown here.

1. Clear description of context is given
2. Analysis is evident
3. Issues are correctly identified

4. Implications of actions are considered

5. Multiple perspectives are examined

6. Creative synthesis is evident

7. Links are made to broader social structures

8. Learning is evident

9. Changes in beliefs or understanding are evident

10. Insightful understanding is evident

11. Revisions to future practice are discussed

12. Self-awareness is evident

Earlier, these indicators were grouped into the following five categories:

1. Student gives a clear description of context

2. Student shows evidence of analysis

3. Student examines multiple perspectives

4. Student demonstrates growth of understanding

5. Student demonstrates self-awareness

Now, in Table 5.3, the implementation of each of these categories is shown at each of the four levels described by Hatton and Smith (1995). The purpose of this table is to identify areas where additional indicators may be required or areas where existing indicators may overlap. The four levels described by Hatton and Smith are Descriptive Writing, Descriptive Reflection, Dialogic Reflection and Critical Reflection. In the table, the reflection indicators are numbered 1 to 12.

Table 5.3: Final indicators and their implementations at levels of reflection

	Level 0: Descriptive Writing	Level 1: Descriptive Reflection	Level 2: Dialogic Reflection	Level 3: Critical Reflection
Student gives clear description of context	A description of context is given, but it is an unfocused description of events.	A description is given that provides background and has *some* links with reflection.	A description is given that is focused on providing the necessary background for reflection.	A description is given that is focused and completely integrated with reflection [1].
Student shows evidence of analysis	None	Some analysis evident, including some identification of issues.	Analysis is evident [2]. Issues are identified [3]. Student considers implications of actions [4].	Analysis is evident at a deep level. This includes self-evaluation.
Student examines multiple perspectives	None	One or more external perspectives may be referred to, but are not explored in any detail.	One or more external perspectives are taken into consideration and examined in detail [5].	Multiple perspectives are examined and creatively synthesised [6]. Links may be made to broader social structures [7].
Student shows growth of understanding	None	Student may recognise an opportunity for learning. Mis-interpretations may be corrected.	Learning is evident [8]. Student may begin to develop changes in her understanding [9].	Insightful understanding is evident [10]. Revisions to future practice are discussed [11].
Student demonstrates self-awareness	None	Emotional reactions are noted and possibly questioned.	Self-questioning occurs. Emotions are recognised and their influence assessed.	Student functions at a metacognitive level and demonstrates self-awareness [12].

It can be seen in Table 5.3 that each of the numbered indicators occurs under either the level of Dialogic reflection or the level of Critical reflection. This is unsurprising as all negative indicators which may have indicated a lower level or a lack of reflection were removed earlier in the refinement process.

At the levels of Dialogic and Critical reflection, there is adequate coverage by each of the categories of reflection indicators. Therefore it can be said that, in the context of

Hatton and Smith's Reflective Practice framework, the indicators developed in this study represent all four levels of reflection.

5.2.3 Summary of Round One

Round One of the Delphi study resulted in 38 indicators. Initially, these were reduced to 15 indicators by removing duplicated indicators and negative indicators (opposites). In order to set these indicators in the context of established Reflective Practice models several frameworks were considered. The framework created by Hatton and Smith (1995) and further developed by Moon (2004) was examined in detail. This examination resulted in an understanding of how the indicators could be implemented at each level of reflection described by Hatton and Smith. It also provided a way of identifying areas where additional indicators may have been required and areas where existing indicators overlapped. Following this examination, three further indicators were removed. This resulted in 12 remaining indicators which are deemed to accurately cover all elements of reflection at both the Dialogic and the Critical levels.

The 12 reflection indicators were then returned to experts for ranking in Round Two of the Delphi study.

5.3 Delphi Study Round Two

The final 12 indicators were returned to experts for ranking. Experts were asked to compare the indicators in pairs and were asked which indicator they believed to be representative of a deeper level of reflection. The question asked was as follows:

> *Compare Indicator A with Indicator B. Which indicator do you believe represents a deeper level of reflection?*

Experts were given information on the degree of preference that each point on the scale represents (see Table 5.4). A score of between -9 and -3 represents a preference for Indicator A. A score of between 3 and 9 represents a preference for Indicator B. A score of 1 represents equal preference for both indicators.

Table 5.4: Pairwise comparison scale explanation

-9	Extremely strong preference for Indicator A
-7	Very strong preference for Indicator A
-5	Strong preference for Indicator A
-3	Slight preference for Indicator A
1	Equal preference for both indicators
3	Slight preference for Indicator B
5	Strong preference for Indicator B
7	Very strong preference for Indicator B
9	Extremely strong preference for Indicator B

In Figure 5.1: Sample Score Sheet, part of the response from Participant H can be seen. First, the 'Clear description of context' indicator is compared with each of the other indicators. Next, the 'Analysis is evident' indicator is compared with each of the remaining indicators: this continues until all indicators have been compared with one another once (a total of 66 comparisons).

Indicator A	-9	-7	-5	-3	1	3	5	7	9	Indicator B
Clear description of context is given	○	○	○	○	○	○	○	◉	○	Analysis is evident
Clear description of context is given	○	○	○	○	○	○	◉	○	○	Issues are correctly identified
Clear description of context is given	○	○	○	○	○	○	◉	○	○	Implications of actions are considered
Clear description of context is given	○	○	○	○	○	○	○	◉	○	Multiple perspectives are examined
Clear description of context is given	○	○	○	○	○	○	◉	○	○	Creative synthesis is evident
Clear description of context is given	○	○	○	○	○	○	◉	○	○	Links are made to broader social structures
Clear description of context is given	○	○	○	○	○	○	○	◉	○	Learning is evident
Clear description of context is given	○	○	○	○	○	○	○	◉	○	Changes in beliefs or understanding are evident
Clear description of context is given	○	○	○	○	○	○	○	◉	○	Insightful understanding evident
Clear description of context is given	○	○	○	○	○	○	○	◉	○	Revisions to future practice are discussed
Clear description of context is given	○	○	○	○	○	○	○	○	◉	Self-awareness evident

Figure 5.1: Sample Score Sheet

In this example, it can be seen in the first comparison that Participant H has a very strong preference for the 'Analysis is evident' indicator over the 'Clear description of context' indicator in terms of the depth of reflection that it represents.

The comparisons made by each expert were analysed using the Analytic Hierarchy Process. This process ranks indicators according to the depth of reflection that they represent, based on the scores given by each expert. This analysis is now discussed.

5.4 Round Two Analysis (AHP)

In Round Two of the Delphi study, experts were asked to compare 12 indicators of reflection. They used a score sheet (see Figure 5.1) to compare indicators in pairs. AHP converts these evaluations into numerical values. The resulting value is known as the priority vector (Saaty, 2000).

The indicators were compared in pairs on a scale from -9 to 9. In the Analytic Hierarchy Process (AHP) this is known as the fundamental scale (Saaty & Vargas, 2001). Experts' responses were then entered into matrices. On the subdiagonal of the matrix values from 1 to 9 were represented as positive integers and values from -3 to -9 were represented as reciprocal fractions (e.g. -3 is represented as $\frac{1}{3}$). The superdiagonal of the matrix is the inverse of the subdiagonal (see Figure 5.2).

	1	2	3	4	5	6	7	8	9	10	11	12
1. Clear description of context is given	1	1/5	1/5	1/5	1/5	1	1/5	1/5	1/5	1/5	1/5	1/5
2. Analysis is evident	5	1	3	1	3	3	1	1/3	1	1/3	1	1
3. Issues are correctly identified	5	1/3	1	1/3	1/3	1	1/3	1/5	1/3	1/3	1/3	1/3
4. Implications of actions are considered	5	1	3	1	3	3	1	1	1	1	1	1
5. Multiple perspectives are examined	5	1/3	3	1/3	1	3	1	1/3	1	1/3	1	1
6. Creative synthesis is evident	1	1/3	1	1/3	1/3	1	1/3	1/5	1/3	1/3	1/3	1/3
7. Links are made to broader social structures	5	1	3	1	1	3	1	1	1	1	1	1
8. Learning is evident	5	3	5	1	3	5	1	1	1	1	1	1
9. Changes in beliefs or understanding evident	5	1	3	1	1	3	1	1	1	1	1	1
10. Insightful understanding evident	5	3	3	1	3	3	1	1	1	1	1	1
11. Revisions to future practice are discussed	5	1	3	1	1	3	1	1	1	1	1	1/3
12. Self-awareness evident	5	1	3	1	1	3	1	1	1	1	3	1

Figure 5.2: Sample Matrix

These matrices were then normalised and the average of each row was taken. This gave a weighted list of indicators for each expert, known as the priority vector. The priority vector for each of the eight experts is shown in Figure 5.3. The indicators have been ordered from the least to the most indicative of depth of reflection.

	Par. A			Par. B			Par. C			Par. E
1. Description	0.00831		1. Description	0.00967		1. Description	0.01931		1. Description	0.00773
2. Analysis	0.01615		3. Identification	0.01370		6. Synthesis	0.02982		3. Identification	0.01521
3. Identification	0.01708		2. Analysis	0.02671		3. Identification	0.03623		2. Analysis	0.02343
4. Implications	0.03372		4. Implications	0.03654		5. Perspectives	0.07321		4. Implications	0.03274
5. Perspectives	0.04396		7. Links	0.04143		11. Revisions	0.09065		5. Perspectives	0.03874
6. Synthesis	0.05378		5. Perspectives	0.04820		2. Analysis	0.09279		8. Learning	0.04355
7. Links	0.06921		11. Revisions	0.09341		7. Links	0.09669		10. Understanding	0.07117
8. Learning	0.08546		8. Learning	0.12600		9. Changes	0.09669		6. Synthesis	0.07673
9. Changes	0.10567		10. Understanding	0.13005		4. Implications	0.10602		7. Links	0.12592
10. Understanding	0.13059		9. Changes	0.13236		12. Self-awareness	0.11074		12. Self-awareness	0.12592
12. Self-awareness	0.17052		12. Self-awareness	0.14124		10. Understanding	0.11865		9. Changes	0.17276
11. Revisions	0.26554		6. Synthesis	0.20070		8. Learning	0.12920		11. Revisions	0.26610

	Par. F			Par. G			Par. H			Par. I
1. Description	0.00841		1. Description	0.03035		1. Description	0.01160		1. Description	0.01089
2. Analysis	0.01706		3. Identification	0.04046		3. Identification	0.01986		3. Identification	0.01571
3. Identification	0.02881		7. Links	0.04167		2. Analysis	0.02423		7. Links	0.03014
4. Implications	0.03745		12. Self-awareness	0.05613		4. Implications	0.02845		6. Synthesis	0.03098
5. Perspectives	0.04344		2. Analysis	0.06864		7. Links	0.04327		2. Analysis	0.06092
6. Synthesis	0.05665		8. Learning	0.06864		6. Synthesis	0.04899		5. Perspectives	0.07410
7. Links	0.06773		4. Implications	0.06918		5. Perspectives	0.05356		10. Understanding	0.08057
8. Learning	0.07357		11. Revisions	0.11567		10. Understanding	0.08995		12. Self-awareness	0.08861
9. Changes	0.11788		6. Synthesis	0.11788		8. Learning	0.11816		4. Implications	0.10060
10. Understanding	0.12784		9. Changes	0.12429		9. Changes	0.14406		9. Changes	0.10855
11. Revisions	0.15468		5. Perspectives	0.13355		11. Revisions	0.15687		11. Revisions	0.17544
12. Self-awareness	0.26648		10. Understanding	0.13355		12. Self-awareness	0.26099		8. Learning	0.22349

Figure 5.3: Priority Vectors (ordered lowest to highest)

These priority vectors were then combined to create a list of weighted Reflective Indicators for the group[4]. It is not sufficient to calculate the average of an indicator's score across all eight experts, as this does not satisfy reciprocity requirements. Therefore, the geometric mean was calculated. These figures were then normalised to give values between 0 and 1 (normalised geometric mean (NGM)). This resulted in the group list of weighted indicators shown in Table 5.5 (ordered from least to most indicative of depth of reflection).

---

[4] The group included eight participants: A, B, C, E, F, G, H and I. Out of the original ten participants, Participants D and J did not complete the second round of responses.

Table 5.5: Group List of Weighted Indicators

Indicator (Least to Most indicative of depth)	NGM	Percent
1. Clear description of context is given	0.01298	1.30%
3. Issues are correctly identified	0.02365	2.37%
2. Analysis is evident	0.03683	3.68%
4. Implications of actions are considered	0.05341	5.34%
7. Links are made to broader social structures	0.06362	6.36%
5. Multiple perspectives are examined	0.06421	6.42%
6. Creative synthesis is evident	0.06915	6.92%
8. Learning is evident	0.10676	10.68%
10. Insightful understanding is evident	0.11780	11.78%
9. Changes in beliefs or understanding are evident	0.13523	13.52%
12. Self-awareness is evident	0.14898	14.90%
11. Revisions to future practice are discussed	0.16736	16.74%
	1.00000	**100%**

Consistency

Logically, if A>B and B>C, then A>C. AHP has a mechanism to check whether an expert's responses are consistent in this manner. First of all, the Principal Eigenvalue (λ_{max}) of an expert's response matrix must be calculated. This is then used to calculate the Consistency Index (CI) as shown in Equation 5.1. The number of response items being compared is represented by *n*.

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

Equation 5.1: Consistency Index

The Consistency Index is then used to calculate the Consistency Ratio (CR). To obtain the Consistency Ratio, the Consistency Index is divided by a Random Index (RI) as defined by Saaty (2000). The RI for n=12 items is 1.54. See Equation 5.2.

$$CR = \frac{CI}{RI}$$

Equation 5.2: Consistency Ratio

Saaty states that no more than 10% inconsistency should be tolerated in the Consistency Ratio (Saaty, 2000). However, Bhushan and Rai (2004) suggest that up to 20% inconsistency can be tolerated when using abstract parameters. Four of the eight Delphi study experts had less than 20% inconsistency. Each expert's Consistency Index and Consistency Ratio can be seen in Figure 5.4.

	Par. A	Par. B	Par. C	Par. E	Par. F	Par. G	Par. H	Par. I
1. Clear description of context is given	0.00831	0.00967	0.01931	0.00773	0.00841	0.03035	0.01160	0.01089
2. Analysis is evident	0.01615	0.02671	0.09279	0.02343	0.01706	0.06864	0.02423	0.06092
3. Issues are correctly identified	0.01708	0.01370	0.03623	0.01521	0.02881	0.04046	0.01986	0.01571
4. Implications of actions are considered	0.03372	0.03654	0.10602	0.03274	0.03745	0.06918	0.02845	0.10060
5. Multiple perspectives are examined	0.04396	0.04820	0.07321	0.03874	0.04344	0.13355	0.05356	0.07410
6. Creative synthesis is evident	0.05378	0.20070	0.02982	0.07673	0.05665	0.11788	0.04899	0.03098
7. Links are made to broader social structures	0.06921	0.04143	0.09669	0.12592	0.06773	0.04167	0.04327	0.03014
8. Learning is evident	0.08546	0.12600	0.12920	0.04355	0.07357	0.06864	0.11816	0.22349
9. Changes in beliefs or understanding evident	0.10567	0.13236	0.09669	0.17276	0.11788	0.12429	0.14406	0.10855
10. Insightful understanding evident	0.13059	0.13005	0.11865	0.07117	0.12784	0.13355	0.08995	0.08057
11. Revisions to future practice are discussed	0.26554	0.09341	0.09065	0.26610	0.15468	0.11567	0.15687	0.17544
12. Self-awareness evident	0.17052	0.14124	0.11074	0.12592	0.26648	0.05613	0.26099	0.08861
Principal Eigen Value	26.47505	18.31204	12.68008	25.51916	24.54296	12.93914	14.30907	14.77476
Consistency Index	1.31591	0.57382	0.06183	1.22901	1.14027	0.08538	0.20992	0.25225
Consistency Ratio	0.85449	0.37261	0.04015	0.79806	0.74043	0.05544	0.13631	0.16380
Consistency = less than 20%	85%	37%	4%	80%	74%	6%	14%	16%

Figure 5.4: Expert Consistency Ratios

If experts who had greater than 20% inconsistency in their responses are removed, the order and weightings of indicators in the group list is altered considerably. However, rather than simply discarding experts' responses due to inconsistencies, alternative methodologies were explored (namely, the use of Linear Ordering and dendrograms). First, the additional data collected from the preliminary questionnaire was examined to find possible explanations for the disparity between experts' responses.

The AHP analysis of Round Two responses revealed two groups amongst the Delphi study experts. Four of the eight experts responded in a relatively conservative way and tended to choose points on the scale which represented either a 'slight' or a 'strong' preference for the chosen indicator. These four experts also had less than 20% inconsistency in their responses.

The remaining four experts responded in a more extreme way and tended to choose points on the scale that represented either a 'very strong' or 'extremely strong' preference for the chosen indicator. These experts had greater than 20% inconsistency in their responses. The additional data that was collected from the questionnaire

administered to experts in advance of Round One of the Delphi study (see Appendix A: Delphi Study Questionnaire) was examined, in the hopes that it may provide an explanation for the differences in experts' responses.

However, the analysis of responses from preliminary questions did not reveal any obvious explanation for the disparity between experts' responses. Therefore other methods were utilised to determine the most consistent expert responses: Linear Ordering (Section 5.5) and dendrograms (Section 5.7).

5.5 Round Two Analysis (Linear Ordering)

The Analytic Hierarchy Process revealed a number of inconsistencies in experts' responses. These could not be explained by analysis of the responses from the pre-Delphi questionnaire. Linear Ordering was explored as an alternative approach to the problem of ranking experts' preferences. The use of the Linear Ordering technique also provided an opportunity for comparison with the orderings obtained from the Analytic Hierarchy Process.

The AHP Fundamental Scale, as seen in Table 5.6, makes use of reciprocal fractions[5]. In this scale, the opposite of 9 is 1/9. Therefore, there is an extreme variation between opposite ends of the scale, which may give a skewed view of the data. It was decided to utilise an alternative scale that utilises only positive integers from 1 to 9. The opposite ends of this revised scale are consequently not as extreme as those seen in the AHP Fundamental Scale. The revised scale can be seen in Table 5.6.

Table 5.6: Revised Scale

AHP Fundamental Scale	1/9	1/7	1/5	1/3	1	3	5	7	9
Revised Scale	1	2	3	4	5	6	7	8	9

[5] The AHP Fundamental Scale was presented to participants as a range from -9 to +9 as it was inconvenient to enter fractions in the spreadsheet used to collect responses. However, for the purpose of analysis using AHP, reciprocal fractions were used.

Expert response matrices were updated to utilise the revised scale. Using AHP 1/9 is on the opposite end of the scale to 9. However, using the revised scale 1 is now the opposite of 9, 2 is the opposite of 8 etc. so that the sum of each pair of numbers in the matrix is 10. The revised matrices were then optimised using the XpressMP optimiser. This process gave an output of each expert's responses ordered from least to most indicative of depth of reflection.

The Linear Ordering and AHP Ordering for each expert were then compared. It was found that while some expert's Linear Ordering rankings remained the same as their AHP ranking, others differed significantly from AHP to Linear Ordering. The Linear Ordering rankings across all eight experts varied greatly (see Figure 5.5). This is also true for the AHP rankings (see Figure 5.6). Interestingly, the more consistent an individual expert's responses were, the less agreement there was with other experts' responses.

Figure 5.5: Linear Ordering: Differences in Indicator Orderings

Figure 5.6: AHP: Differences in Indicator Orderings

5.6 Round Two Analysis (Dendrograms)

A dendrogram is a valued, hierarchical tree diagram (Barthélemy & Guénoche, 1991). Dendrograms are used to illustrate clusters in data. They are used here to demonstrate clustering of reflection indicators and the closeness between indicators based on each expert's rankings. The use of dendrograms provides another means to check the consistency of experts' responses. This step was essential in finalising a group set of weightings as it identified the most consistent set of responses.

It was not possible to draw a dendrogram from every expert's response. It is necessary for each of the twelve indicators to form a cluster with neighbouring indicators and this was not possible using five out of the eight response matrices. This represents an inconsistency in those experts' responses. However, for the remaining three experts (Participants C, F and H) dendrograms have been drawn. These can be seen in

Appendix E: Dendrograms.   In the case of Participants C & F there was only one inconsistent response.   Dendrograms were adjusted accordingly and adjustments are shown on the diagrams.   The influence of these dendrograms is now discussed in terms of how the final sets of responses that make up the instrument were selected.

5.7 Final Instrument Selection

It was not possible to draw dendrograms for participants A, B, E, G and I.   This means that only three out of the eight participants can have their Linear Ordering output analysed in this way.

It is also difficult to find commonality between the three participant dendrograms that were drawn.   Participant C's dendrogram expresses a great degree of closeness between the majority of indicators, whereas Participant F's dendrogram shows a great degree of distance between the indicators.   Participant H's dendrogram appears to be the most balanced, but with only three dendrograms to analyse it is hard to say which (if any) is the most appropriate portrayal of the distance between indicators.

There is a significant challenge in determining which experts' weightings should be included in the final weighted list.   If the ability to create a dendrogram from an expert's responses is used as a criterion for inclusion then only Participants C, F and H can be included.   If the AHP Consistency Ratio is adhered to then only Participants C, G, H and I can be included (as they had less than 20% inconsistency in their responses).

In the table below the ordering and weighting of the final list of indicators is shown in three different scenarios.   The first includes all expert responses; the second includes only experts who had less than 20% inconsistency in their responses according to the AHP Consistency Ratio, and the third includes only experts whose responses were used to create a dendrogram.   There is some degree of similarity between these three sets of orderings and weightings.

Table 5.7: Comparison of Order/Weightings

Ordered, Weighted List (from least to most indicative of deep reflection)

All experts			Only experts with <20% inconsistency (C, G, H, I)			Only experts with dendrograms (C, F, H)	
1. Clear description of context is given	0.01298		1. Clear description of context is given	0.01784		1. Clear description of context is given	0.01304
3. Issues are correctly identified	0.02365		3. Issues are correctly identified	0.02813		3. Issues are correctly identified	0.02901
2. Analysis is evident	0.03683		7. Links are made to broader social structures	0.05178		2. Analysis is evident	0.03561
4. Implications of actions are considered	0.05341		6. Creative synthesis is evident	0.05198		6. Creative synthesis is evident	0.04602
7. Links are made to broader social structures	0.06362		2. Analysis is evident	0.05989		4. Implications of actions are considered	0.05105
5. Multiple perspectives are examined	0.06421		4. Implications of actions are considered	0.07321		5. Multiple perspectives are examined	0.05854
6. Creative synthesis is evident	0.06915		5. Multiple perspectives are examined	0.08536		7. Links are made to broader social structures	0.06936
8. Learning is evident	0.10676		10. Insightful understanding is evident	0.11196		8. Learning is evident	0.10977
10. Insightful understanding is evident	0.11780		12. Self-awareness is evident	0.11843		10. Insightful understanding is evident	0.11713
9. Changes in beliefs or understanding are evident	0.13523		9. Changes in beliefs or understanding are evident	0.12664		9. Changes in beliefs or understanding are evident	0.12459
12. Self-awareness is evident	0.14898		8. Learning is evident	0.13380		11. Revisions to future practice are discussed	0.13734
11. Revisions to future practice are discussed	0.16736		11. Revisions to future practice are discussed	0.14097		12. Self-awareness is evident	0.20855

In particular, the order in the list for 'All Experts' is close to the order in the list for 'Only Experts with Dendrograms'. The first three indicators are in the same order on both lists (*1, 3, 2*). The subsequent four indicators are the same on both lists, albeit in a different order (*4, 7, 5, 6* versus *6, 4, 5, 7*). The following three indicators are in the same order on both lists (*8, 10, 9*). The final two indicators on both lists are 11 and 12, except the order has been inverted (*12, 11* versus *11, 12*).

The list under the heading 'Only experts with dendrograms' in Table 5.7 is deemed to be the most consistent of the three. In addition to this, there is a great degree of similarity between this list and the list for 'All experts'. Therefore, the ordered, weighted list for 'Only experts with dendrograms' is representative of the views of 'All experts' to some extent.

Consequently, the set of orderings and weightings for 'Only experts with dendrograms' will be used as the final list. This approach excludes inconsistent responses but at the same time is inclusive of all experts' views. The final list of ordered, weighted reflection indicators can be seen in Table 5.8[6].

Table 5.8: Reflection Indicators (Ordered & Weighted)

Reflective Practice Indicators (ordered from least to most indicative of depth of reflection)	Reflective Practice Indicator Weightings
1. Clear description of context is given (1)	0.01304
3. Issues are correctly identified (2)	0.02901
2. Analysis is evident (3)	0.03561
6. Creative synthesis is evident (4)	0.04602
4. Implications of actions are considered (5)	0.05105
5. Multiple perspectives are examined (6)	0.05854
7. Links are made to broader social structures (7)	0.06936
8. Learning is evident (8)	0.10977
10. Insightful understanding is evident (9)	0.11713
9. Changes in beliefs or understanding are evident (10)	0.12459
11. Revisions to future practice are discussed (11)	0.13734
12. Self-awareness is evident (12)	0.20855

---

[6] From this point in the thesis onwards the reflection indicators have been renumbered to reflect the order decided upon in this section. The new numbers are shown in brackets above.

5.8 Development of Coding Scheme

The 12 reflection indicators form the basis of an instrument that can be used to assess depth of reflection in the text of blogs or handwritten learning journals. The implementation and testing of this instrument is discussed in Chapter 6: Analysis of Reflective Writing. First, this section describes how a set of guidelines was developed to provide supporting information about the reflection indicators to the coders who conducted the content analysis. These guidelines were given to coders at the beginning of the content analysis in a document entitled "Reflective Writing Assessment Instrument: Coding Scheme" (see Appendix D: Coding Scheme).

The guidelines were developed based on the Round One responses from the Delphi Study and on selected models of Reflective Practice (specifically, the levels of reflection defined by Hatton & Smith (1995) and the Generic Framework for Reflective Writing described by Moon (2004)).

5.8.1 Clear description of context is given

Although 'descriptive writing' is often seen as negative in Reflective Practice (as it suggests a lack of reflection) it is nonetheless a vital part of a reflective journal. Hatton and Smith (1995) and Moon (2004) both discuss the importance of a clear description to provide a contextual background to any reflection that takes place. Moon (2004) notes that students often describe the event as it happened without attempting to highlight particular issues. She adds that, in some cases, the description provided by the student may go on to identify points where reflection could occur. The student might also group ideas by meaning rather than describing them sequentially (Moon, 2004).

A participant from the Delphi study states:

> *"The first criterion [clear description of context is given] is fundamental to reflective practice. I always stress the need, for example with a critical incident, to*

first of all be able to effectively recreate the incident in writing which is clear and which evokes the incident through the use of the correctly chosen word."

A number of criteria are defined below in relation to Indicator 1 'Clear description of context is given'. These criteria are derived from both the Delphi study responses and the literature on reflective writing.

1. Clear description of context is given
- The student provides a description of an event or topic
- The description provided identifies points where reflection could occur
- The description provides the context and background for reflective writing

5.8.2 Issues are correctly identified

Several responses from Round One of the Delphi study noted the importance of the students' ability to correctly identify issues relevant to their subject area. Sample responses include:

"Identified successful and unsuccessful activities and assessments"

"[Student] identifies problems"

"Key and relevant issues identified from experience"

"Themes/issues also measured or evaluated in some way"

In her Generic Framework for Reflective Writing, Moon notes that at the level of Descriptive reflection the student may be aware that there are issues which require attention. At the level of Dialogic reflection, the student identifies issues and discusses them in more detail.

The following criteria have been set out in relation to the 'Issues are correctly identified' indicator:

2. Issues are correctly identified

- The student demonstrates an awareness that there are issues which require attention
- The student identifies issues and discusses them in more detail
- The student provides a relevant example related to the event or topic

5.8.3 Analysis is evident

In Round One of the Delphi study, participants indicated that one of the things they look for when assessing reflective writing was analysis on the part of the student. One participant stated that:

> *"In effect, the individual answers the question, 'Why is this important?' or 'What does this mean?'"*

Another noted that that student should engage in:

> *"active construction of meaning through analysis and deconstruction of the events"*

It was suggested by another Delphi study participant that the student should:

> *"examine what happened through a more analytical and perhaps theoretical framework"*

The criteria defined below in relation to the 'Analysis is evident' indicator reflect the expectations described above; that the student examines the event or topic in a questioning and analytical way.

3. Analysis is evident

- The student asks questions related to the event or topic
- There is evidence of analysis e.g. the student compares/contrasts

5.8.4 Creative synthesis is evident

Synthesis is the 5th level (the 6th level being the highest) of Bloom's taxonomy (Bloom, 1956). Synthesis involves the combination of two or more alternative perspectives in a new (and perhaps unexpected) way. A number of Delphi study participants stated that they look for evidence of synthesis in reflective writing. One participant expanded on this, saying that for her, synthesis involves:

> *"Creating new meaning from new perspectives [...and...] drawing threads together from a range of sources to create that new picture/story"*

Based on these observations, the following criteria have been set out for the 'Creative synthesis is evident' indicator:

4. **Creative synthesis is evident**
   – The student combines two or more alternate perspectives in a creative way
   – The student makes unexpected links between alternative perspectives

5.8.5 Implications of actions are considered

Moon's Generic Framework for Reflective Writing (2004) describes reflection at the Dialogic level, stating that "there is recognition of the worth of exploring motives or reasons for behaviour" (Moon, 2004, p. 215). Delphi study participants also report that when assessing reflective writing they expect the student to consider the implications of their actions.

> *"The student reflects on their critical incident and considers the implications and consequences of their actions and beliefs"*

Moon also notes that students may analyse their own behaviour in comparison with that of others (Moon, 2004). This concept is factored in to the criteria set out below.

5. Implications of actions are considered

 – The student considers the implications of his/her own actions

 – The student analyses his/her own actions in comparison to those of others

5.8.6 Multiple perspectives are examined

In her Generic Framework for Reflective Writing, Moon (2004) states that at the level of Descriptive reflection the student may refer to alternative viewpoints or attitudes. At the level of Dialogic reflection there is "evidence of external ideas or information and… this material is subjected to reflection" (Moon, 2004, p. 215).

In Round One of the Delphi study, participants confirmed that examination of multiple perspectives is an element that they expect to see in reflective writing.

> *"Connection with outside elements is offered i.e. personal experience, course readings, [and] conversation with others"*

> *"[Students] substantiate their discussion with reference to relevant up to date literature"*

The observations made by Moon (2004) and the Delphi study participants were incorporated into the criteria set out below.

6. Multiple perspectives are examined

 – The student refers to alternative viewpoints

 – The student refers to one or more external perspectives (e.g. related literature, alternative approaches or attitudes of others)

 – External ideas are present and these views are reflected on

5.8.7 Links are made to broader social structures

Hatton and Smith (1995), in their discussion of the level of 'critical reflection', state that students should demonstrate an awareness of broader social structures. Expanding on this, Moon (2004) goes on to observe that the student may set the event in a historical, ethical or legal context. Delphi study participants, in their assessment of reflective writing, also seek evidence that students examine social structures.

> *"Here they are expected to make links between their everyday practice and broader social structures and forces e.g. justice, equality etc."*

> *"The explanation may also include engagement with contextual factors that influence change or address importance; this might include social factors, cultural contexts, political influences, etc."*

Based on these observations, the following criteria have been set out for this indicator:

7. Links are made to broader social structures
   - The student sets the event or topic in a historical context
   - The student sets the event or topic in a social context
   - The student sets the event or topic in an ethical context
   - The student sets the event or topic in a legal context

5.8.8 Learning is evident

Several Delphi study participants reported that they seek evidence of learning when assessing students' reflective writing. One participant noted that, in terms of evidence of learning, they expect to see the student "correct misinterpretations". Another participant expects that the new knowledge acquired should be incorporated with existing knowledge and looks for:

> *"synthesis of the learning gained from such critical reflection"*

Moon (2004) states that, at the level of Descriptive reflection, the student may recognise that there is an opportunity for learning but may not necessarily pursue that opportunity. At the level of Dialogic reflection, it is evident that learning has occurred (Moon, 2004).

The following criteria have been set out for the 'Learning is evident' indicator.

8. Learning is evident
- The student demonstrates evidence of learning
- The student corrects previous misunderstandings
- The student states that he/she has gained knowledge

5.8.9 Insightful understanding is evident

In Round One of the Delphi study, participants noted that they expect students' reflective writing to display insight, demonstrating that the student has attained a deep understanding of the topic under discussion. One participant (who assesses the reflective writing of pre-service teachers) sets out the following criteria:

> *"Reflections regarding the effectiveness of instruction displayed insight"*

> *"Conclusions regarding the effectiveness of instruction displayed insight"*

Another participant assesses the "judgement-making" abilities of students as a means of determining their understanding of a topic. This has been included in the criteria described below for the 'insightful understanding is evident' indicator.

9. Insightful understanding is evident
- The student demonstrates an insightful understanding of an event or topic e.g. a discussion of an event or topic that shows a deep understanding of that event or topic

> – The student states an opinion or judgement on the event or topic that demonstrates an understanding of that event or topic

5.8.10 Changes in beliefs or understanding are evident

In addition to looking for evidence of 'insightful understanding' Delphi study participants also expect to see changes in this understanding over time. One participant notes that discussion of changes in beliefs or understanding should be backed up by a discussion for the rationale behind these changes.

> *"I also look for the individual's explanation of her change of belief or understanding. This explanation includes offering details of prior belief or understanding, presenting the motivating factors for change, and addressing the meaning of the change."*

This is reflected in the criteria described below i.e. it is stipulated that the student should 'discuss' these changes in their beliefs or understanding.

10. Changes in beliefs or understanding are evident
> – The student discusses changes in his/her beliefs
> – The student discusses changes in his/her understanding

5.8.11 Revisions to future practice are discussed

This indicator suggests that the student has come to a new understanding which caused him to reconsider and revise his practices. It moves on from the previous indicator, 'changes in beliefs or understanding are evident', as at this stage the student should discuss her intention to act and make plans for revisions to her future practice. Participants in Round One of the Delphi study reported that, when examining students' reflective writing, they expect to see the following traits:

> *"The student begins to see that there are alternative ways to engage in practice"*

"A vivid description of the adaptations/modifications of the instructional sequence or learning activity plans was provided"

These observations are reflected in the criteria set out here for the 'revisions to future practice' indicator.

11. Revisions to future practice are discussed
- The student discusses a new understanding that has caused him/her to consider the revision of future practices
- The student states his/her intention to do something differently in the future

5.8.12 Self-awareness is evident

Self-awareness is an important part of the reflective process. Moon's Generic Framework for Reflective Writing (2004) examines the idea of self-awareness and states that, at an early stage, the student may note his emotional reactions to an event. The student may then go on to assess the influence of these reactions. At the level of 'Critical reflection' the student functions at a metacognitive level and is aware of his own thought processes (Moon, 2004).

Delphi study participants frequently mentioned self-awareness (including self-evaluation) in their Round One responses.

"There is evidence of reflection on her/his own teaching strengths and needs for improvement"

"Has the student demonstrated that their reflective process includes […] [reference to] thoughts, feelings and/or behaviour [and consideration of] personal significance"

"[The student] moves on to identify personal responses including feelings"

The examination of existing Reflective Practice models and the observations from Round One of the Delphi study have both been used as the basis for the criteria set out here for the 'Self-awareness is evident' indicator.

12. Self-awareness is evident
- The student notes his/her emotional reactions to an event
- The student assesses the influence of his/her emotional reactions
- The student explores motives or reasons for his/her behaviour
- The student discusses his/her own thought processes or learning processes

5.9 Chapter Review

In this chapter, the development of an instrument to assess depth of reflection was described. A Delphi study was used with a group of Reflective Practice experts to identify 12 indicators of reflection. The responses from the Delphi study were then analysed using a variety of techniques to obtain a weighted list of indicators, ordered by the depth of reflection that they represent.

The analysis of the Delphi study presented a number of challenges. The process of reducing the number of indicators identified in the first round from 38 to 12 was difficult and required a large amount of analysis. However, the Delphi study indicators were compared with established models of Reflective Practice. This provided reassurance that the final 12 indicators accurately represented all aspects of reflective writing.

These 12 indicators were then returned to experts for pairwise comparisons. The analysis of pairwise comparisons was challenging and a number of techniques were used for this purpose. The Analytic Hierarchy Process was a useful method for obtaining ordered, weighted lists from experts' responses. However, using AHP's

Consistency Ratio, it was demonstrated that four out of the eight experts had more than 20% inconsistency in their responses. Therefore, alternative methods were explored.

The Linear Ordering technique was used to obtain ordered lists from experts' responses and these were compared with the AHP orderings. While some orderings were unchanged, others differed significantly. Dendrograms were drawn from a number of experts' responses as a further confirmation of the consistency of responses.

The AHP ordered, weighted list for all experts was compared with the list for those experts whose responses were suitable for drawing a dendrogram. It was found that the order of indicators on both these lists was similar. Therefore, it was decided to include only those experts whose responses resulted in a dendrogram. This approach only includes the most consistent responses. At the same time, it is representative of the views held by all experts due to the similarity between the two lists.

While there have been a number of inconsistencies in experts' responses with both the AHP and Linear Ordering processes, it is deemed that this final list is as accurate as the study allows. The final ordered, weighted list of reflection indicators was seen in Table 5.8.

It is possible that the problems encountered in the analysis of pairwise comparisons could be attributed to the number of indicators that were being compared. It is difficult for participants to be fully consistent when comparing 12 indicators (as this involves 66 comparisons). In future research, reducing the number of indicators may produce more consistent results.

Finally, a coding scheme was developed that sets out a number of criteria for each reflection indicator. These criteria were derived from the responses in Round One of the Delphi study, along with an examination of Hatton and Smith's Reflective Practice framework (1995) and Moon's Generic Framework of Reflective Writing (2004). This coding scheme was used as an instrument to assess depth of reflection in the text of learning journals. Chapter 6 describes the implementation of this instrument.

Chapter 6 : Analysis of Reflective Writing

6.0 Chapter Introduction

This chapter discusses the implementation of the Reflective Writing Assessment Instrument. There were two phases: a content analysis and a linguistic analysis.

The content analysis that was performed was based on the 12 reflection indicators identified in the Delphi study. Evidence of these indicators was sought in the text of 27 reflective blogs and journals. This chapter describes the coding processes used. An additional coder was used to ensure the reliability of the analysis. Paired *t*-tests were performed to measure inter-coder reliability; the results of these tests are examined. Examples of coded text that relate to each reflection indicator are given and the use of analytic memos to aid decision-making is discussed. Finally, the method used to assign a score to a piece of reflective writing is described.

Following the content analysis, a sample of 18 reflective blogs and journals (word count: 14,100) were selected for a linguistic analysis. This analysis examined ten types of linguistic resources based on the model proposed by Ryan (2011). This chapter describes the linguistic resources and presents examples of each resource from the blogs and journals examined.

6.1 Content Analysis

This section reviews the methods for coding reflective writing that were discussed in Chapter 4: Methodology. A total of 27 reflective learning journals were assessed. These consisted of a mixture of blogs (n=17) and handwritten journals (n=10). The first and sixth entries of each of these were examined. Excerpts of text that were representative of one of the 12 reflection indicators were coded to the corresponding node in NVivo.

In Chapter 4: Methodology a number of approaches to coding were considered. Saldaña (2009) discusses 1st cycle and 2nd cycle coding methods. Several 1st cycle coding methods were examined in Chapter 4. Hypothesis coding was selected as the most appropriate method for this study. This is the application of a list of pre-determined, researcher-generated codes to a body of text (Saldaña, 2009). The hypothesis coding approach was suitable for this study as the reflection indicators were clearly defined before the analysis of reflective writing began. The coding scheme used can be seen in Appendix D: Coding Scheme. According to the guidelines discussed by Maykut & Morehouse (1994) a rule for inclusion was defined in relation to each reflection indicator. For an excerpt of text to be coded as an example of a reflection indicator it must meet at least one of the conditions of that indicator, based on the Coding Scheme. In Section 6.1.2 the application of this coding scheme to the text of reflective blogs and journals is discussed and an example is given in relation to each reflection indicator.

Analytic memos were used to aid decision-making in relation to coding. Saldaña (2009) states that analytic memos can be used to document the process of coding and the coding decisions made. In this study, an analytic memo was created each time a piece of text was coded to a reflection indicator. This was done using an annotation in NVivo (a note that can be linked to the text to which it refers). The use of analytic memos meant that the researcher's coding decisions are made available for examination by the researcher or by others. Samples of analytic memos are given in Section 6.1.3.

The screenshot below (Figure 6.1) demonstrates how the NVivo software is used in the coding process. The text of the reflective blog/journal can be seen in the middle panel of the screen, while reflection indicators can be seen to the left of this in the panel called 'free nodes'. To code text to a node, it is simply highlighted and dragged to the correct node (each node represents a reflection indicator). Coding stripes can be seen in the panel on the right-hand side. These stripes provide an easy way to identify the nodes to which a segment of text has been coded. Finally, annotations can be seen in the bottom panel. Annotations were used as analytic memos.
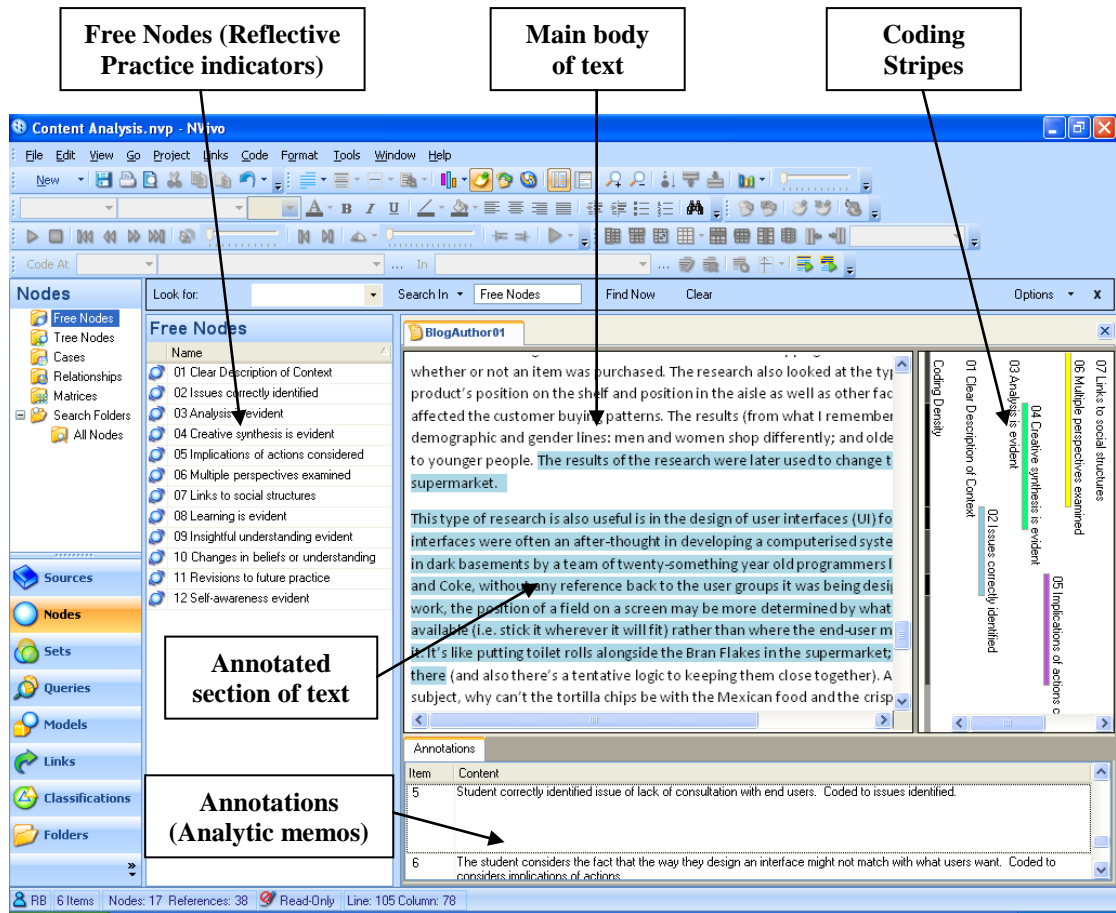
Figure 6.1: Screenshot of coding process in NVivo 8.0

Saldaña (2009) also discussed 2nd cycle coding methods, which re-examine the codes used in the 1st cycle and sort or re-categorise those codes. The codes used in this study were clearly defined before the study began. While many studies that take a 'bottom-up' approach to coding (e.g. grounded research) would redefine codes at this stage, this study takes a 'top-down' approach to coding. The purpose of the content analysis was to identify samples of text that relate specifically to the reflection indicators developed in the Delphi study. It would be inappropriate to make changes to the codes (indicators) at this stage of the research; therefore, no 2nd cycle of coding was performed.

Use of additional coder

A second coder was used to ensure the reliability of the content analysis. The term 'reliability' refers to consistency and replicability of research results over time (Cohen, Manion & Morrison, 2000). In terms of a Content Analysis, it must be established that

more than one individual can use the same coding scheme with similar results (Neuendorf, 2002).

Krippendorff (2004) states that a coder should have both the necessary cognitive abilities and the appropriate background. Although coding text to a particular category may appear to be a mechanical task, the coder must understand the coding scheme and be able to apply it consistently. For the purposes of this study, it was essential for the second coder to be suitably qualified (e.g. have completed a PhD) and to have a background in education. The individual chosen meets these requirements and has experience of working in higher education (both as an educator and as a researcher).

In advance of the content analysis, the second coder was given a copy of the Coding Scheme (found in Appendix D: Coding Scheme). A training session was conducted where the researcher and the second coder discussed the definitions of each of the reflection indicators. The content analysis of reflective text was then conducted. The following section examines the inter-coder reliability of the analysis, using paired *t*-tests.

6.1.1 Inter-coder reliability

A paired *t*-test was performed to assess the correlation between the two coders' judgements. For a paired *t*-test to function correctly, the observations from the first sample must be paired in some meaningful way with the observations from the second sample (Devore & Peck, 1990). In this case, the 'pair' refers to only one sample, but two sets of judgements. Therefore the test will examine the difference (or lack of difference) between the coders' judgements.

6.1.1.1 Blogs

Blogs and journals were examined separately. There were 17 blogs in the sample, giving a *df* (degrees of freedom) of 16. The critical value for t_{16} is 2.120 at the 0.05 significance level (Clegg, 1990); therefore values less than -2.120 or greater than 2.120

were rejected. If the test result falls between these values there can be 95% confidence that there is no significant difference between the coders' judgements in that case. Therefore a result that is 'not significant' represents an acceptable level of reliability between the two coders.

Table 6.1: Inter-coder reliability – blogs

	Mean (d)	St. Dev. (s)	Test Statistic	Comment
Indicator 1	0.0000	0.3536	0.00	Not Significant
Indicator 2	-0.118	0.485	-1.00	Not Significant
Indicator 3	-0.0588	0.2425	-1.00	Not Significant
Indicator 4	-0.1176	0.3321	-1.46	Not Significant
Indicator 5	-0.0588	0.2425	-1.00	Not Significant
Indicator 6	-0.118	0.485	-1.00	Not Significant
Indicator 7	-0.529	0.717	-3.04*	Significant Difference
Indicator 8	-0.1176	0.3321	-1.46	Not Significant
Indicator 9	-0.0588	0.2425	-1.00	Not Significant
Indicator 10	0	0	N/A	*Identical – No test required*
Indicator 11	-0.294	0.588	-2.06	Not Significant
Indicator 12	-0.353	0.493	-2.95*	Significant Difference

The final column in Table 6.1 comments on whether the test statistic is significant or not significant. When all judgements are identical the test does not need to be performed, as in the case of Indicator 10 above. There was no significant difference between the coders' judgements for Indicators 1, 2, 3, 4, 5, 6, 8, 9 and 11. However, a significant difference was found in the test for Indicators 7 and 12 at the 0.05 level. Indicators 7 and 12 were subsequently tested at the 0.01 level ($t_{16} = 2.921$). The judgements for both Indicators 7 and 12 were also found to be significantly different at the 0.01 level.

The outliers, Indicators 7 and 12, were revisited by the researcher and the second coder at a later stage (discussed in Section 6.2.3).

6.1.1.2 Journals

The 10 journals in the sample were examined separately. In relation to the journals, the *df* (degrees of freedom) is 9; the critical value for t_9 is 2.262 at the 0.05 significance level. The test was not performed for Indicators 2, 3, 4, 6, 7, 10 and 11, where the

coders' judgements were identical. There was no significant difference between the coders' judgements for Indicators 1, 5, 8, 9 and 12 (see Table 6.2).

Table 6.2: Inter-coder reliability – journals

	Mean (d)	**St. Dev. (s)**	**Test Statistic**	**Comment**
Indicator 1	0.100	0.316	1.00	Not Significant
Indicator 2	0	0	N/A	*Identical – No test required*
Indicator 3	0	0	N/A	*Identical – No test required*
Indicator 4	0	0	N/A	*Identical – No test required*
Indicator 5	-0.100	0.316	-1.00	Not Significant
Indicator 6	0	0	N/A	*Identical – No test required*
Indicator 7	0	0	N/A	*Identical – No test required*
Indicator 8	-0.400	0.966	-1.31	Not Significant
Indicator 9	-0.100	0.316	-1.00	Not Significant
Indicator 10	0	0	N/A	*Identical – No test required*
Indicator 11	0	0	N/A	*Identical – No test required*
Indicator 12	0.000	0.471	0.00	Not Significant

The coding for the journals was remarkably similar. There was no significant difference identified in the judgements for any of the indicators, in contrast to the blog sample where the judgements for two of the indicators were significantly different. This can be accounted for by the fact that the coding of the journals occurred after the coding of the blogs was already completed. By that stage, the coders had an improved, shared understanding of the meaning of each of the indicators. This strongly suggests that a pilot phase of coding should always be included to allow coders time to become properly accustomed to the coding scheme.

6.1.1.3 Outliers

In the analysis of inter-coder reliability on the coding of blogs, the judgements on Indicators 7 and 12 were found to be significantly different. These judgements were revisited to determine possible reasons for this discrepancy.

Indicator 7:

The coders' judgements on the blog sample for the seventh indicator, "Links are made to broader social structures", were found to be significantly different at the 0.05 level. In the sample of 17 blogs, the researcher coded only three examples of the indicator.

The second coder, on the other hand, identified twelve examples of the indicator. This accounts for the result of the paired *t*-test for Indicator 7. The reason for the difference between the coders can be attributed to a disparity in their understanding of the indicator's meaning. The coding scheme stated that, when referring to broader social structures, "the student sets the event or topic in a historical, social, ethical or legal context".

The following excerpts demonstrate the judgements made by the coders. The first example is one where the coders agreed on the judgement; the second example is an instance where there was a lack of agreement.

Agreement: The following excerpt was identified as an example of Indicator 7 (Links are made to broader social structures) by both coders.

> *Having read up on the data of faces; it is not just in the domain of Art or society – it has now migrated into science. The science world is not constructed by those who 'just know' but rather those who 'want to know how'. Facial recognition has affected various scientific disciplines such as mathematics, computer vision and biometrics.*

Lack of agreement: The example below was coded as an example of Indicator 3 (Analysis is evident) by the researcher. The second coder agreed with this, but also coded part of the paragraph as an example of Indicator 7 (Links are made to broader social structures) because of the references to married employees.

> *My hypothesis which I test every year is: "Organizing Christmas dinner on a Thursday night maximizes turn out numbers."*
>
> *Thursday is the independent variable and maximize turn out is the dependent variable. The reason Thursday night is good is because it is close to the weekend and people are in good spirits, it is the end of the working week and people want to relax. Also some people are not from Waterford and leave Waterford after work every Friday. Married employees want to spend time with their partners on a Friday night and find it hard to get baby sitters. I have tested my hypothesis numerous times by using Wiki Surveys whereby team members can participate in what there [sic] preference night would be. I have also used email but I prefer the online survey because then others can see the automatic updated status of the survey online.*

The difference between these two examples is that in the first the student has made explicit reference to links between structures such as art, mathematics and computing whereas in the second example the student has made a passing reference to marriage. This does not show the same level of analysis. When "links are made to broader social structures", it is expected that the student will include an explicit reference to these social structures (as in the first example above).

Indicator 12:

For the twelfth indicator, "Self-awareness is evident", the coders' judgements were found to be significantly different at the 0.05 level. In the sample of 17 blogs, the researcher identified 10 examples of the indicator whereas the second coder identified 16 examples. This disparity accounts for the result of the paired t-test for Indicator 12. The following excerpts show an example where the coders did agree on the judgement made and another where they did not.

Agreement: Both coders agreed that the following excerpt was an example of Indicator 12 (Self-awareness is evident) as the student discusses his thought processes.

> *I think that there are actions we perform without thought: breathing, blinking, etc. Perhaps it's possible to become so good at something that it becomes one of those background operations that don't require active attention by the brain. Take simultaneous interpretation for example, I'm fortunate enough to be bilingual in Spanish which I learned from birth. When I hear Spanish I don't have to translate it to English – I immediately know the meaning of what is being said. A few years back I took a course in simultaneous interpretation. This required the ability to listen to the "source" language and speak in the "target" language at the same time with a very minor delay. At first this seemed impossible, even to the expert linguist. But, with practice the listening becomes a background operation and you focus only on giving the most accurate spoken interpretation as possible. So maybe multitasking is just learning to perform certain operations in the background while you focus on the more arduous tasks.*

Lack of agreement: The researcher coded the following example as an example of Indicator 1 (Clear description of context). The second coder, however, coded the paragraph as an example of Indicator 12 (Self-awareness is evident) because the student noted his interest in the way in which Cognitive Science is studied (and the second coder believed that this constituted an "emotional reaction" to the learning material). It

is debatable whether this excerpt contains strong enough evidence of an emotional reaction to warrant coding to Indicator 12.

> *The way Cognitive Science is studied is interesting. There are different ways to gather data and then different ways in which that data is used to come up with detailed results. Qualitative and Quantitative data is recorded and analyzed during research and the results are studied to produce scientific findings.*

Cases where text excerpts were coded differently by the researcher and second coder were revisited with a view to reaching a shared understanding of the indicator and revising earlier decisions where appropriate.

6.1.1.4 Revised decisions

Indicators 7 and 12 were revisited by the researcher and the second coder and each of the decisions made in relation to these indicators was discussed in turn. Following further discussion, revisions were made to some of the decisions. For example, the researcher and the coder had coded the following extract differently:

> *I found I was very slow and that the patient took up my whole night. I felt out of my depth. I did eventually get all nursing notes finished and the patient was stabilised. But I feel I could have handled the situation better, remained calmer not fussing and updating all documentation as I went on.*

This had originally been coded as an example of Indicator 5 (Implications of actions are considered) by the researcher and as Indicator 12 (Self-awareness is evident) by the second coder. After some discussion, it was agreed that the repeated references to the student's feelings ("I felt out of my depth", "I feel I could have handled the situation better, remained calmer") constitute an example of Indicator 12 (Self-awareness is evident), in addition to Indicator 5 (Implications of actions are considered). This change was then reflected in the results of the paired *t*-tests (as were any other changes).

The revised inter-coder reliability for the coding of blogs for Indicators 7 and 12 can be seen in Table 6.3. There is now no significant difference between the coders' judgements at the 0.05 level ($t_{16} = 2.120$).

Table 6.3: Inter-coder reliability – outliers

	Mean (d)	St. Dev. (s)	Test Statistic	Comment
Indicator 7	-0.235	.562	-1.73	Not Significant
Indicator 12	-0.176	0.393	-1.85	Not Significant

6.1.1.5 Inter-coder reliability – conclusions

Overall, the judgements made by the two coders were remarkably similar. Although there were a number of outliers, any significant differences in the coders' judgements were overcome following further discussion.

The coding of journals by the researcher and the second coder was found to be particularly reliable; no outliers were identified in this case. The analysis of journals occurred later than that of the blogs, which meant that the coders were more familiar with the instrument by the time the journals were assessed. Discussions with regards to coding were held at intervals throughout the analysis, meaning that a shared understanding of each of the indicators had been reached by the time the journals were coded.

This demonstrates that a pilot phase of coding should always be included to allow coders time to become properly accustomed to the coding scheme. This should be followed by inter-coder reliability tests to identify indicators where there is a significant difference between coders' judgement. Further discussion of the indicators should be held to resolve any cases where an agreed definition of an indicator has not been reached.

6.1.2 Coding Decisions

This section provides an example of the type of text coded at each reflection indicator in order to give an insight into the coding decisions made.

6.1.2.1 Clear description of context is given

For an excerpt of text to be coded to the 'Clear description of context' node, one of the following conditions should be true:

- The student provides a description of an event or topic
- The description provided identifies points where reflection could occur
- The description provides the context and background for reflective writing

In the following excerpt the student describes part of an incident that occurred while on her placement. She describes the event as it happened (it is subjected to further reflection in the subsequent paragraphs).

> *This week while on the ward a patient had a cardiac arrest. A nurse pressed the cardiac arrest button, while I grabbed the crash trolley. On reaching the side room where the patient was being nursed my preceptor instructed me to begin creating space for when the crash team arrived. I began removing furniture from the room. Within seconds the crash team arrived and successfully revived the patient.*

6.1.2.2 Issues are correctly identified

The coding criteria specified for the 'Issues are correctly identified' node are as follows:

- The student demonstrates an awareness that there are issues which require attention
- The student identifies issues and discusses them in more detail
- The student provides a relevant example related to the event or topic

In the following excerpt the student has identified an issue relevant to the topic of Interface Design (that user interfaces were often designed without consulting end users).

> *User interfaces were often an after-thought in developing a computerised system;*

> *the UI was developed in dark basements by a team of twenty-something year old programmers living on a diet of Big Macs and Coke, without any reference back to the user groups it was being designed for.*

6.1.2.3 Analysis is evident

In order for an excerpt to be coded to the 'Analysis is evident' node, one of the following conditions must be true:

- The student asks questions related to the event or topic
- There is evidence of analysis e.g. the student compares/contrasts

In the following excerpt the student compares the usability of three methods of password entry for online banking systems:

> *If you take online banking for example where the user has to enter their PIN number, I find that certain methods/banks are a lot less user-friendly when it concerns recall from memory. Bank of Ireland online banking – this I believe is the best method of entering a PIN number. As we remember the number as a whole and in order, it is easier to type it in. Formerly BOI utilized drop-down menus for each number but this proved time-consuming so they changed to input boxes. AIB online banking jumbles up the order of the PIN number and you first have to recall the number in sequence and choose the digit in accordance to the question (I tend to use my fingers to facilitate this). Finally, I believe Ulster Bank online banking to be most confusing as they require both a PIN number and a password and ask for digits/characters in a jumbled up fashion which stumps me every time. However in summation, I am not sure how much usability vs. security comes into play. Are AIB & Ulster Bank more secure methods?*

6.1.2.4 Creative synthesis is evident

At the 'Creative synthesis is evident' node one of the following conditions must be true in relation to the coded text:

- The student combines two or more perspectives in a creative way
- The student makes unexpected links between alternative perspectives

In the following example the student makes a link between the information processing model of human cognition and web design:

> *I think once you have researched these process models and discovered how we take in and use information, then it can help in many areas such as web design. If you can understand the basic theories behind this and how people will view information then it could help to design very user-friendly websites and interfaces.*

6.1.2.5 Implications of actions are considered

For an excerpt of text to be coded to the 'Implications of actions are considered' node one of the following conditions should be true:

- The student considers the implications of his/her own actions
- The student analyses his/her own actions in comparison to those of others

In the following excerpt, the student considers the implications of her actions when dealing with elderly patients:

> *It also made me realise that encouraging independence with the older adult during their hospital stay will lead to an earlier discharge date and that the patient can be discharged to their own home.*

6.1.2.6 Multiple perspectives are examined

The criteria specified for the 'Multiple perspectives are examined' node are as follows:

- The student refers to alternative viewpoints
- The student refers to one or more external perspectives (e.g. related literature, alternative approaches or attitudes of others)
- External ideas are present and these views are reflected on

In the following example, the student relates his reading about cognitive science to an advertising campaign that makes claims about 'brain age':

During my research into Cognitive Neuroscience and the Nintendo DS it was interesting to see Nintendo or more correctly Nicole Kidman claim that it keeps her brain young. However it seems there is no conclusive evidence to support the claim of improvements to cognition as practice with any task will lead to an improvement in that task.

6.1.2.7 Links are made to broader social structures

In order for an excerpt to be coded to the 'Links are made to broader social structures' node, one of the following conditions must be true:

- The student sets the event or topic in a historical context
- The student sets the event or topic in a social context
- The student sets the event or topic in an ethical context
- The student sets the event or topic in a legal context

In the following excerpt, the student discusses face recognition systems in the context of human rights and privacy:

Therefore if [face recognition systems] could be perfected without infringing on our human rights and privacy, I think [they] could be a useful weapon against the global threat of terror.

6.1.2.8 Learning is evident

At the 'Learning is evident' node one of the following conditions must be true in relation to the coded text:

- The student demonstrates evidence of learning
- The student corrects previous misunderstandings
- The student states that he/she has gained knowledge

In the following example the student directly discusses her learning and the increased confidence it has given her:

On certain weeks I would try to learn from specialists. On the week of ECGs I came in on my reflective hours and spent the four hours with the hospital's ECG technician. I learned a lot from doing this and I now feel very confident undertaking ECGs. I also learned how to spot major changes in the patient's cardiac condition such as A Fib.

6.1.2.9 Insightful understanding is evident

For an excerpt of text to be coded to the 'Insightful understanding is evident' node, one of the following conditions should be true:

- The student demonstrates an insightful understanding of an event or topic e.g. a discussion of an event or topic that shows a deep understanding of that event or topic
- The student states an opinion or judgement on the event or topic that demonstrates an understanding of that event or topic

With the following statement, the student demonstrates an understanding of the topic by concisely summarising the key issues:

I believe that the future of software lies in creating easy-to-use, efficient and secure interfaces which will also be adaptable to the ever-changing technology trends.

6.1.2.10 Changes in beliefs or understanding are evident

The criteria specified for the 'Changes in beliefs or understanding are evident' node are as follows:

- The student discusses changes in his/her beliefs
- The student discusses changes in his/her understanding

In this example, a student who had previously written about the "monotonous" daily life on a quiet ward demonstrates a change in opinion over time:

> *However, once I began to get used to the ward I realised that it was great to have the time to spend with the patients.*

6.1.2.11 Revisions to future practice are discussed

In order for an excerpt to be coded to the 'Revisions to future practice are discussed' node, one of the following conditions must be true:

- The student discusses a new understanding that has caused him/her to consider the revision of future practices
- The student states his/her intention to do something differently in the future

In the following excerpt, the student discusses improvements that he could make in relation to the Quality Management System maintained by his team:

> *An area we in the Quality team need to look at is people with visual, or other cognitive disabilities. All our QMS [Quality Management System] documents are in MS word... but what if employees have impaired vision? It would be a great idea to provide 'voice' or some other auditory aspect to the QMS.*

6.1.2.12 Self-awareness is evident

At the 'Self-awareness is evident' node, one of the following conditions must be true in relation to the coded text:

- The student notes his/her emotional reactions to an event
- The student assesses the influence of his/her emotional reactions
- The student explores motives or reasons for his/her behaviour
- The student discusses his/her own thought processes or learning processes

In the following example the student expresses her fear and apprehension at starting her work placement:

> *Going into Week One of work placement of our internship year I was quite*

apprehensive about what would now be expected of me as a 4th year student nurse.
I was afraid I wouldn't live up to the expectations and that I wouldn't be as good
as I should be.

6.1.3 Analytic memos

Analytic memos were used to aid decision-making when coding reflective blogs. This section provides examples of analytic memos used by the researcher to aid and clarify coding decisions. Each time a section of text was coded to a reflection indicator an analytic memo was written. There were a total of 338 analytic memos recorded. The use of analytic memos is recommended by Saldaña (2009) and allows the decisions made by the researcher to be available for examination; either by herself at a later stage, or by others.

In the first example, the analytic memo describes the decision to code the section of text as an example of the 'Self-awareness evident' indicator. The memo states the reasons why the excerpt is deemed to be an example of that indicator.

Analytic memo (1):

The student refers to emotional reactions - feeling 'clueless', mind going blank etc. Coded to self-awareness evident.

Related sample of coding (1):

As this was the first time I had experienced a cardiac arrest I felt a bit clueless, and needed direction. I felt my mind went blank as it was an emergency situation, and I seemed to forget everything I had learned about dealing with a cardiac arrest.

The second analytic memo demonstrates a scenario where a section of text has relevance to more than one reflection indicator. The memo states the rationale for the coding of the text to each of the indicators.

Analytic memo (2):

The student evaluates which UI design and accessibility guidelines are relevant for her project (coded to analysis is evident). Also the student notes the implications of usability for her end users (coded to implications). She notes her intention to

apply the UI Design and W3C/WAI guidelines to her project (coded to revisions to future practice).

Related sample of coding (2):

I will be applying all of the above theory in my main project module, an online Sports Registration System. The users have a varying level of experience with computers so it is important for me to make the system as easy as possible to use. The important user design concepts for this I believe are learnability vs. usability, intuitiveness, simplicity, providing traceable paths and providing feedback. With regard to the W3C/WAI guidelines, I plan to at the very least make my website Priority 2 compliant.

In the third example, the analytic memo is used to justify why an excerpt of text was not coded to one of the reflective indicators (2 – 12) but rather to the 'Clear description of context is given' indicator.

Analytic memo (3):

I wondered whether this was an example of reflection - in one sense at least the student is thinking and has an opinion but on the other hand by stating that Sternberg's study is "pretty obvious" he is choosing not to analyse it further and hasn't experienced any learning or changed understanding following examination of this topic. Coded as description of context.

Related sample of coding (3):

This, of course, doesn't require much study as I would have thought it pretty obvious that the more information there is to process the longer it takes to do so.

6.2 Assigning a score to a piece of reflective writing

The purpose of the content analysis was to identify samples of text that represent each of the 12 reflection indicators. Once these samples of text have been identified they can be used in a number of different ways, including assigning a score to a piece of writing based on the amount of reflection it contains. The process of assigning a score is discussed in this section.

A blog or journal's reflective score is based on both the number of references it contains to the 12 reflection indicators and the weightings of those indicators. The method for calculating the reflective score is as follows:

*(Number of references to Indicator 1 * Indicator 1 weighting) + (Number of references to Indicator 2 * Indicator 2 weighting) + … + (Number of references to Indicator 12 * Indicator 12 weighting) = **Total reflective score***

The number of references to a reflection indicator is the number of times a piece of text was coded to that indicator. For each reflection indicator, the number of references is multiplied by the weighting of that indicator. These are then added together to get a total score for the blog or journal. This could be useful in terms of summative assessment. In Table 6.4 the calculation of the reflective blog score for BlogAuthor1 can be seen.

Table 6.4: Method of calculating Reflective Score

	No. References	Weighting	No. Refs * Weight
Indicator 1	6	0.01304	0.07824
Indicator 2	1	0.02901	0.02901
Indicator 3	1	0.03561	0.03561
Indicator 4	1	0.04602	0.04602
Indicator 5	1	0.05105	0.05105
Indicator 6	4	0.05854	0.23416
Indicator 7	0	0.06936	0.00000
Indicator 8	0	0.10977	0.00000
Indicator 9	0	0.11713	0.00000
Indicator 10	0	0.12459	0.00000
Indicator 11	0	0.13734	0.00000
Indicator 12	1	0.20855	0.20855
		Total Score	**0.68264**

Next, the analysis of the linguistic structure of the reflective blogs and journals is described.

6.3 Analysis of Linguistic Structure

A sample of 18 blogs and journals was chosen. They were selected based on the reflective score they received; the nine highest-scoring and nine lowest-scoring blogs

and journals were chosen. The sample consisted of nine blogs (six in the low-scoring group and three in the high-scoring group) and nine journals (three in the low-scoring group and six in the high-scoring group). The reflective score for each blog and journal is shown in Table 6.5.

Table 6.5: Linguistic analysis - sample selected

	Reflective Score	**Group**
JournalAuthor01	0.02608	Low
JournalAuthor07	0.11363	Low
BlogAuthor09	0.21685	Low
JournalAuthor06	0.28713	Low
BlogAuthor04	0.32714	Low
BlogAuthor15	0.35790	Low
BlogAuthor10	0.48268	Low
BlogAuthor11	0.54399	Low
BlogAuthor07	0.65533	Low
BlogAuthor17	0.70830	
BlogAuthor02	0.72268	
BlogAuthor13	0.75423	
BlogAuthor01	0.76726	
BlogAuthor03	0.82307	
JournalAuthor04	0.82339	
BlogAuthor16	0.85092	
BlogAuthor05	0.93011	
BlogAuthor06	0.94556	
JournalAuthor05	1.00342	High
JournalAuthor03	1.13198	High
JournalAuthor09	1.23275	High
BlogAuthor14	1.24426	High
BlogAuthor08	1.32845	High
JournalAuthor08	1.37873	High
JournalAuthor10	1.56794	High
BlogAuthor12	1.63178	High
JournalAuthor02	1.75236	High

6.3.1 Linguistic Resources examined

The total word count for the sample was 14,100. In total, 1,310 examples of the ten types of linguistic resources were identified. The ten linguistic resources, which are based on the work of Ryan (2011) were discussed in Section 3.2 (related research on the linguistic structure of reflective writing) and again in Section 4.6 (analysis of reflective writing methods). The ten linguistic resources under examination were:

1. First person voice (SFL 01)

2. Thinking and sensing verbs (SFL 02)

3. Nominalisation (SFL 03)

4. Professional nouns/noun groups (SFL 04)

5. Language of comparison/contrast (SFL 05)

6. Causal links (SFL 06)

7. Appraisal adjectives and reasoning adverbs (SFL 07)

8. Temporal links (SFL 08)

9. Future tense verbs (SFL 09)

10. Impact adverbs (SFL 10)

6.3.2 Examples of each resource type

Examples of each linguistic resource, taken from the sample of blogs and journals, are presented here for explanatory purposes. In each example there may be several types of linguistic resource used. The portion of the text that relates to the resource under discussion is highlighted each time. For example in the first sentence shown under First person voice (SFL 01) the words "I began to relax" are highlighted. This is the part of the text that was coded as an example of first person voice.

6.3.2.1 First person voice (SFL 01)

The first type of linguistic resource examined was the use of first person voice. These excerpts demonstrate the kind of text that was coded to this resource:

> *Day 2 was much the same and **I began to relax** into the ward and became familiar with the routine.*
>
> *However, **I felt it was important**, especially as when the patient was alert his eyes would follow people around the room.*
>
> *We were also introduced to more flexible model in class which better represented the thought process however **I still believe** it is impossible to encapsulate the human thought process into a defined model.*

6.3.2.2 Thinking and sensing verbs (SFL 02)

In relation to the second type of linguistic resource (thinking and sensing verbs) verbs such as 'believe', 'feel' and 'know' were coded. Below, examples of SFL 02 coding can be seen:

> ***I am unsure of*** *exactly computational systems work exactly but **I do understand** their intended behaviour.*

> *If someone attempted to convince you that green is now the indicator of heat, **I believe there still would be** a slight hesitation to try based on former attained experience.*

> *As this was the first time I had experienced a cardiac arrest **I felt a bit clueless**, and needed direction.*

6.3.2.3 Nominalisations (SFL 03)

Nominalisations occur when a verb is turned into a noun; Ryan (2011) states that students do this to say more with fewer words, something that she suggests is a requirement of academic writing. Nominalisations allow the student to express abstract concepts in concise ways (Ryan, 2011). The following are examples of this type of linguistic resource:

> *Perception encompasses all processes associated with **the recognition, transformation and organization of** sensory information.*

> *In conjunction with these websites, I borrowed the ward protocol on my break and read through the WRM protocols for **the administration of** medication and the collection and checking procedures of blood products.*

6.3.2.4 Professional nouns/noun groups (SLF 04)

Another feature of academic reflective writing, according to Ryan (2011), is the use of discipline specific nouns (or groups of nouns). Some examples of this (fourth) type of

linguistic resource are presented below. Note that the disciplines of the students whose blogs and journals were examined in this study were Computing (specifically Cognitive Science and HCI) and Nursing, respectively.

> *Icons and other **graphical representations** should enable the audience to readily distinguish their meaning.*
>
> *Prolog is a **high-level programming language** based on formal logic.*
>
> *I also feel it highlights the importance of assessing a patient's risk of falling, even if the patient is **compos mentis**.*
>
> *As part of my placement in surgical I came across a number of patients with **gastro-oesophageal reflux**.*

6.3.2.5 Language of comparison/contrast (SFL 05)

The fifth type of linguistic resource considered in this analysis was the use of language for comparing and contrasting. This included words such as 'similarly', 'like' and 'unlike', as seen in Table 4.2. Below, some examples of this type of resource are presented.

> *For example provide an 'OK' and 'Cancel' **rather than just** an 'OK' button.*
>
> *The lady was completely **independent compared with the lady I admitted** two days earlier.*
>
> *[The student felt that she] would never be **as good as** everybody else.*

6.3.2.6 Causal links (SFL 06)

The use of causal links was the sixth type of linguistic resource to be examined. Ryan (2011) states that students use causal links in their writing to provide explanation. Some examples of causal links are presented below.

> *If they responded "terrible" I may have anticipated replying "that's great" **because** that would have been the normal response.*
>
> *This type of deprivation can result in 'feral children' which basically means a child*

> *that was isolated from any communication or contact at a very early age **and as a result is** socially dysfunctional.*

> ***Despite** constant encouragement to ring the call bell before mobilising, the patient continued to mobilise independently.*

6.3.2.7 Appraisal adjectives and reasoning adverbs (SFL 07)

Ryan, in her Academic Reflective Writing model, described the use of "adjectival groups to appraise and show evidence" and "adverbial groups to show reason" (Ryan, 2011, p.105). For the purposes of this analysis, these linguistic resources have been combined into one group, SFL 07.

It was found that when students were 'appraising', that is, writing about their evaluation of a particular topic, they used adjectives and adverbs as necessary; they did not use only adjectives for appraisal, as suggested by Ryan (2011), but also used adverbs. The same was found to be true for reasoning; adjectives were used, as well as adverbs.

In the blogs and journals examined it was found that students, when evaluating a particular topic, generally commented on not only their reaction to a subject but the degree to which they reacted. For example, in the first excerpt below, the student states that the incident "was *extremely* challenging". In the second example, the student provides reasons why they found the discussion awkward, while also appraising the degree to which he felt awkward ("slightly"). As there was no clear distinction found between the use of adjectives for appraisal and adverbs for reasoning, these resources were combined and examined together. Below, examples of appraisal and reasoning resources (which contain both adjectives and adverbs) can be seen.

> *The incident was **extremely challenging** for me.*

> *I found this topic's discussion **slightly awkward as** I felt that people's comprehension of a child's linguistic development in some form was relatable to their aptitude for school.*

> *The website I chose to evaluate was the FAS eCollege website and I found it **very useful** to examine it using the 12 concepts above.*

The procedure and preparations for setting up for resuscitation are now a lot clearer in my mind and I am aware of **how quickly and unexpectedly** *a cardiac arrest can occur.*

6.3.2.8 Temporal links (SFL 08)

The eighth type of linguistic resource considered was the use of temporal links. Students use these links in their writing to indicate the passing of time. The examples below demonstrate the type of text that was coded as an example of this type of resource.

At the start of the week *I felt that I was a bit out of my league.*

During my time *on the ophthalmic ward there were very few ophthalmic patients.*

Even though I have never seen the design concepts listed above **before this** *course, from experience we had thought about these issues* **way back in 2004** *because we knew what was important for the successful delivery of the end product whereby the customer was happy and we got paid.*

6.3.2.9 Future tense verbs (SFL 09)

The use of future tense verbs was also examined as part of the linguistic analysis. Some examples of this type of resource are presented below.

I intend to bring this forward *with me and use a similar approach* **when I am qualified.**

I intend to always ask questions *to the members of the team as I have learned so much from doing so.*

It is something I can definitely find [sic] **studying/reading about in future years**.

6.3.2.10 Impact-related adverbials (SFL 10)

The final linguistic resource to be considered was the use of adverbial groups to consider different impacts or possibilities. Ryan states that this type of resource is used

to "describe conditions under which something could be done" (Ryan, 2011, p.108). Some examples of the coding to this type of resource are shown below.

> ***This depends on the type of user*** *expected to use the site.*

> *Therefore* ***if it could be perfected without infringing on our human rights and privacy, I think it could be a useful weapon*** *against the global threat of terror.*

> ***If this arose again I would again risk assess*** *and place patient in a bed where they can be closely monitored.*

The results from the linguistic analysis are presented in Chapter 7: Results. First, this chapter is reviewed.

6.4 Chapter Review

This chapter examined the implementation of the Reflective Writing Assessment Instrument in a content analysis of reflective blogs and journals. It examined the inter-coder reliability of this content analysis. In most cases, there were no significant differences in the judgements made by the two coders. Significant differences in the coders' judgements on the reflective blogs for Indicators 7 and 12 were overcome following further discussion. This problem did not repeat itself when the journals were assessed at a later stage, demonstrating that a shared understanding of each of the indicators had been reached by the time the journals were coded.

This highlights the need for a pilot phase of coding, which should always be included to allow coders time to become properly accustomed to the coding scheme. This should be followed by inter-coder reliability tests and further discussion of the indicators, if necessary.

This chapter also discussed the coding decisions made in relation to each reflection indicator and gave an example in each case. It elucidated the method used to give a piece of reflective writing a score based on the amount of reflection it contains.

The linguistic analysis of the sample of reflective writing was also discussed. A subset of 18 blogs and journals was chosen. The analysis examined ten types of linguistic resources. Examples of each type of resource were given in this chapter.

The results obtained from both the content analysis and linguistic analysis of reflective writing will be presented in Chapter 7. These results include the scores that were given to blogs and journals, the amount of reflection that was identified in relation to each reflection indicator and the linguistic structure of students' reflective writing.

Chapter 7 : Results

7.0 Chapter Introduction

Chapter 5 described the development of the Reflective Writing Assessment Instrument, which consists of 12 reflection indicators (weighted according to the depth of reflection that they represent) and a set of criteria for each indicator. This instrument was then used in a content analysis, which looked for examples of the reflection indicators in the text of 27 reflective blogs and journals. Chapter 6 elucidated the coding decisions made in the content analysis and confirmed the inter-coder reliability of the analysis. It presented the method used for assigning a score to a piece of reflective writing. It also described how a subsequent analysis was performed to assess the use of linguistic resources in the students' reflective writing.

Chapter 7 is divided into two parts. The first, Section 7.1, examines the levels of reflection identified using the Reflective Writing Assessment Instrument. It also examines the differences between the blog sample and the sample of handwritten journals. Results are presented on the reflective scores and the degree to which they changed over time. The effect of feedback on improvement is also considered.

The second part of the chapter, Section 7.2, reports on the findings from the analysis of the linguistic structure of the reflective blogs and journals. Correlations are made between reflection indicators and linguistic resources. The relationship between linguistic resources and reflective score is examined. The language used in blogs and journals is compared, and changes over time in the type of language used are considered.

7.1 Levels of reflection identified

Examples of each of the 12 reflection indicators were found in the 27 blogs and journals examined. Throughout this chapter, these examples will be known as 'references'. There were a total of 422 references coded in the content analysis.

7.1.1 Overall results

The number of references to each of the 12 reflection indicators can be seen in Figure 7.1. It can be seen that the quantities of reflection indicators identified vary greatly, from only 4 examples of 'Creative synthesis is evident' to 133 examples of 'Clear description of context'.
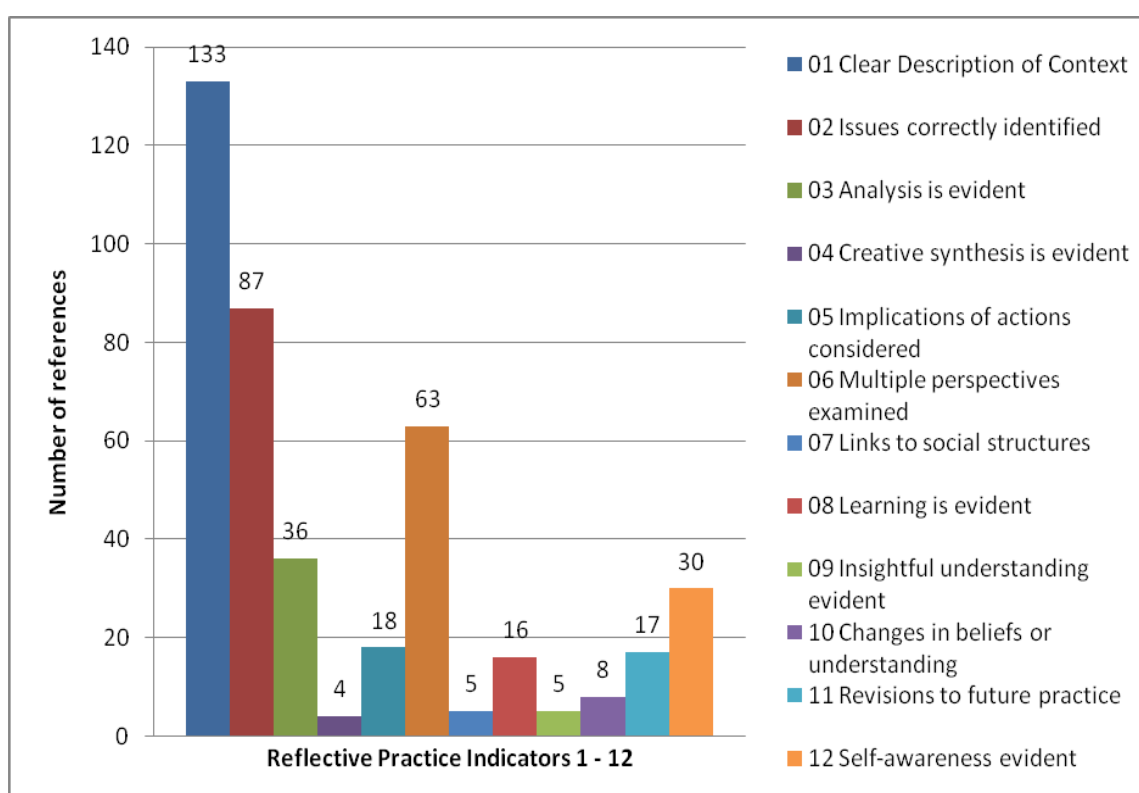
Figure 7.1: Number of references to each indicator

The amount of text coded to each indicator was also examined. In Figure 7.2, it can be seen that Indicator 1 'Clear description of context' accounts for 39% of the text of the reflective blogs and journals. The second largest coverage percentage is by Indicator 2 'Issues are correctly identified' at 17% of the text. In fact, the chart in Figure 7.2 demonstrates that, in general, the lower-weighted indicators have the highest percentage coverage of text. Higher-weighted indicators, on the other hand, cover a lot less text (that is, examples of these indicators tend to be brief in terms of word count). For

example Indicators 11 (Revisions to future practice are discussed) and 12 (Self-awareness is evident) each cover only 3% of the text in the sample.
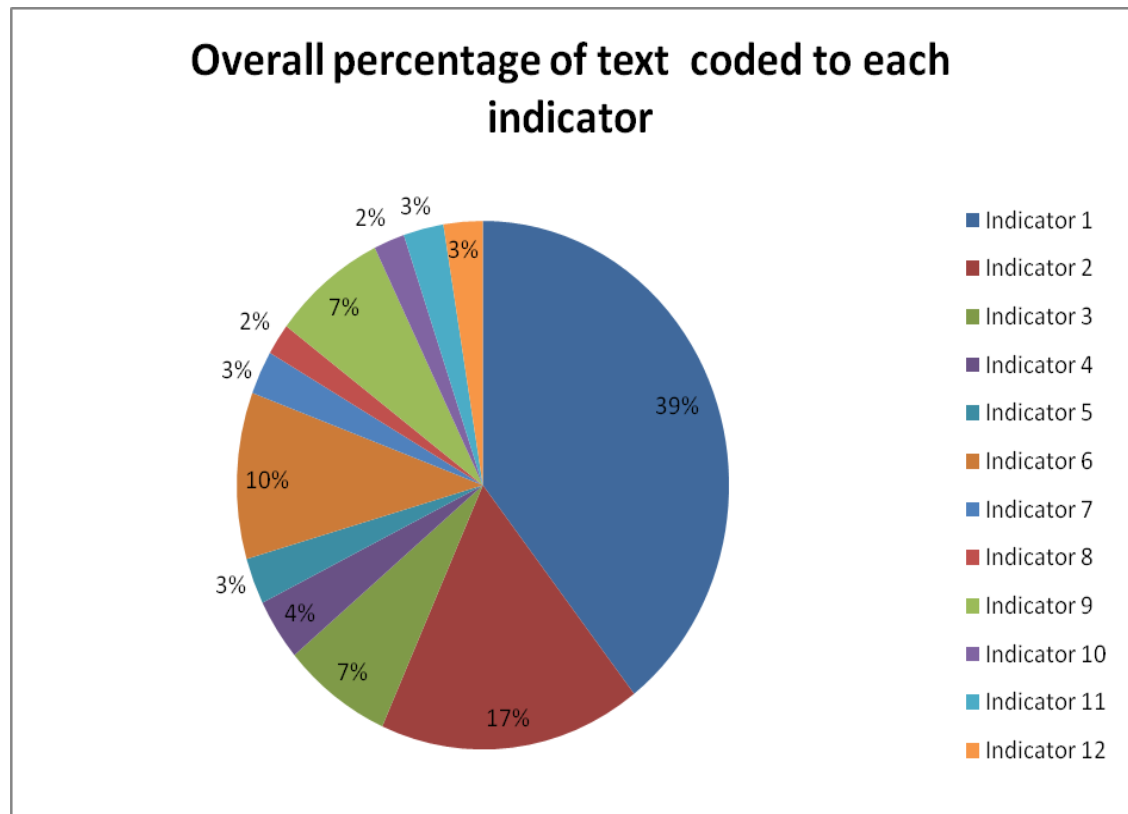
Figure 7.2: Percentage of text coverage for each indicator

A Pearson's *r* correlation coefficient examines the relationship between two variables and determines whether the presence of one variable is associated with that of the second variable. In examining the relationship between text coverage and indicator weighting, there was found to be a strong, negative correlation (*r* = -0.551). Muijs (2011, p. 145) suggests the following standard cut-off points in Pearson's *r* value when determining the strength of a relationship:

> *<0.±1 weak*
> *<0.±3 modest*
> *<0.±5 moderate*
> *<0.±8 strong*
> *≥±0.8 very strong*

This strong, negative correlation means that an indicator that has a large amount of text coded to it is not likely to have a high weighting in terms of reflection.

A subsequent test measures the significance of the correlation coefficient result. The *p*-value indicates the probability that the relationship would be present in the sample if it was not present in the general population; a lower *p*-value means it is less likely that the results occur only in the sample examined (Muijs, 2011). In other words, a low *p*-value suggests that the results are likely to be generalisable to the rest of the population. Acceptable boundaries that are generally set for this value are:

<0.05:   There is a 5% chance the results are unique to the sample; conversely, there is a 95% chance that they are generalisable to the rest of the population

<0.01:   There is a 1% chance that the results occur only in the sample examined and a 99% chance that they occur in the general population

In the case of the relationship between text coverage and indicator weighting, the result is not statistically significant (*p*-value 0.063). However, it is interesting nonetheless, as it shows that higher-weighted indicators tend to be less represented in the text (and vice versa, that there is more text that relates to lower-weighted indicators). This finding is discussed in relation to the literature on reflective writing in Chapter 8: Evaluation of Findings.

The amount of reflection identified in the 27 blogs and journals is now discussed in terms of levels of reflection. For ease of description and for comparative purposes with similar studies the reflection indicators have been grouped into four categories: Descriptive, Low, Medium and High.

Indicator 1 (Clear description of context) is purely descriptive and does not represent evidence of reflection. This indicator also has the lowest weighting (.01304). For these reasons, Indicator 1 is the only indicator in the Descriptive category.

It was decided to group the remaining indicators according to the weighting they were assigned in Round Two of the Delphi study, as follows:

- Low reflection: less than 0.05
- Medium reflection: greater than or equal to 0.05 and less than 0.1
- High reflection: greater than or equal to 0.1

Indicators 2 to 4 are weighted between 0.02901 and 0.04602 and therefore these indicators represent a 'low' level of reflection. Indicators 5 to 7 are weighted between 0.05105 and 0.06936 and represent a 'medium' level of reflection. The remaining indicators, 8 to 12, are all weighted greater than 0.1 and therefore represent a 'high' level of reflection (between 0.10977 and 0.20855).

In Figure 7.3 the number of references at each of these levels can be seen. In the Descriptive category, there were 133 references (representing 32% of the total number of references). There were 127 references at the low level of reflection (30% of total references). The medium level of reflection comprised 20% of the total references (n=86) and, finally, there were 76 references at the high level of reflection (making up 18% of the total references).
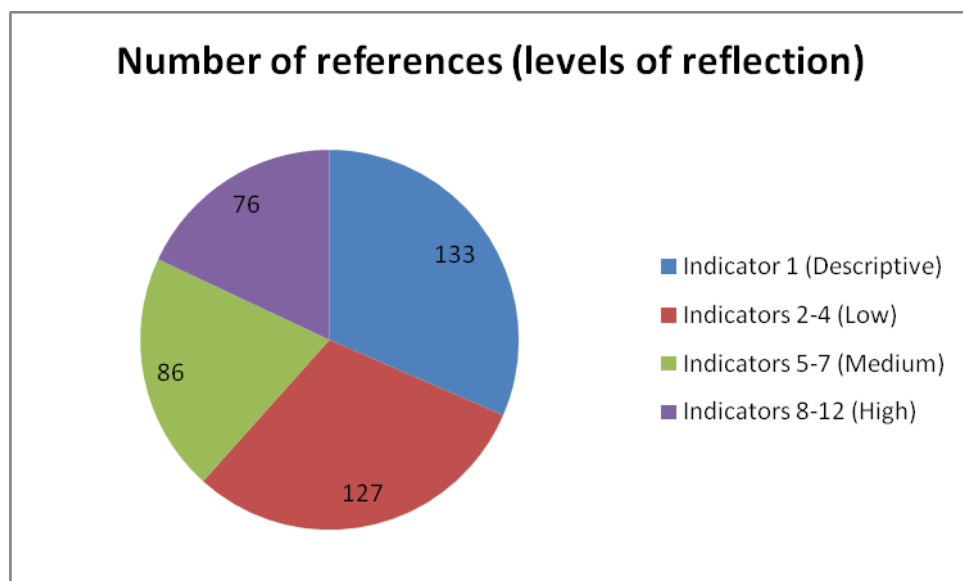
Figure 7.3: Number of references at levels of reflection

Figure 7.3 again demonstrates that the majority of references identified in the blogs and journals relate to the descriptive or low-level reflection categories, with 62% of references falling into these categories.

7.1.2 Amount of reflection (by student)

Up to this point, the amount of reflection found in the blogs and journals has been considered in terms of the number of references that related to each reflection indicator. Now, the number of students who showed evidence of reflection indicators in their writing is examined.
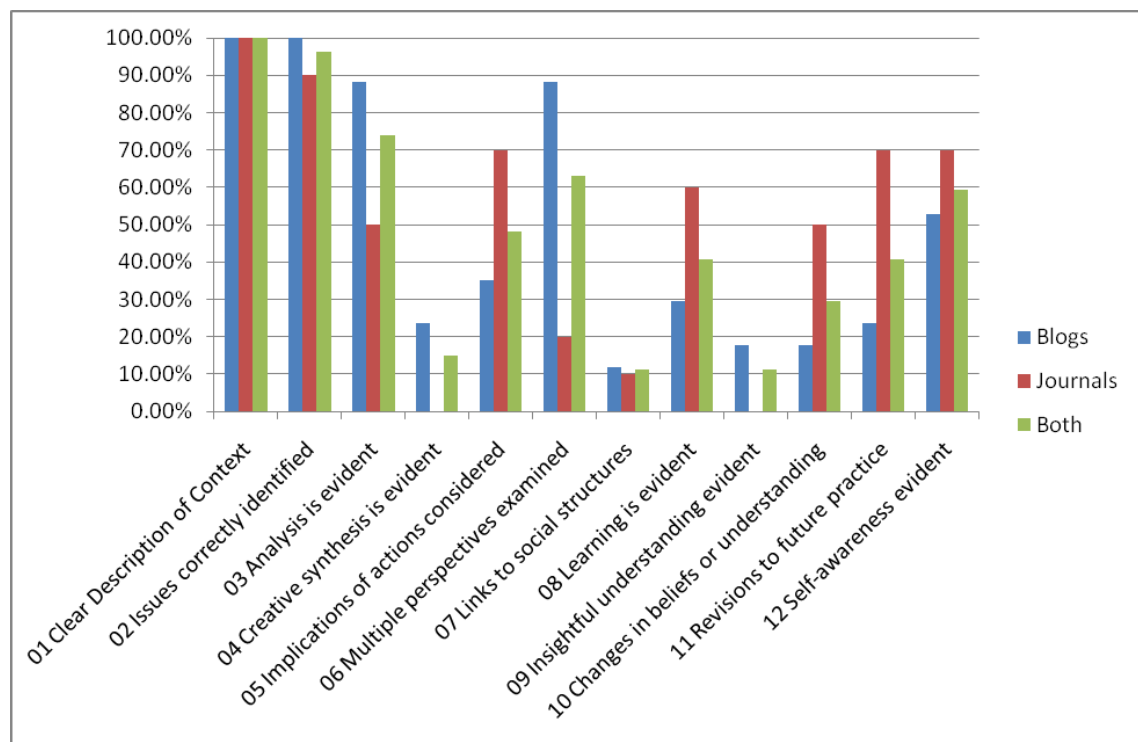
Figure 7.4: Indicator usage by students

It can be seen in Figure 7.4 that all students showed evidence of the first indicator, Clear description of context. The second indicator, Issues are correctly identified, was the second most commonly used (96.3%), followed by Indicator 3 Analysis is evident (74.1%). In contrast, the least commonly used indicators were Indicator 4 Creative

synthesis is evident (14.8%), Indicator 07 Links are made to broader social structures and Indicator 9 Insightful understanding evident (both 11.1%). Figure 7.4 also shows the breakdown of these figures into two groups of students based on whether they used a blog or journal as the medium for reflective writing (blogs and journals are compared further in the next section).

The percentages upon which Figure 7.4 is based are also presented in Table 7.1. Again the usage of each indicator by students is shown for students in the blog group, students in the journal group and finally, for all 27 students.

Table 7.1: Indicator usage by students

Reflection Indicator	Blogs	Journals	Both
01 Clear Description of Context	100.0%	100.0%	*100.0%*
02 Issues correctly identified	100.0%	90.0%	*96.3%*
03 Analysis is evident	88.2%	50.0%	*74.1%*
04 Creative synthesis is evident	23.5%	0.0%	*14.8%*
05 Implications of actions considered	35.3%	70.0%	*48.1%*
06 Multiple perspectives examined	88.2%	20.0%	*63.0%*
07 Links to social structures	11.8%	10.0%	*11.1%*
08 Learning is evident	29.4%	60.0%	*40.7%*
09 Insightful understanding evident	17.6%	0.0%	*11.1%*
10 Changes in beliefs or understanding	17.6%	50.0%	*29.6%*
11 Revisions to future practice	23.5%	70.0%	*40.7%*
12 Self-awareness evident	52.9%	70.0%	*59.3%*

Earlier, indicators were grouped into four categories: description, low-level reflection, medium-level reflection and high-level reflection. The usage of each reflection indicator by students is now also grouped in terms of these four categories. Findings are presented in this way to enable comparison with results from related studies, as will be seen in Chapter 8: Evaluation of Findings. In Table 7.2 the levels of reflection found in relation to each of these categories can be seen.

Table 7.2: Levels of reflection (by students)

Level of reflection	Average
Description	100.0%
Low-level reflection (Indicators 2-4)	61.7%
Medium-level reflection (Indicators 5-7)	40.7%
High-level reflection (Indicators 8-12)	36.3%

On average, low-level reflection indicators were found in 16.67 blogs or journals (61.7%). Medium-level reflection indicators were found in 11 (on average) of the blogs or journals (40.7%). Examples of high-level reflection indicators were seen in the writing of 36.3% of students (an average of 9.8 blogs or journals).

7.1.3 Blog/journal comparison

In the sample examined in the Content Analysis there were 17 blogs and 10 journals. As discussed in Chapter 4, the blogs were used by students on a Cognitive Science and HCI module to reflect on their learning. These students had not done any reflective writing previously, although they were given guidelines on how to write reflectively. They wrote between six and eight blog posts in total; the first and sixth blog posts were examined in the Content Analysis.

The 10 handwritten journals in the sample were completed by 3rd year Nursing students. They were used by students to reflect on their practice while they were on work placement. These students were also given guidelines on how to reflect, and as 3rd year Nursing students they all had previous experience of reflective writing (as Reflective Practice is part of their course from Year One onwards). As with the blogs, the first and sixth journal entries were examined (all the journals had at least six entries).

The average word count for the blog sample was 1184 words, whereas the average word count in the journals was 438 words. The average number of references found in blogs was 18; in the journals, the average number of references was 12. In Figure 7.5 the number of references to each indicator can be seen for both blogs and journals. It can be seen that the blogs contained a far greater number of references to Indicators 1, 2, 3 and 6 and slightly more references to Indicators 4, 7 and 9. Journals, on the other hand, contained slightly more references to Indicators 5, 8, 10, 11 and 12.
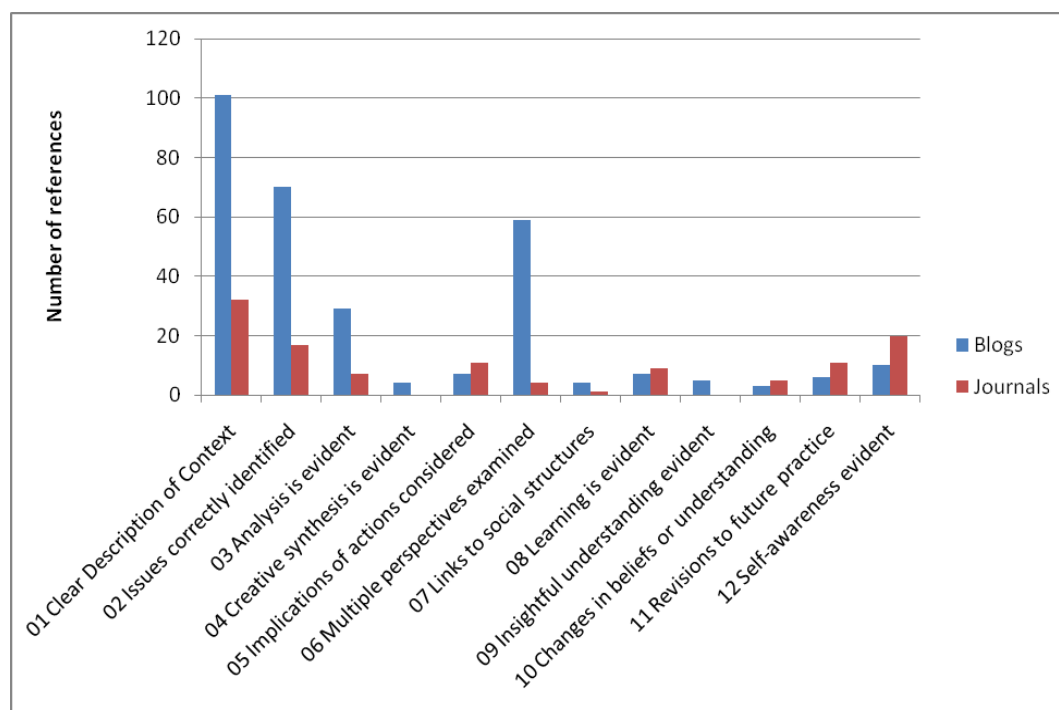
Figure 7.5: Number of references - blogs vs. journals

Earlier, the percentage coverage of text by each indicator was examined, and it was found that most of the writing done by students was either descriptive or representative of low-level reflection and that references to high-level reflection indicators tended to be brief in terms of word count. Figure 7.6 examines percentage coverage of text by indicators and compares blogs and journals in this regard.
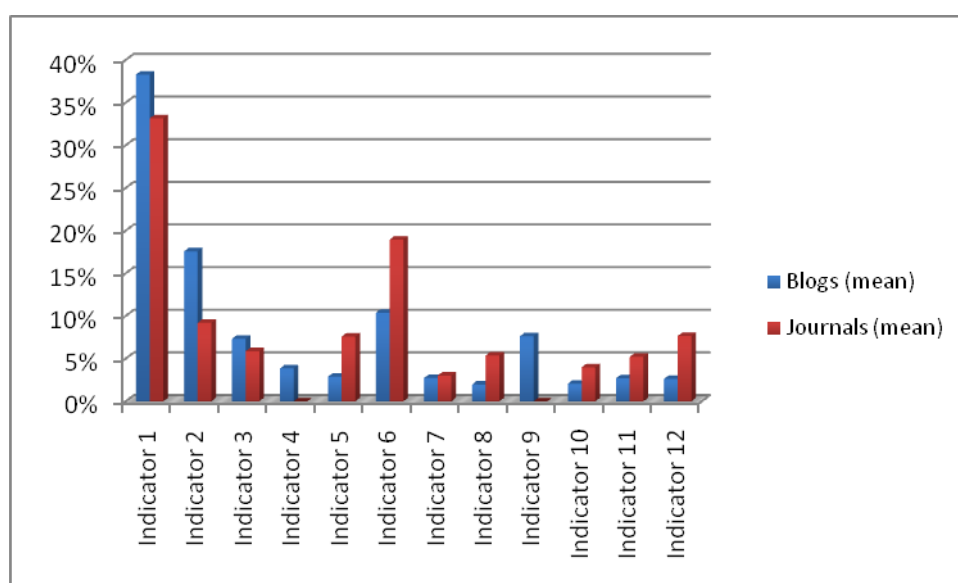
Figure 7.6: Percentage coverage of text - blogs vs. journals

It can be seen in Figure 7.6 that both blogs and journals contain mostly descriptive writing, and that the amounts are similar (38% and 33%, respectively). Earlier, a Pearson's *r* correlation test showed that there was a strong negative correlation between text coverage and indicator weighting (meaning that higher-weighted reflection indicators tended to be the least represented in the text, or vice versa). Similar results are found here when examining the blog and journal samples separately. Performing this test on the blog sample alone gives a result of -0.557, a strong negative correlation (Muijs, 2011). When performed on the journal sample, the result is -0.401, indicating a moderate negative correlation.

The 12 reflection indicators were previously examined in four groups: Descriptive (Indicator 1), Low-level reflection (Indicators 2 – 4), Medium-level reflection (Indicators 5 – 7) and High-level reflection (Indicators 8 – 12). The number of references found at each of these groups is examined once again in Figure 7.7, but with comparisons made between the blog and journal groups.
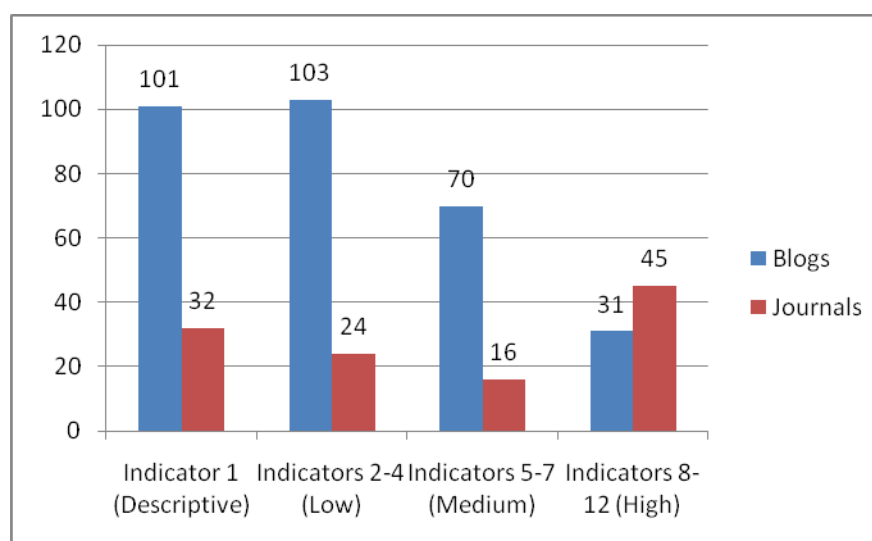
Figure 7.7: References and levels of reflection - blogs vs. journals

Figure 7.7 shows that, at the descriptive, low and medium levels, the blogs contained far more references than the journals (up to three or four times as many). However, it can be seen that, at the high level of reflection, the journals contained more references than

the blogs. In Table 7.3 the levels of reflection found in the blog group are compared with those found in the journal group.

Table 7.3: Levels of reflection (Blogs vs. Journals)

Level of reflection	Blogs	Journals
Description	100.0%	100.0%
Low-level reflection (Indicators 2-4)	70.6%	46.7%
Medium-level reflection (Indicators 5-7)	45.1%	33.3%
High-level reflection (Indicators 8-12)	28.2%	50.0%

In Table 7.3 it can be seen that all 27 students had examples of descriptive writing in their blogs or journals. The blogs contained a greater amount of low-level and medium-level reflection, while high-level reflection was seen more frequently in the journal group.

The statistical significance of these differences was assessed using independent *t*-tests and the effect size was measured using Cohen's *d*. These results are seen in Table 7.4. An independent *t*-test examines the difference between two groups in a sample and determines the significance of any differences found. In examining the difference between the blog and journal groups, there was found to be a significant difference (at the 0.01 level) between the amounts of descriptive writing found in the blog group and the journal group; the same is true in terms of the amount of low-level reflection found. At the 0.05 level of significance there was found to be a significant difference between blogs and journals in terms of both medium and high-level reflection.

Table 7.4: Differences in groups: significance and effect size

	t^7	df	sig (p)	Mean A	Mean B	SD A	SD B	Pooled SD	Cohen's d	Strength
Descriptive	3.767**	23.6	0.001	5.94	3.20	2.609	1.135	1.872	1.46	Strong
Low	3.085**	25.0	0.005	6.06	2.40	3.436	1.897	2.667	1.37	Strong
Medium	2.189*	25.0	0.038	4.12	1.60	3.276	2.011	2.644	0.95	Moderate
High	-2.611*	11.7	0.023	1.82	4.50	1.510	3.028	2.269	-1.18	Strong

[7] *Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

A subsequent test of 'effect size' determines the strength of the differences seen between the two groups; Cohen's *d* can be used for this purpose (Muijs, 2011). A benchmark for interpreting the *d* value was suggested by Cohen (1988):

0 – 0.20: weak

0.21 – 0.50: modest

0.51 – 1.00: moderate

>1.00: strong

In the case of medium-level reflection the effect size was found to be moderate; for descriptive writing, low-level reflection and high-level reflection the effect size was strong.

These differences are discussed in Chapter 8: Evaluation of Findings. First, however, the reflective scores assigned to blogs and journals are examined.

7.1.4 Reflective scores

Chapter 6 elucidated the method for assigning a score to a piece of reflective writing. In Table 7.5 the total reflective score for each blog and journal can be seen. Later, the differences between the blog and journal groups are reported and the improvement over time is examined. First, the reflective scores are correlated with the total word count. In addition to this, the reflective scores assigned by the instrument are compared with the original grades given to students.

As Table 7.5 demonstrates, the total word count varied greatly, from 102 words to 1,764 words. The mean word count was 908 words; the mean reflective score was 0.83733. There is a moderate positive correlation (Muijs, 2011) of 0.325 between reflective score and word count. This is not a statistically significant relationship (*p*-value 0.098) but is nonetheless interesting, as it shows that an increased word count does not automatically mean a higher reflective score: if this was the case, a stronger correlation would have been expected.

Table 7.5: Word Count vs. Reflective Score

	Word Count	Reflective Score
BlogAuthor01	1056	0.76726
BlogAuthor02	1197	0.72268
BlogAuthor03	1742	0.82307
BlogAuthor04	591	0.32714
BlogAuthor05	997	0.93011
BlogAuthor06	951	0.94556
BlogAuthor07	997	0.65533
BlogAuthor08	1217	1.32845
BlogAuthor09	600	0.21685
BlogAuthor10	991	0.48268
BlogAuthor11	960	0.54399
BlogAuthor12	1760	1.63178
BlogAuthor13	1163	0.75423
BlogAuthor14	1764	1.24426
BlogAuthor15	1156	0.35790
BlogAuthor16	1367	0.85092
BlogAuthor17	1624	0.70830
JournalAuthor01	102	0.02608
JournalAuthor02	479	1.75236
JournalAuthor03	396	1.13198
JournalAuthor04	318	0.82339
JournalAuthor05	361	1.00342
JournalAuthor06	266	0.28713
JournalAuthor07	191	0.11363
JournalAuthor08	386	1.37873
JournalAuthor09	425	1.23275
JournalAuthor10	1458	1.56794
Mean	**908**	**0.83733**

The reflective scores assigned using the Reflective Writing Assessment Instrument were compared with students' original grades for the purpose of achieving triangulation of results. A Pearson's *r* correlation coefficient was used to compare reflective scores and original grades.

The average score assigned by the instrument was 0.7818 and the average grade given by the lecturer was 70%. Interestingly, the students with the lowest and highest original grades also had the lowest and highest reflective scores (BlogAuthor09 and BlogAuthor12, respectively).

Table 7.6: Comparison of reflective scores and original grades (blogs)

	Score with instrument (sorted from low to high)	Original grade (without instrument)
BlogAuthor09	0.21685	46%
BlogAuthor04	0.32714	54%
BlogAuthor15	0.35790	56%
BlogAuthor10	0.48268	68%
BlogAuthor11	0.54399	80%
BlogAuthor07	0.65533	59%
BlogAuthor17	0.70830	48%
BlogAuthor02	0.72268	70%
BlogAuthor13	0.75423	72%
BlogAuthor01	0.76726	75%
BlogAuthor03	0.82307	81%
BlogAuthor16	0.85092	83%
BlogAuthor05	0.93011	84%
BlogAuthor06	0.94556	76%
BlogAuthor14	1.24426	75%
BlogAuthor08	1.32845	80%
BlogAuthor12	1.63178	88%

There was found to be a strong correlation between the score assigned by the instrument and the original grade (Pearson's r: 0.719; p value: 0.001). This result is statistically significant (at the 0.01 level of significance).

The journal scores (assigned by the instrument) were also compared with the original grades given to these students. The average score using the Reflective Writing Assessment Instrument was 0.9317 and the average grade was 69%.

Table 7.7: Comparison of reflective scores and original grades (journals)

	Score with instrument (sorted from low to high)	Original grade (without instrument)
JournalAuthor01	0.02608	67%
JournalAuthor07	0.11363	67%
JournalAuthor06	0.28713	69%
JournalAuthor04	0.82339	70%
JournalAuthor05	1.00342	62%
JournalAuthor03	1.13198	76%
JournalAuthor09	1.23275	79%
JournalAuthor08	1.37873	62%
JournalAuthor10	1.56794	66%
JournalAuthor02	1.75236	75%

There was found to be a modest, not statistically significant, correlation between the score assigned by the instrument and the original grade (Pearson's r: 0.226; p value: 0.531). It should be noted that the original grade for the journal group was for the entire

module, rather than the reflective journal itself; information on the breakdown of grades was not available. The reflective journal constituted only 25% of this module; therefore, 75% of this grade was for other activities that relate to the Applying Caring in Practice module. The grade for the blogs, on the other hand, solely relates to the reflective blogging assignment. These findings in relation to reflective score are discussed in Chapter 8. In the next section the degree to which reflective scores improved over time is examined.

7.1.5 Improvement over time

The first and sixth posts were included in the analysis so that improvement over time could be measured. The reflective score for each blog and journal can be seen in Table 7.8. In addition to this, the score for the first and sixth post of each blog and journal is shown. The mean reflective score for blogs was 0.7818, whereas for journals it was 0.9317 (almost 20% higher).

It was expected that the reflective score would improve from the first post to the sixth. However, this turned out not to be the case; on average, scores were 23% worse in the sixth post than they were in the first. The average score for Post 1 was 0.4740 and the average score for Post 6 was 0.3633. The lack of improvement in scores was seen in both blogs (where the sixth post had a score that was 26% lower than the first) and journals (where the later post was scored 18% lower).

Table 7.8: Reflective scores and improvement over time

	Total Score	Post 1 Score	Post 6 Score	Improvement?	Percentage
BlogAuthor1	0.7673	0.7412	0.0261	-0.7151	-96%
BlogAuthor2	0.7227	0.5053	0.2174	-0.2879	-57%
BlogAuthor3	0.8231	0.6153	0.2078	-0.4075	-66%
BlogAuthor4	0.3271	0.1649	0.1623	-0.0026	-2%
BlogAuthor5	0.9301	0.4170	0.5132	0.0962	23%
BlogAuthor6	0.9456	0.7508	0.1948	-0.5560	-74%
BlogAuthor7	0.6553	0.3379	0.3174	-0.0205	-6%
BlogAuthor8	1.3285	0.7136	0.6148	-0.0988	-14%
BlogAuthor9	0.2169	0.1197	0.0971	-0.0226	-19%
BlogAuthor10	0.4827	0.1067	0.3760	0.2693	252%
BlogAuthor11	0.5440	0.1783	0.3657	0.1875	105%
BlogAuthor12	1.6318	1.0264	0.6054	-0.4210	-41%
BlogAuthor13	0.7542	0.5531	0.2012	-0.3519	-64%
BlogAuthor14	1.2443	0.2849	0.9593	0.6744	237%
BlogAuthor15	0.3579	0.1727	0.1852	0.0125	7%
BlogAuthor16	0.8509	0.5193	0.3316	-0.1877	-36%
BlogAuthor17	0.7083	0.4355	0.2728	-0.1628	-37%
JournalAuthor1	0.0261	0.0130	0.0130	0.0000	0%
JournalAuthor2	1.7524	1.4793	0.2730	-1.2063	-82%
JournalAuthor3	1.1320	1.0258	0.1061	-0.9197	-90%
JournalAuthor4	0.8234	0.3989	0.4245	0.0255	6%
JournalAuthor5	1.0034	0.4938	0.5096	0.0158	3%
JournalAuthor6	0.2871	0.1518	0.1353	-0.0165	-11%
JournalAuthor7	0.1136	0.1006	0.0130	-0.0876	-87%
JournalAuthor8	1.3787	0.7211	0.6577	-0.0634	-9%
JournalAuthor9	1.2328	0.2595	0.9733	0.7139	275%
JournalAuthor10	1.5679	0.5124	1.0556	0.5432	106%

	Total Score	Post 1 Score	Post 6 Score	Improvement?	Percentage
Blog Mean	0.7818	0.4496	0.3322	-0.1173	-26%
Journal Mean	0.9317	0.5156	0.4161	-0.0995	-19%
Overall Mean	*0.8373*	*0.4740*	*0.3633*	*-0.1107*	*-23%*

It was expected that both blogs and journals would show improvement in their reflective score over time. Given the unexpected results seen here, it was decided to further explore the differences between the number of indicators used in the first and sixth posts.

In Figure 7.8, the differences between the reflective scores for blogs and journals are summarised. It can be seen that the journal group consistently score higher than the blog group, and that in both, the score for the sixth post was lower than the score for the first post.
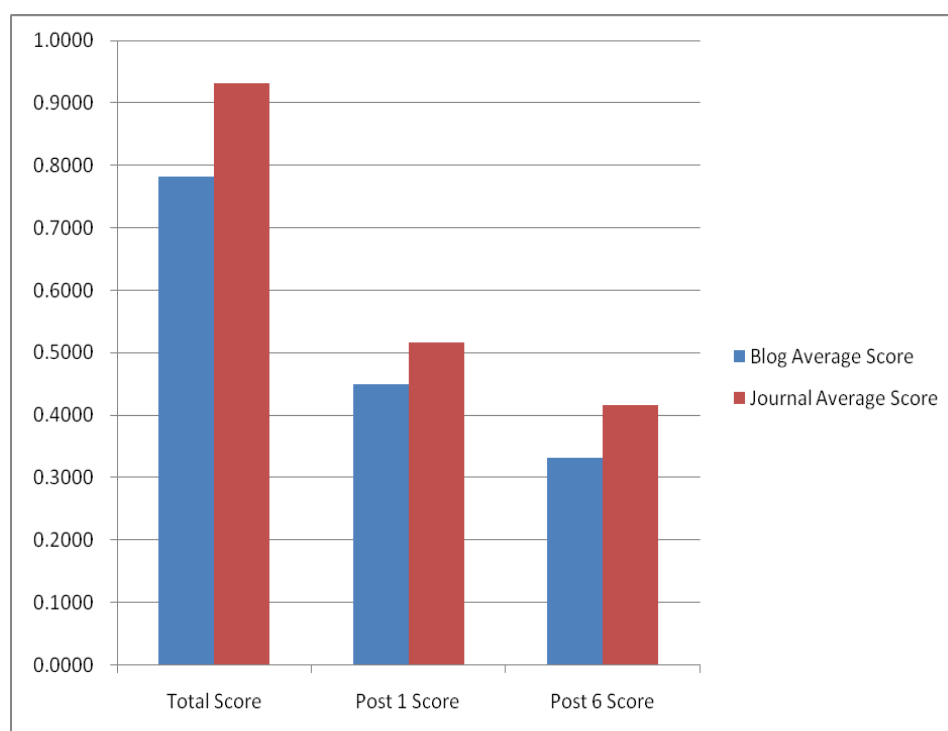
Figure 7.8: Reflective scores summary chart

The difference between the reflective scores seen in the blog and journal groups was examined using an independent samples *t*-test. The results of this test are presented in Table 7.9. It can be seen that there was no significant difference between the reflective scores given to the blog and journal group. This is the case for the total score, the Post 1 score and the Post 6 score.

Table 7.9: Reflective scores: blogs vs. journals

	t	*df*	*sig*	*Mean A*	*Mean B*	*SD A*	*SD B*	*Pooled SD*	*Cohen's d*	*Strength*
Total score	-0.707	13	0.492	0.78	0.93	0.368	0.608	0.488	-0.31	Weak
Post 1 score	-0.479	25	0.636	0.45	0.52	0.265	0.456	0.360	-0.18	Weak
Post 6 score	-0.716	25	0.480	0.33	0.42	0.231	0.381	0.306	-0.27	Weak

Next, the type of writing (reflective or descriptive) found in the first and sixth posts was considered. Below, the number of references to reflection indicators found in each post is compared. Indicators have been grouped into the descriptive and reflective (low,

medium and high) categories once again for ease of description. Figure 7.9 shows the number of references to reflection indicators by all 27 blogs and journals. It can be seen that the only category to increase from Post 1 to Post 6 was description: all types of reflection (low, medium and high) showed a decrease in the sixth post.
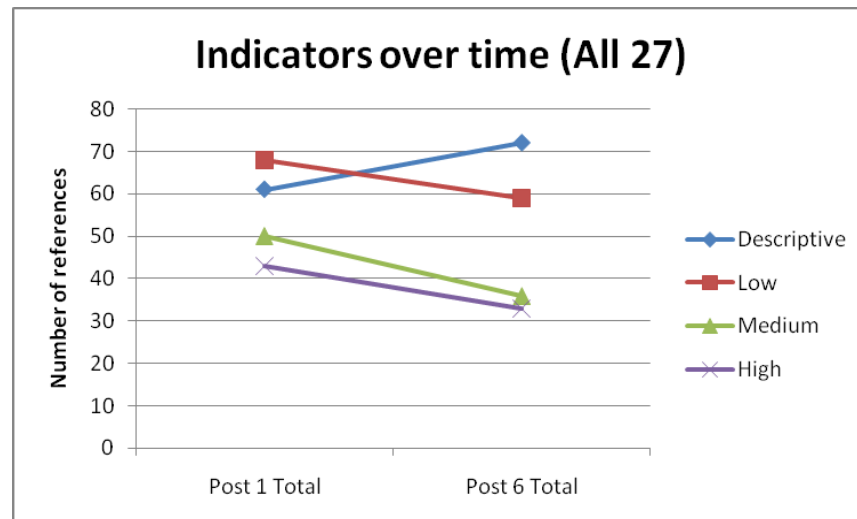
Figure 7.9: Indicators over time (All 27)

The same was found to be true for the group of 17 blogs, as demonstrated in Figure 7.10. A decrease in low, medium and high-level reflection was seen between the first and sixth post, with a slight increase in the number of descriptive references.
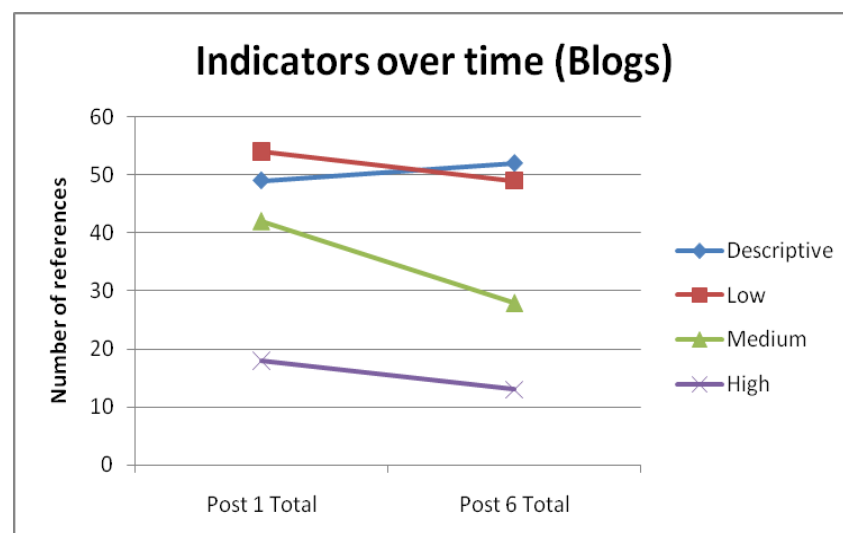
Figure 7.10: Indicators over time (Blogs)

Similar results were seen in the sample of 10 journals. Figure 7.11 shows that there was an increase seen in the descriptive category between the first and sixth post. A decrease in the number of references was found in relation to the low and high levels of reflection. The amount of medium-level reflection was found to be the same in both posts.
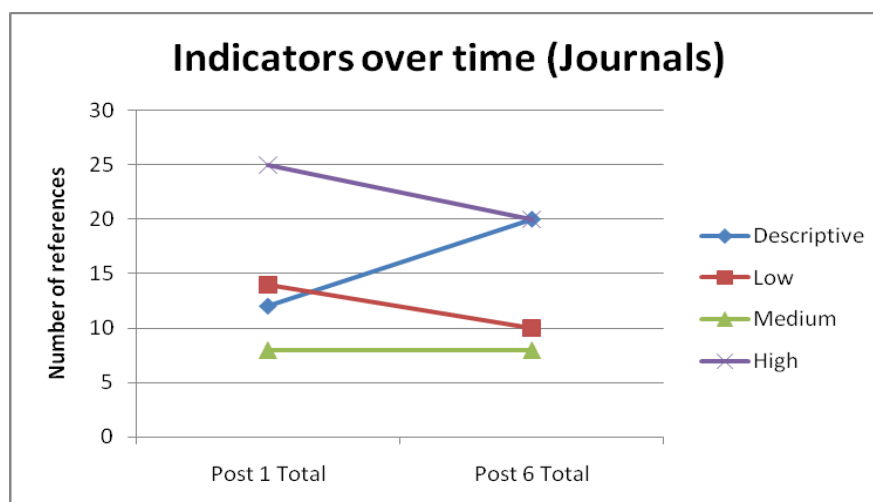
Figure 7.11: Indicators over time (Journals)

It was then decided to compare the Post 1 and Post 6 samples using a paired *t*-test to assess the statistical difference between the samples. First, the number of indicators found at Post 1 and Post 6 were compared for all 27 blogs and journals. With a sample size of 27 the degrees of freedom (*df*) is 26; the critical value for t_{26} at the 0.05 level of significance is 2.056. This means that if the test result falls within the range of values from -2.056 to 2.056 there can be 95% confidence that there is no significant difference between the reflection indicators found in Post 1 and those found in Post 6.

Table 7.10 shows the results of the *t*-test for each indicator. In most cases there was no significant difference found between the number of indicators in the first and sixth posts. However, in two cases (Indicators 4 and 6) there was found to be a significant difference between the number of references in the first and sixth posts, at the 0.05 level. These indicators were subsequently tested at the 0.01 level of significance (where the critical value for t_{26} is 2.779). At the 0.01 level of significance, a wider range of values is examined (from -2.779 to 2.779). If the test result falls between these values, there can be 99% confidence that there is no significant difference between the

reflection indicators found in Post 1 and those found in Post 6. At the 0.01 level, no significant difference was found between the first and sixth posts for Indicators 4 and 6.

Therefore, it can be said that there is no significant difference (statistically speaking) between the number of references to reflection indicators in the first and sixth posts of the blogs and journals examined.

Table 7.10: Indicators in Post 1 vs. 6 – Paired *t*-test results

	Mean (d)	St. Dev. (s)	Test Statistic	Comment
Indicator 1	-0.407	1.647	-1.285	Not Significant (0.05 level)
Indicator 2	0.111	1.219	0.473	Not Significant (0.05 level)
Indicator 3	0.074	1.269	0.303	Not Significant (0.05 level)
Indicator 4	0.148	0.362	2.126	Not Significant (0.01 level)
Indicator 5	-0.296	0.775	-1.986	Not Significant (0.05 level)
Indicator 6	0.630	1.523	2.148	Not Significant (0.01 level)
Indicator 7	0.185	0.622	1.546	Not Significant (0.05 level)
Indicator 8	0.000	0.920	0.000	Not Significant (0.05 level)
Indicator 9	0.111	0.424	1.363	Not Significant (0.05 level)
Indicator 10	0.074	0.550	0.700	Not Significant (0.05 level)
Indicator 11	-0.111	0.641	-0.901	Not Significant (0.05 level)
Indicator 12	0.296	1.409	1.093	Not Significant (0.05 level)

This result was also confirmed on the blog and journal samples individually. There were 17 blogs in the sample, giving a *df* (degrees of freedom) of 16. The critical value for t_{16} is 2.120 at the 0.05 significance level. There was no significant difference found at the 0.05 level for 10 out of the 12 indicators. The other two (Indicators 4 and 11) showed no significant difference at the 0.01 level (which for t_{16} is 2.921). These results are presented in Table 7.11.

Table 7.11: Indicators in Post 1 vs. 6 – Paired *t*-test results (blogs only)

	Mean (d)	St. Dev. (s)	Test Statistic	Comment
Indicator 1	-0.176	1.879	-0.387	Not Significant (0.05 level)
Indicator 2	-0.118	1.166	-0.416	Not Significant (0.05 level)
Indicator 3	0.176	1.468	0.496	Not Significant (0.05 level)
Indicator 4	0.235	0.437	2.219	Not Significant (0.01 level)
Indicator 5	-0.294	0.686	-1.768	Not Significant (0.05 level)
Indicator 6	0.882	1.867	1.949	Not Significant (0.05 level)
Indicator 7	0.235	0.752	1.289	Not Significant (0.05 level)
Indicator 8	-0.059	0.899	-0.270	Not Significant (0.05 level)
Indicator 9	0.176	0.529	1.376	Not Significant (0.05 level)
Indicator 10	0.176	0.393	1.852	Not Significant (0.05 level)
Indicator 11	-0.235	0.437	-2.219	Not Significant (0.01 level)
Indicator 12	0.235	0.664	1.461	Not Significant (0.05 level)

There were 10 journals in the sample; the critical value for t_9 is 2.262 at the 0.05 significance level. All of the t values for the journal sample were found to be not significant at the 0.05 significance level, as can be seen in Table 7.12.

Table 7.12: Indicators in Post 1 vs. 6 – Paired *t*-test results (journals only)

	Mean (d)	St. Dev. (s)	Test Statistic	Comment
Indicator 1	-0.800	1.135	-2.228	Not Significant (0.05 level)
Indicator 2	0.500	1.269	1.246	Not Significant (0.05 level)
Indicator 3	-0.100	0.876	-0.361	Not Significant (0.05 level)
Indicator 4	0	0	N/A	*Identical – no test required*
Indicator 5	-0.300	0.949	-1.000	Not Significant (0.05 level)
Indicator 6	0.200	0.422	1.500	Not Significant (0.05 level)
Indicator 7	0.100	0.316	1.000	Not Significant (0.05 level)
Indicator 8	0.100	0.994	0.318	Not Significant (0.05 level)
Indicator 9	0	0	N/A	*Identical – no test required*
Indicator 10	-0.100	0.738	-0.429	Not Significant (0.05 level)
Indicator 11	0.100	0.876	0.361	Not Significant (0.05 level)
Indicator 12	0.400	2.221	0.569	Not Significant (0.05 level)

When scoring the first and sixth posts, similar results were seen in terms of blogs and journals (and both groups combined). There was no significant difference in the reflective scores assigned. The amount of descriptive writing increased over time in all groups, while all groups showed a decrease in the amount of reflective writing. Finally there was no significant difference in the amount of reflection indicators used in the first and sixth posts (in any of the groups). These results are discussed in further detail in Chapter 8: Evaluation of Findings, where they are compared with results from other studies that assessed the degree to which students' reflective writing improved over time. Next, the effect of feedback on reflective score is examined.

7.1.6 Effect of feedback

The effect of feedback on students' reflective scores (and the degree to which they improved over time) was examined. The Nursing students (in the journal group) did not receive any feedback on their reflective writing during the course of their assignment; therefore, these results only relate to the blog group.

In Table 7.13 the amount of feedback received by students can be seen. Students were told that they would receive feedback on their reflective writing if they posted to their blog on a regular basis. Nine out of the seventeen students did this; the rest added all their blog posts in the days leading up to the deadline[8] (and therefore did not receive any feedback).

Feedback took the form of a comment on the student's blog. As seen in Table 7.13, students who did get feedback received between 1 and 4 comments. Of the nine students who received feedback, only eight of these are included in the analysis that follows. It was decided to exclude the results of any student who submitted their work past the assignment deadline (Friday 4th May 2007 and Friday 21st March 2008 for the two groups, respectively). The students whose results are excluded are highlighted in red in Table 7.13. This affects BlogAuthor01 (as he is the only student who did receive feedback but also submitted work past the deadline). This student performed significantly worse in the sixth post (perhaps unsurprisingly) and consequently including this data causes the results on the effect of feedback to be skewed.

Table 7.13: Students who received feedback

Student	Date 1st post	Date 6th post	Number of days	Number of comments
BlogAuthor01	26/03/2007	07/05/2007	42	2
BlogAuthor04	09/03/2007	01/05/2007	53	2
BlogAuthor05	13/03/2007	03/05/2007	51	2
BlogAuthor09	26/03/2007	01/05/2007	36	1
BlogAuthor10	03/05/2007	04/05/2007	1	0
BlogAuthor11	14/05/2007	16/05/2007	2	0
BlogAuthor16	16/04/2007	01/05/2007	15	2
BlogAuthor02	04/03/2008	19/03/2008	15	1
BlogAuthor03	20/03/2008	20/03/2008	0	0
BlogAuthor06	20/03/2008	20/03/2008	0	0
BlogAuthor07	18/03/2008	27/03/2008	9	0
BlogAuthor08	19/03/2008	19/03/2008	0	0
BlogAuthor12	19/03/2008	20/03/2008	1	0
BlogAuthor13	11/02/2008	18/03/2008	36	2
BlogAuthor14	11/02/2008	17/03/2008	35	4
BlogAuthor15	27/01/2008	27/02/2008	31	3
BlogAuthor17	20/03/2008	21/03/2008	1	0

---

[8] The assignment deadlines for the academic years 06/07 and 07/08 were Friday 4th May 2007 and Thursday 20th March 2008, respectively.

Table 7.14 presents the scores for the eight students who did receive feedback. There was found to be a strong positive correlation between the number of comments a student received and their Post 6 score (Pearson's *r*: 0.741; *p*-value: 0.036). Similarly, there is a strong positive correlation between the number of comments received and overall improvement (Pearson's *r*: 0.763; *p*-value 0.028). Both of these relationships are statistically significant at the 0.05 level.

Table 7.14: Feedback details

Student	Date 1st post	Date 6th post	Number of days	Number comments	Post 1 Score	Post 6 Score	Improved?	Total Score
BA04	09/03/07	01/05/07	53	2	0.1649	0.1623	-0.0026	0.3271
BA05	13/03/07	03/05/07	51	2	0.4170	0.5132	0.0962	0.9301
BA09	26/03/07	01/05/07	36	1	0.1197	0.0971	-0.0226	0.2169
BA16	16/04/07	01/05/07	15	2	0.5193	0.3316	-0.1877	0.8509
BA02	04/03/08	19/03/08	15	1	0.5053	0.2174	-0.2879	0.7227
BA13	11/02/08	18/03/08	36	2	0.5531	0.2012	-0.3519	0.7542
BA14	11/02/08	17/03/08	35	4	0.2849	0.9593	0.6744	1.2443
BA15	27/01/08	27/02/08	31	3	0.1727	0.1852	0.0125	0.3579

The relationship between improvement in score and number of days was also examined (to determine whether this might be the reason for changes seen, rather than the number of comments received). A weak positive correlation was found between Post 6 score and the number of days between the first and sixth posts (Pearson's *r*: 0.085; *p*-value 0.841). A moderate positive correlation was found between the number of days between Post 1 and Post 6 and the overall improvement seen (Pearson's *r*: 0.336; *p*-value 0.417). Neither of these relationships is statistically significant.

Although it was seen that there is a correlation between the number of comments a student received and the degree to which their reflective score improved, there was still a slight decrease seen in reflective scores over time. On average, there was a reduction in score of 2.5% between the first and sixth posts. However, this decrease pales in comparison to the one seen in the blog sample overall (where scores were 26% lower in the sixth post).

Changes over time in the type of writing done by students who received feedback were examined. These are presented in Figure 7.12. It can be seen that (like the groups of 17

blogs and 10 journals examined earlier) the amount of descriptive writing increased between the first and sixth posts. The levels of low and high-level reflection, however, have remained constant and the quantity of medium-level reflection has increased slightly. This is in contrast to what was seen in either the blog or journal groups examined earlier.
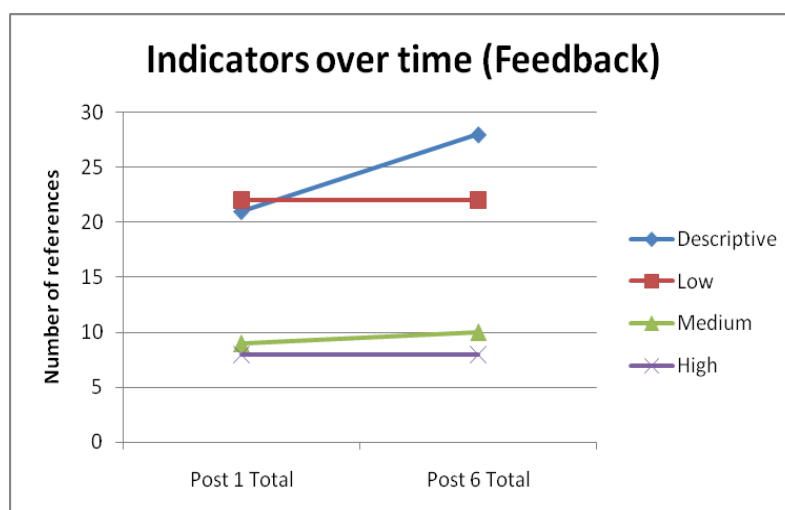
Figure 7.12: Indicators over time (feedback group)

This result is examined in Chapter 8: Evaluation of Findings. In the next section, the results of the linguistic analysis are presented.

7.2 Linguistic structure

Once the content analysis was completed, the sample of text that was coded using the Reflective Writing Assessment Instrument was examined in the context of a Systemic Functional Linguistics framework. This was based on the linguistic resources described by Ryan (2011), as discussed in Section 3.2. Chapter 4 discussed the decision to combine appraisal and reasoning resources for the purposes of this analysis, meaning that there were ten groups of linguistic resources under examination.

A subset of the 27 blogs and journals were included in the linguistic analysis: the nine highest-scoring and the nine lowest-scoring. The high-scoring group consisted of six

journals and three blogs; the low-scoring group consisted of three journals and six blogs. Later in this section, the differences between the high-scoring and low-scoring groups are considered. The language used in blogs is compared with that used in journals, and comparisons are also made between the language used in the first and sixth post. First, the number of linguistic resources found in students' writing is considered, and correlations between linguistic resources and reflection indicators are examined.

The total number of words coded in the linguistic analysis was 14,100. In this sample, 1,310 linguistic resources were identified. Figure 7.13 breaks this total down by linguistic resource. It can be seen that the most frequently used resource was First person voice (364 resources identified). The least used resource was Future tense verbs (with only 28 resources used).
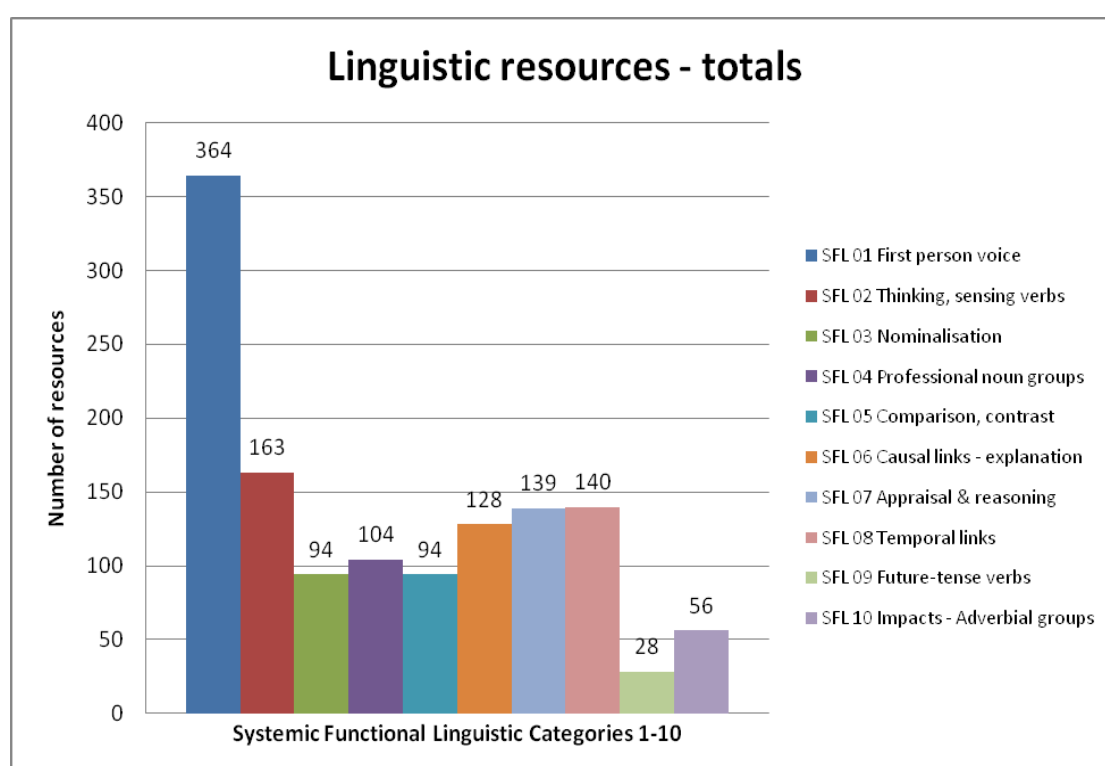
Figure 7.13: Total number of linguistic resources used

7.2.1 Linguistic resources and reflection indicators

A Pearson's *r* correlation test was performed, comparing each type of linguistic resource with the 12 reflection indicators. For each linguistic resource, a chart is presented below showing the correlations with the 12 indicators. Statistically significant results are highlighted. These results are summarised at the end of this section (in Table 7.15) and are discussed in Chapter 8: Evaluation of Findings. Note that the Pearson's *r* and *p*-values for each relationship (between the 10 types of linguistic resources and 12 reflection indicators) can be found in Appendix F: Linguistic Resources and Reflection Indicators (Pearson's *r* and *p*-values).

In Figure 7.14, the results for the first person voice resource in relation to each of the 12 indicators can be seen. The first person voice linguistic resource (SFL 01) has a strong relationship with Indicators 2, 5 and 8. The relationship between first person voice and Indicator 2 (Issues are correctly identified) is significant at the 0.05 level (Pearson's *r*: 0.548, *p*-value: 0.019). Indicator 5 (Implications of actions are considered) is also related to first person voice; this relationship is significant at the 0.05 level (Pearson's *r*: 0.514, *p*-value: 0.029). Finally, the relationship between first person voice and Indicator 8 (Learning is evident) is significant at the 0.01 level (Pearson's *r*: 0.608, *p*-value: 0.007).
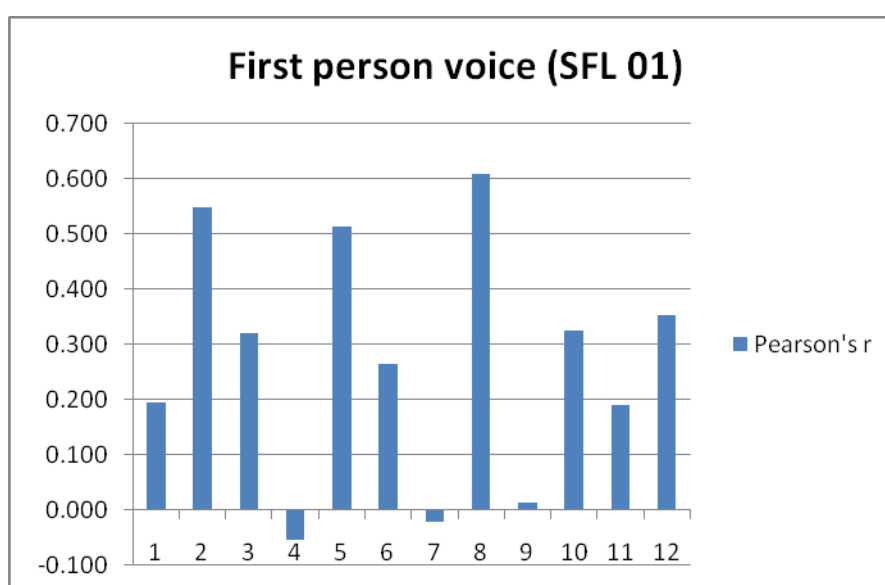
Figure 7.14: Pearson's *r* - Indicators and SFL01 Resources

The Pearson's *r* value for the correlation between the reflection indicators and the second type of linguistic resource, thinking and sensing verbs, can be seen in Figure 7.15. This resource has a strong relationship with Indicator 2 Issues are correctly identified (Pearson's *r*: 0.576, *p*-value: 0.012) and Indicator 5 Implications of actions are considered (Pearson's *r*: 0.492, *p*-value: 0.038). Both of these relationships are statistically significant at the 0.05 level. There is also a moderate correlation (which is significant at the 0.05 level) between thinking and sensing verbs and Indicator 10 Changes in beliefs and understanding are evident (Pearson's *r*: 0.477, *p*-value: 0.045). Similarly, Indicator 12 Self-awareness is evident has a moderate correlation with thinking and sensing verbs, which is significant at the 0.05 level (Pearson's *r*: 0.502, *p*-value: 0.034).
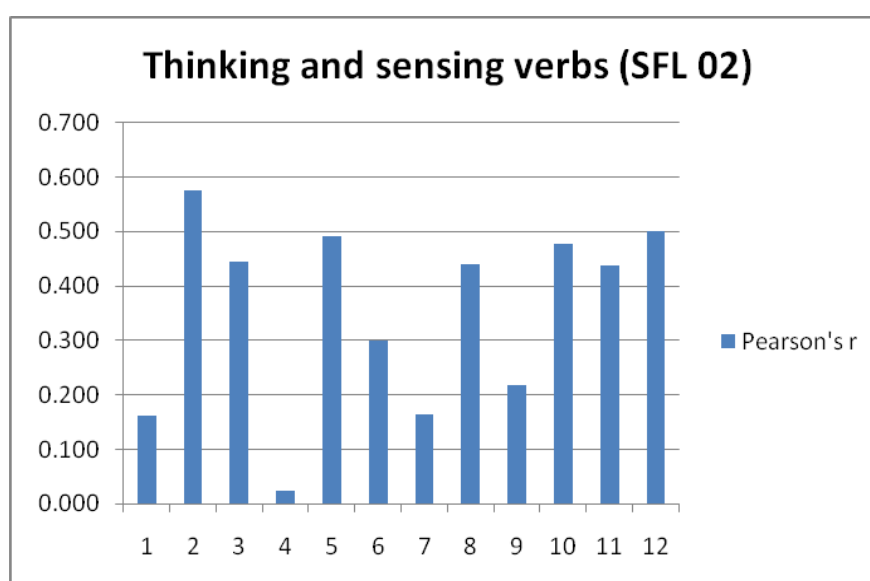
Figure 7.15: Pearson's *r* - Indicators and SFL02 Resources

The use of nominalisations has a strong correlation with Indicators 5, 6, 7 and 9, as can be seen in Figure 7.16. The relationship between nominalisations and Indicator 5 Implications of actions are considered is significant at the 0.01 level (Pearson's *r*: 0.599, *p*-value: 0.009). The use of nominalisation has a significant relationship with the following indicators at the 0.05 level: Indicator 6 Multiple perspectives are examined (Pearson's *r*: 0.559, *p*-value: 0.016), Indicator 7 Links are made to broader social

structures (Pearson's *r*: 0.508, *p*-value: 0.032) and Indicator 9 Insightful understanding evident (Pearson's *r*: 0.513, *p*-value: 0.029).
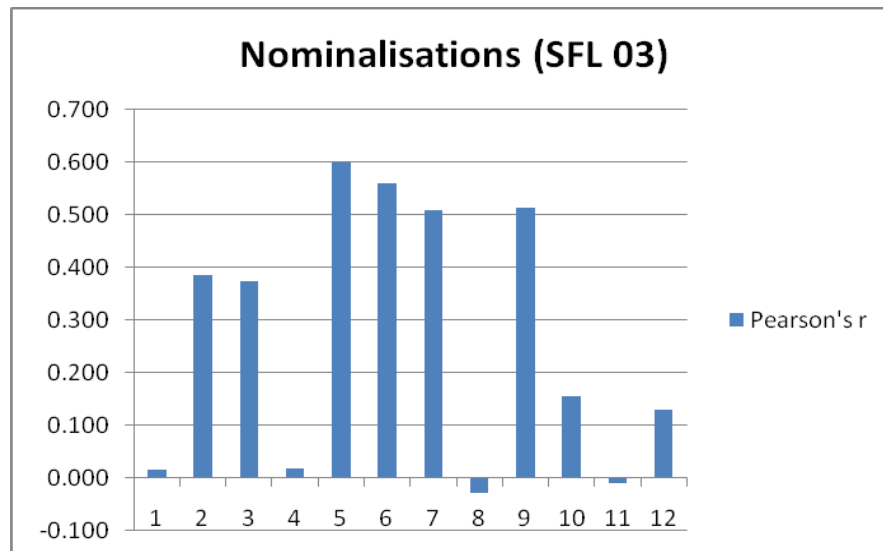
Figure 7.16: Pearson's *r* - Indicators and SFL03 Resources

The fourth type of linguistic resource that was examined (the use of professional nouns or noun groups) was found to have a strong relationship with Indicator 6 Multiple perspectives are examined (Pearson's *r*: 0.579, *p*-value: 0.012). This relationship is statistically significant at the 0.05 level.
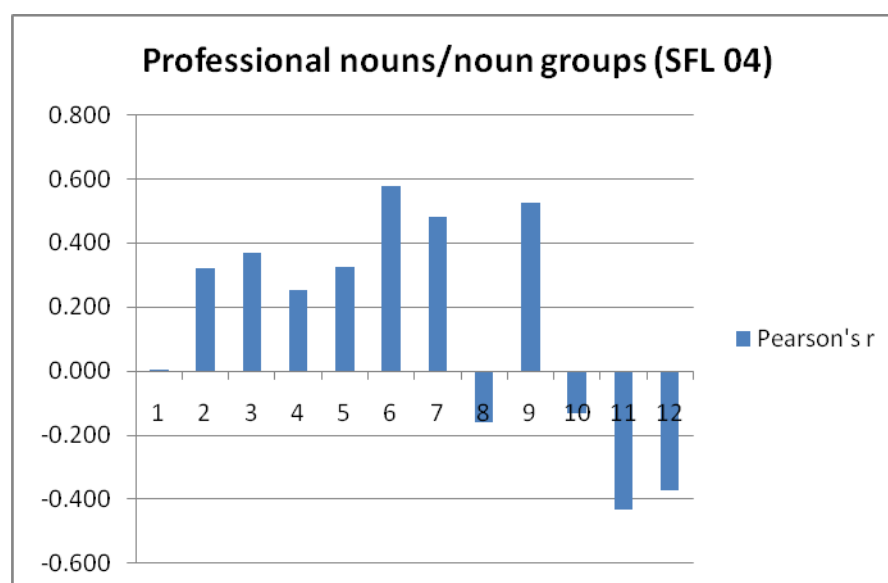
Figure 7.17: Pearson's *r* - Indicators and SFL04 Resources

The use of professional nouns also has a strong relationship with Indicator 9 Insightful understanding evident (Pearson's *r*: 0.524, *p*-value: 0.026), which is, again, significant at the 0.05 level. Finally, there is a moderate correlation between Indicator 7 Links are made to broader social structures (Pearson's *r*: 0.481, *p*-value: 0.043) and the use of professional nouns/noun groups (significant at the 0.05 level). The correlations between the SFL 04 resource and 12 reflection indicators can be seen in Figure 7.17.

There were several strong, statistically significant relationships found between the reflection indicators and the use of linguistic resources for comparing and contrasting. Figure 7.18 presents the Pearson's *r* value for each relationship. There was found to be a strong relationship, significant at the 0.01 level, between the language of comparison/contrast and the following indicators: Indicator 1 Clear description of context (Pearson's *r*: 0.670, *p*-value: 0.002), Indicator 2 Issues are correctly identified (Pearson's *r*: 0.732, *p*-value: 0.001) and Indicator 6 Multiple perspectives are examined (Pearson's *r*: 0.692, *p*-value: 0.001). There was also a strong relationship between the SFL 05 linguistic resource and both Indicator 3 Analysis is evident (Pearson's *r*: 0.539, *p*-value: 0.021) and Indicator 4 Creative synthesis is evident (Pearson's *r*: 0.583, *p*-value: 0.011), significant at the 0.05 level in both cases.
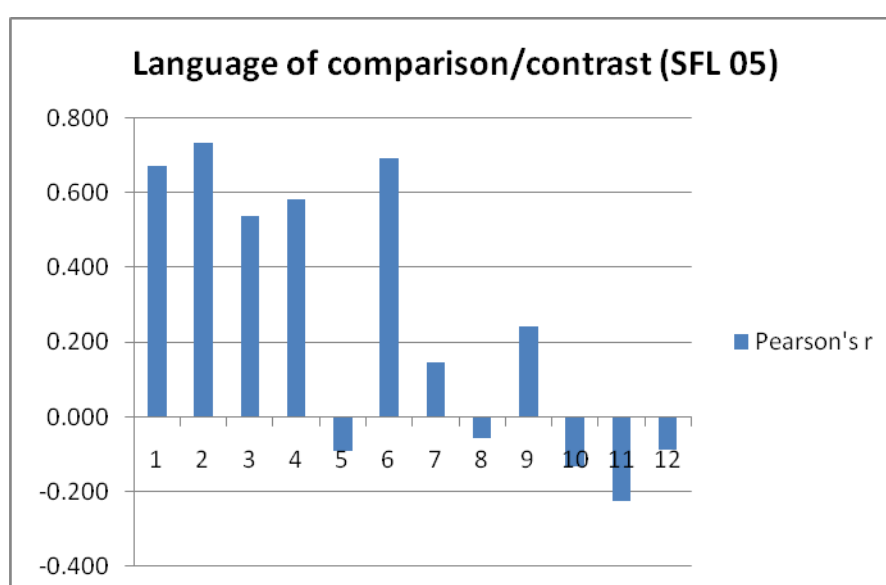
Figure 7.18: Pearson's *r* - Indicators and SFL05 Resources

The sixth type of linguistic resource included in the analysis was the use of causal links for explanation and reasoning. The correlations between the SFL 06 resource and the 12 reflection indicators can be seen in Figure 7.19.

The use of causal links has a strong relationship with both Indicator 2 Issues are correctly identified (Pearson's r: 0.641, p-value: 0.004) and Indicator 6 Multiple perspectives are examined (Pearson's r: 0.608, p-value: 0.007). Both of these correlations are significant at the 0.01 level. The SFL 06 resource also has a strong relationship, significant at the 0.05 level, with the following indicators: Indicator 3 Analysis is evident (Pearson's r: 0.551, p-value: 0.018), Indicator 5 Implications of actions are considered (Pearson's r: 0.560, p-value: 0.016) and Indicator 7 Links are made to broader social structures (Pearson's r: 0.526, p-value: 0.025). Finally, there is a moderate correlation between Indicator 9 Insightful understanding evident (Pearson's r: 0.476, p-value: 0.046) and the use of causal links (which is significant at the 0.05 level).
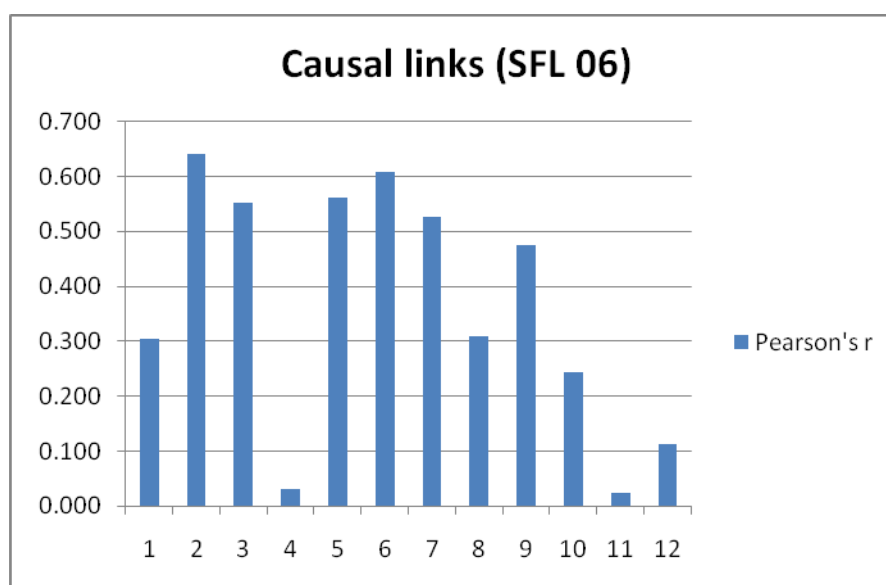
Figure 7.19: Pearson's *r* - Indicators and SFL06 Resources

The use of appraisal adjectives and reasoning adverbs was also considered. The relationships between the reflection indicators and SFL 07 resources can be seen in Figure 7.20.

There was found to be a very strong relationship between the use of appraisal and reasoning resources and Indicator 2 Issues are correctly identified (Pearson's *r*: 0.827, *p*-value: 0.000). This relationship is statistically significant at the 0.01 level. Also significant at the 0.01 level were the strong relationships between SFL 07 resources and both Indicator 3 Analysis is evident (Pearson's *r*: 0.720, *p*-value: 0.001) and Indicator 6 Multiple perspectives are examined (Pearson's *r*: 0.612, *p*-value: 0.007).

Finally, there were strong correlations found between appraisal and reasoning resources and both Indicator 7 Links are made to broader social structures (Pearson's *r*: 0.539, *p*-value: 0.021) and Indicator 9 Insightful understanding evident (Pearson's *r*: 0.588, *p*-value: 0.010). Both of these relationships were found to be statistically significant at the 0.05 level.
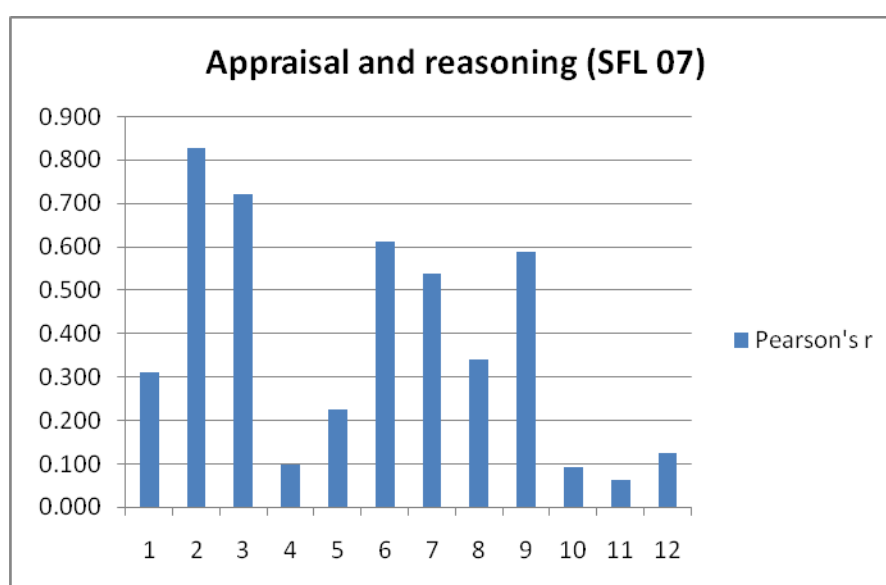
Figure 7.20: Pearson's *r* - Indicators and SFL07 Resources

The eighth group of linguistic resources examined was the use of temporal links. The Pearson's *r* value for each correlation between SFL 08 and the 12 reflection indicators can be seen in Figure 7.21. There was found to be a strong relationship between temporal links and Indicator 8 Learning is evident (Pearson's *r*: 0.506, *p*-value: 0.032), significant at the 0.05 level. Also significant at the 0.05 level was the moderate correlation between temporal links and Indicator 2 Issues are correctly identified (Pearson's *r*: 0.470, *p*-value: 0.049).
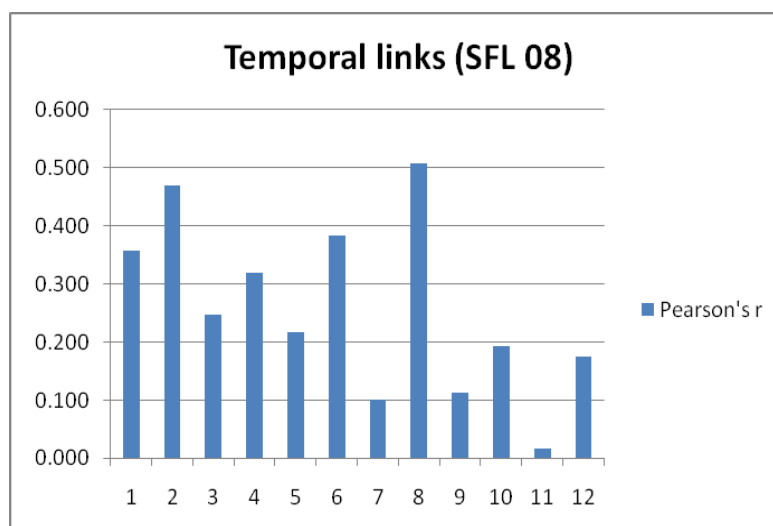
Figure 7.21: Pearson's *r* - Indicators and SFL08 Resources

The use of future tense verbs was the ninth group of linguistic resources under consideration. The correlations between the SFL 09 group and the 12 reflection indicators can be seen in Figure 7.22. There were strong correlations found between the use of future tense verbs and the following indicators: Indicator 7 Links are made to broader social structures (Pearson's *r*: 0.521, *p*-value: 0.027), Indicator 9 Insightful understanding evident (Pearson's *r*: 0.509, *p*-value: 0.031) and Indicator 11 Revisions to future practice are discussed (Pearson's *r*: 0.545, *p*-value: 0.019). Each of these relationships is statistically significant at the 0.05 level. There was also found to be a moderate correlation between future tense verbs and Indicator 12 Self-awareness is evident (Pearson's *r*: 0.495, *p*-value: 0.037), significant at the 0.05 level.
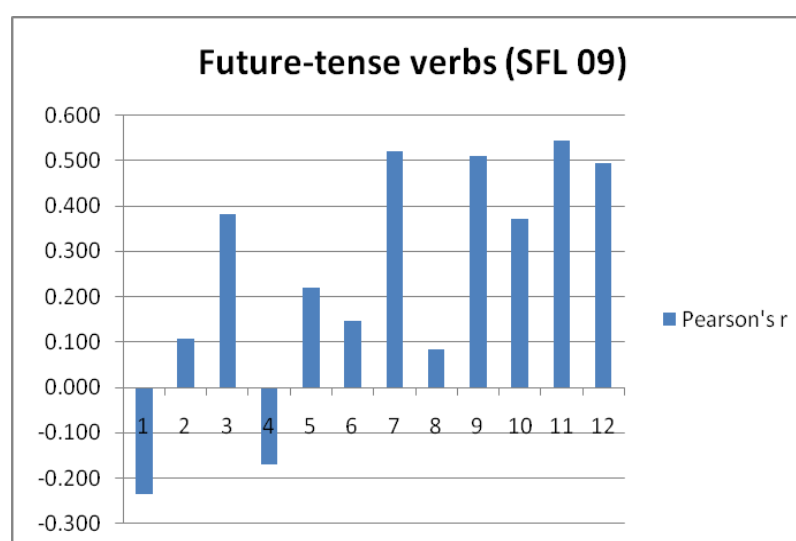
Figure 7.22: Pearson's *r* - Indicators and SFL09 Resources

The final group of linguistic resources to be examined was the use of adverbials to suggest impact. The Pearson's *r* values which demonstrate the correlations between the SFL 10 group and the reflection indicators are shown in Figure 7.23. There was found to be a strong correlation between impact-related adverbials and Indicator 5 Implications of actions are considered (Pearson's *r*: 0.542, *p*-value: 0.020). This relationship is statistically significant at the 0.05 level.
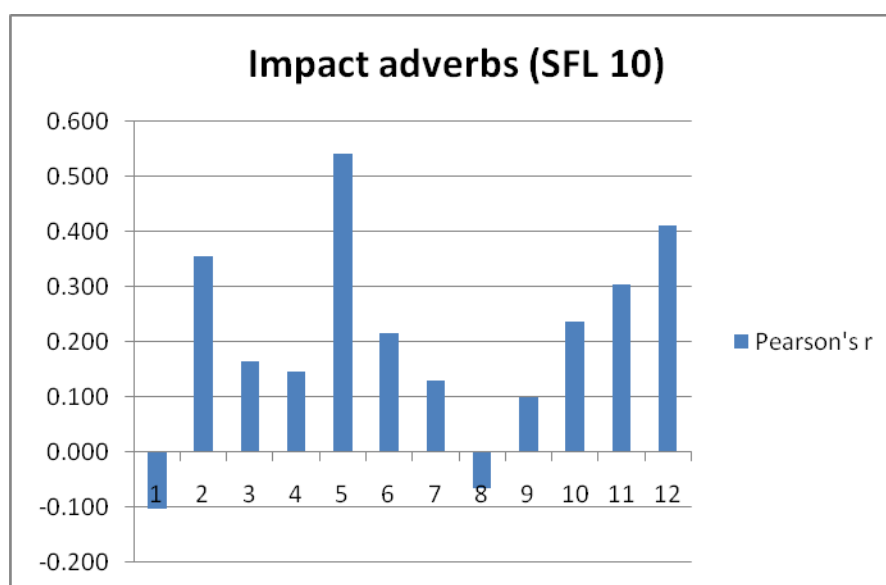
Figure 7.23: Pearson's *r* - Indicators and SFL10 Resources

The Pearson's *r* values for the relationships between the 10 types of linguistic resources and the 12 reflection indicators are presented in Table 7.15. Strong or very strong positive correlations are highlighted in blue; moderate positive correlations are shown in green. Moderate negative correlations are shown in amber. Also indicated in the table are relationships which are significant at both the 0.01 and 0.05 levels. The *p*-values for each relationship can be seen in Appendix F: Linguistic Resources and Reflection Indicators (Pearson's *r* and *p*-values).

Table 7.15: Summary of correlations - linguistic resources and indicators

	Indicator01	*Indicator02*	*Indicator03*	*Indicator04*	*Indicator05*	*Indicator06*	*Indicator07*	*Indicator08*	*Indicator09*	*Indicator10*	*Indicator11*	*Indicator12*
SFL01	0.194	**0.548***	**0.321**	-0.055	**0.514***	0.264	-0.021	**0.608****	0.013	**0.325**	0.191	**0.354**
SFL02	0.162	**0.576***	**0.445**	0.024	**0.492***	**0.300**	0.163	**0.441**	0.219	**0.477***	**0.437**	**0.502***
SFL03	0.015	**0.386**	**0.373**	0.019	**0.599****	**0.559***	**0.508***	-0.029	**0.513***	0.154	-0.009	0.131
SFL04	0.007	**0.321**	**0.369**	0.252	**0.325**	**0.579***	**0.481***	-0.160	**0.524***	-0.130	**-0.432**	**-0.372**
SFL05	**0.670****	**0.732****	**0.539***	**0.583***	-0.091	**0.692****	0.146	-0.057	0.241	-0.134	-0.226	-0.089
SFL06	**0.305**	**0.641****	**0.551***	0.030	**0.560***	**0.608****	**0.526***	**0.308**	**0.476***	0.243	0.025	0.114
SFL07	**0.311**	**0.827****	**0.720****	0.097	0.226	**0.612****	**0.539***	**0.341**	**0.588***	0.093	0.063	0.125
SFL08	**0.358**	**0.470***	0.246	**0.319**	0.217	**0.383**	0.101	**0.506***	0.113	0.194	0.016	0.175
SFL09	-0.236	0.107	**0.383**	-0.169	0.219	0.146	**0.521***	0.083	**0.509***	**0.371**	**0.545***	**0.495***
SFL10	-0.102	**0.356**	0.165	0.146	**0.542***	0.216	0.129	-0.065	0.100	0.237	**0.305**	**0.410**

Key/Legend:

Indicator01	Clear description of context
Indicator02	Issues are correctly identified
Indicator03	Analysis is evident
Indicator04	Creative synthesis is evident
Indicator05	Implications of actions considered
Indicator06	Multiple perspectives examined
Indicator07	Links to broader social structures
Indicator08	Learning is evident
Indicator09	Insightful understanding evident
Indicator10	Changes in beliefs or understanding
Indicator11	Revisions to future practice discussed
Indicator12	Self-awareness is evident

SFL01	First person voice
SFL02	Thinking, sensing verbs
SFL03	Nominalisations
SFL04	Professional noun groups
SFL05	Comparison/contrast
SFL06	Causal, explanation
SFL07	Appraisal, reasoning
SFL08	Temporal links
SFL09	Future tense
SFL10	Impact adverbials

Blue	Strong or very strong positive correlation
Green	Moderate positive correlation
Amber	Moderate negative correlation
Red	Strong or very strong negative correlation

**	Correlation is significant at the 0.01 level
*	Correlation is significant at the 0.05 level

7.2.2 Linguistic resources and reflective score

The use of linguistic resources was compared with reflective score. A strong correlation was found between the total number of linguistic resources that a student used and their reflective score (Pearson's *r*: 0.703). This relationship is statistically significant at the 0.01 level, with a *p*-value of 0.001. This result is examined in Chapter 8: Evaluation of Findings.

First, each type of linguistic resource is correlated with reflective score to determine which resources are predictors of a high reflective score. The correlations between linguistic resources and reflective score can be seen in Figure 7.24. The *r* and *p*-values for each of these relationships are presented in Table 7.16.
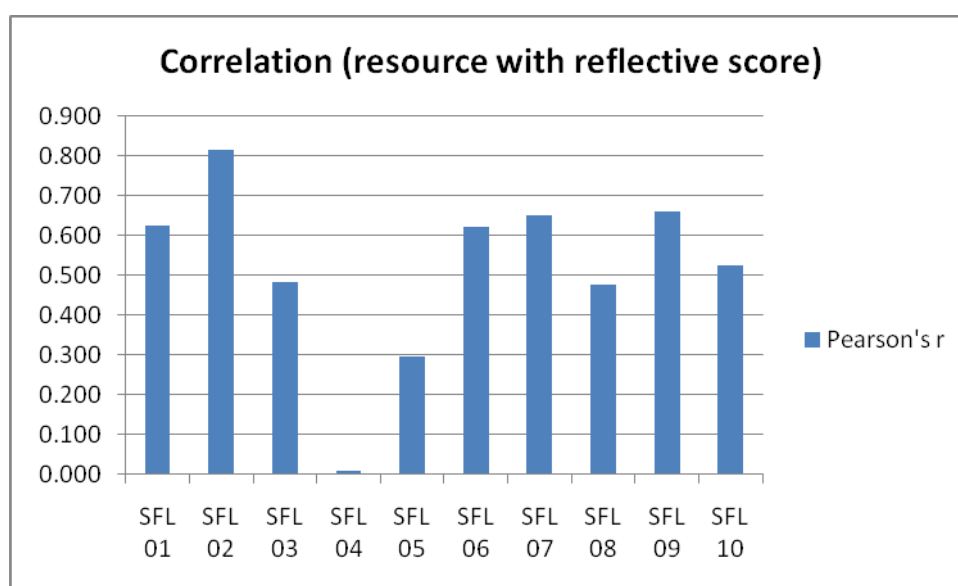
Figure 7.24: Pearson's *r* - number of resources and reflective score

There is a very strong relationship (Pearson's *r*: 0.816) between the use of SFL 02 resources (thinking and sensing verbs) and overall reflective score. This relationship is statistically significant at the 0.01 level (*p*-value: 0.000).

There are strong correlations between reflective score and the following linguistic resources: SFL 01 First person voice (Pearson's *r*: 0.626, *p*-value: 0.005), SFL 06 Causal links (Pearson's *r*: 0.621, *p*-value: 0.006), SFL 07 Appraisal and reasoning resources (Pearson's *r*: 0.650, *p*-value: 0.004) and SFL 09 Future tense verbs (Pearson's *r*: 0.659, *p*-value: 0.003). Each of these correlations is statistically significant at the 0.01 level.

There is also a strong relationship between the tenth type of linguistic resource, adverbials that suggest impact, and reflective score (Pearson's *r*: 0.524, *p*-value: 0.026). This relationship is significant at the 0.05 level. Also significant at this level is the moderate correlation between reflective score and SFL 03 resources (the use of nominalisations). The Pearson's *r* value for this correlation is 0.484, with a *p*-value of 0.042. Another moderate correlation was found between reflective score and SFL 08 resources (temporal links); this correlation was also significant at the 0.05 level (Pearson's *r*: 0.476, *p*-value: 0.046).

Finally, the SFL 04 (use of professional noun groups) and SFL 05 (language of comparison/contrast) linguistic resources only have a weak or modest correlation to reflective score, as can be seen in Table 7.16.

Table 7.16: Linguistic resources and reflective score - Pearson's *r* and *p*-value

	Pearson's *r*	***p*-value**	*Strength*	*Significance*
SFL 01	0.626	0.005	*Strong*	**
SFL 02	0.816	0.000	*Very Strong*	**
SFL 03	0.484	0.042	*Moderate*	*
SFL 04	0.010	0.968	*Weak*	
SFL 05	0.296	0.233	*Modest*	
SFL 06	0.621	0.006	*Strong*	**
SFL 07	0.650	0.004	*Strong*	**
SFL 08	0.476	0.046	*Moderate*	*
SFL 09	0.659	0.003	*Strong*	**
SFL 10	0.524	0.026	*Strong*	*

Next, the numbers of linguistic resources used were compared in two groups: high-scoring and low-scoring. The original sample of 27 blogs and journals was reduced to 18 for the linguistic analysis (total word count: 14,100). These were selected on the basis of their reflective score (the nine highest-scoring and the nine lowest-scoring were selected). Figure 7.25 summarises the number of resources used and compares the high-scoring and low-scoring groups. In general, the high-scoring group used more of each type of linguistic resource than the low-scoring group did. The only exception is the use of professional nouns/noun groups, where the low-scoring group used slightly more resources than the high-scoring group did. This corresponds to the weak correlation between SFL 04 resources and reflective score seen in Table 7.16.

The results found here will be compared with results from similar studies in Chapter 8: Evaluation of Findings.
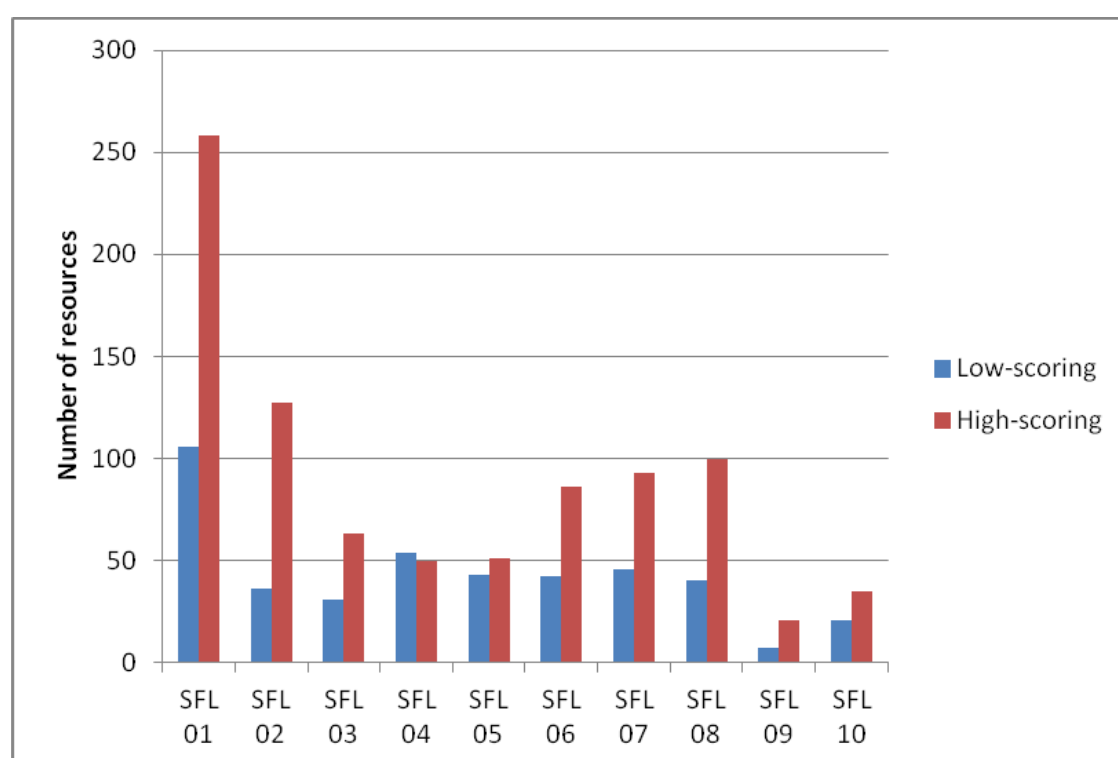
Figure 7.25: Number of resources – high vs. low-scoring groups

7.2.3 Language used: blogs vs. journals

The number of linguistic resources used in blogs was compared with that used in journals. Out of the 18 blogs and journals examined in the linguistic analysis there were nine blogs and nine journals.

Although the total number of resources used by bloggers and journal-writers is quite similar in general, this must be considered in the context of the word count. The average blog word count (of the nine blogs examined in this analysis) was 1,115. The average word count of the journals was 452 words. Therefore, the journals used only 40% of the words that blogs did, yet used almost as many linguistic resources. This result will be evaluated in Chapter 8. First, Figure 7.26 compares the number of resources used by the two groups.
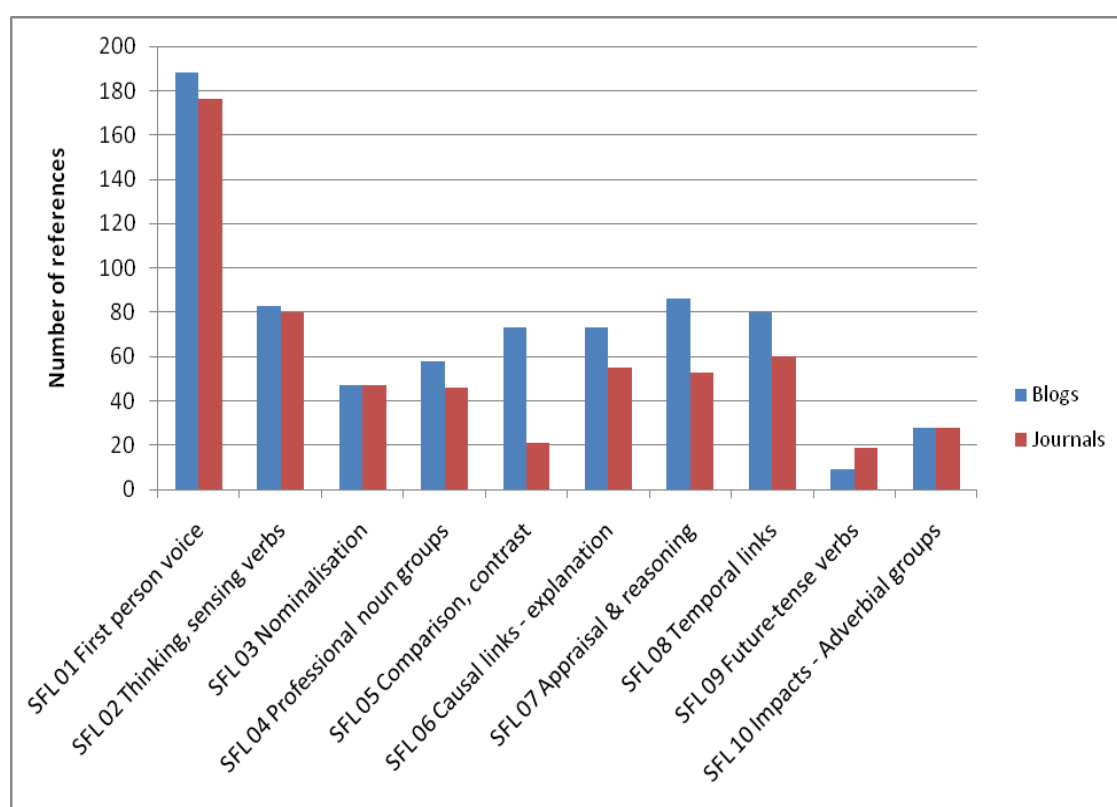
Figure 7.26: SFL resources - blogs vs. journals

An independent samples *t*-test was used to assess the significance of any differences between the language used by the blog and journal groups. Cohen's *d* was then used to calculate the effect size of any difference seen. These results are presented in Table 7.17. For most of the linguistic resources there is no significant difference between the blog and journal groups. There is however a difference between the two groups in relation to the language of comparison and contrast; blogs use more of this type of resource than journals do. This relationship is significant at the 0.01 level (effect size: strong). On the other hand, it was found that journal-writers use more future tense verbs than bloggers do (relationship significant at the 0.05 level, effect size strong).

Table 7.17: Type of language used: blogs vs. journals

	t	*df*	*sig*	*Mean A*	*Mean B*	*SD A*	*SD B*	*Pooled SD*	*Cohen's d*	*Strength*
Total	0.768	16	0.454	80.56	65.00	38.533	46.995	42.764	0.36	Modest
SFL01	0.186	16	0.855	20.89	19.56	14.726	15.693	15.210	0.09	Weak
SFL02	0.101	16	0.921	9.22	8.89	6.200	7.688	6.944	0.05	Weak
SFL03	0.000	16	1.000	5.22	5.22	4.410	6.241	5.326	0.00	Weak
SFL04	1.148	16	0.268	6.44	5.11	2.297	2.619	2.458	0.54	Moderate
SFL05	**4.656****	**16**	**0.000**	**8.11**	**2.33**	**2.977**	**2.236**	**2.607**	**2.22**	**Strong**
SFL06	0.905	16	0.379	8.11	6.11	4.676	4.702	4.689	0.43	Modest
SFL07	1.715	16	0.106	9.56	5.89	4.953	4.076	4.515	0.81	Moderate
SFL08	0.653	16	0.523	8.89	6.67	8.781	5.196	6.989	0.32	Modest
SFL09	**-2.169***	**16**	**0.045**	**1.00**	**2.11**	**1.225**	**0.928**	**1.077**	**-1.03**	**Strong**
SFL10	0.000	16	1.000	3.11	3.11	1.537	2.848	2.193	0.00	Weak

These results are discussed further in Chapter 8: Evaluation of Findings. First, the language used in the first and sixth posts is compared.

7.2.4 Language used: Post 1 vs. Post 6

Earlier, the reflective scores in the first and sixth posts of the blogs and journals were compared and it was found that, on average, reflective scores were higher in the first post. Here, the language used in the first and sixth post is compared.

In Figure 7.27 it can be seen that the number of each type of resource used is, in general, quite similar for both Post 1 and Post 6. In seven out of ten cases, there were slightly more linguistic resources used in Post 1. There was a total of 667 resources used in Post 1 and a total of 643 resources used in Post 6. It should be noted that for this sample of 18 blogs and journals, the reflective score was only 6% higher for the first post than it was for the sixth (compared with 23% higher for Post 1 vs. Post 6 in the original sample of 27 blogs and journals).
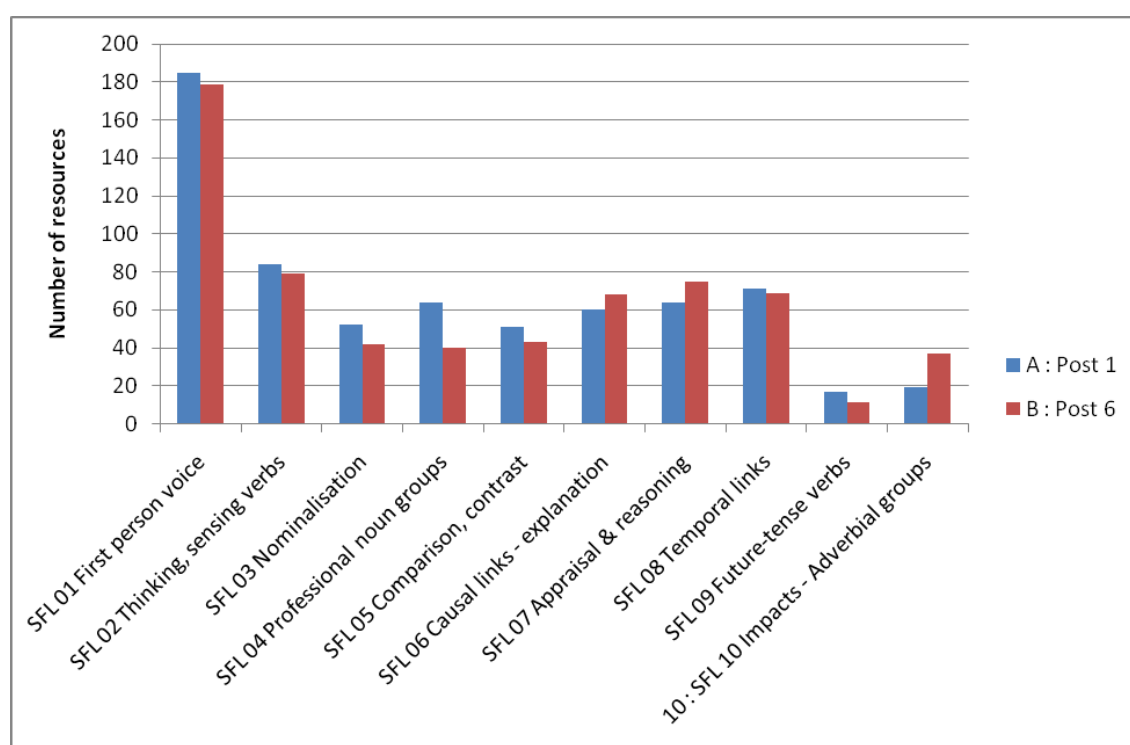
Figure 7.27: Resources in Post 1 vs. Post 6 (by resource type)

A paired *t*-test was used to compare the number of resources found in Post 1 and Post 6, in terms of each linguistic resource. The results from this test are presented in Table 7.18. There were 18 blogs and journals examined in the linguistic analysis; therefore, the *df* for this sample is 17. The critical value for t_{17} at the 0.05 level of significance is between -2.110 and 2.110. There was no difference found between the first and sixth posts for the first nine linguistic resources at the 0.05 level. The tenth type of linguistic resource, impact-related adverbials, was found to be significantly different at this level.

However, this resource was retested for significance at the 0.01 level (critical value t_{17} = -2.898 to 2.898). There was no significant difference in the use of impact-related adverbials between the first and sixth posts at the 0.01 level.

Table 7.18: Language used: Post 1 vs. Post 6

	Mean (d)	St. Dev. (s)	Test Statistic	Comment
SFL 01	0.333	6.508	0.217	Not Significant (0.05 level)
SFL 02	0.278	3.908	0.302	Not Significant (0.05 level)
SFL 03	0.556	2.229	1.058	Not Significant (0.05 level)
SFL 04	1.333	2.765	2.046	Not Significant (0.05 level)
SFL 05	0.444	2.479	0.761	Not Significant (0.05 level)
SFL 06	-0.444	2.572	-0.733	Not Significant (0.05 level)
SFL 07	-0.611	2.789	-0.929	Not Significant (0.05 level)
SFL 08	0.111	4.028	0.117	Not Significant (0.05 level)
SFL 09	0.333	1.237	1.144	Not Significant (0.05 level)
SFL 10	-1.000	1.749	-2.426	Not Significant (0.01 level)

The findings in relation to the language used in the first and sixth posts are examined in Chapter 8: Evaluation of Findings.

7.3 Chapter Review

This section summarises the main findings from the content analysis and subsequent linguistic analysis. These findings are discussed further and evaluated in Chapter 8: Evaluation of Findings. There are two groups of results to be considered: Content Analysis results (which relate to the levels of reflection identified and the reflective scores) and Linguistic Analysis results (which relate to the linguistic structure of the reflective blogs and journals).

Summary of Content Analysis results:

The amount of reflection contained in 27 reflective blogs and journals was assessed using the Reflective Writing Assessment Instrument. In total, 32% of the references were found to be descriptive in nature (relating to Indicator 1). 30% of references represented an example of a low level of reflection (Indicators 2 to 4), while 20%

related to a medium level of reflection (Indicators 5 to 7). Only 18% of the references were indicative of a high level of reflection (Indicators 8 to 12). There was found to be a strong negative correlation (Pearson's *r*: -0.551) between indicator weighting and the percentage of text coded to that indicator. This negative correlation was found in both the blog and journal groups. Although this result is not statistically significant (*p*-value: 0.063) it demonstrates that there tends to be a greater quantity of text that relates to lower-weighted reflection indicators (and a lesser quantity of text that is indicative of higher-weighted reflection indicators).

The blog sample contained significantly more references to descriptive, low-level reflection and medium-level reflection than the journals did. The journals, on the other hand, contained a significantly greater number of references to high-level reflection indicators. The overall reflection (by student) was summarised in terms of levels. It was found that 100% of students had examples of descriptive writing in their blogs and journals. On average, 61.7% of students used indicators that represented low-level reflection (70.6% of blogs; 46.7% of journals). Examples of medium-level reflection were found in 40.7% of students' writing (45.1% in the blog group; 33.3% in the journal group). Finally, high-level reflection was identified in 36.3% of students whose writing was examined (28.2% of blogs; 50% of journals).

The Reflective Writing Assessment Instrument was used to assign a reflective score to each blog and journal. It was found that, on average, journals scored almost 20% higher than blogs. The reflective scores for the first post and sixth post of each blog and journal were compared. It was found that, contrary to expectations, the reflective score did not improve over time. This was found to be true for both the blog and journal groups (blogs scored 26% lower on their sixth post; journals scored 19% lower). Further analysis showed that (for both blogs and journals) descriptive writing increased over time and that there was a decrease in reflective writing (low, medium and high). However, a paired *t*-test for each reflection indicator revealed that there were no significant differences between the first and sixth posts; in other words, although the sixth post did score lower, the difference found is not a statistically significant one.

Finally, the effect of feedback on improvement over time was considered. It was found that there was a strong positive correlation between the number of comments a student received and the degree to which their score improved over time. In addition to this, students who received feedback maintained their levels of low, medium and high reflection over time (in contrast to those who did not receive feedback).

Summary of Linguistic Analysis results:

A sample of 18 blogs and journals was chosen for the linguistic analysis (the nine highest-scoring and the nine lowest-scoring). The occurrence of ten types of linguistic resources was examined. Then, the relationships between these linguistic resources and the 12 reflection indicators were explored. Each linguistic resource had one or more statistically significant correlation(s) with reflection indicators, demonstrating that linguistic resources can be mapped to specific indicators of reflection. This is considered further in Chapter 8: Evaluation of Findings.

The relationship between linguistic resources and reflective score was also considered. Overall, there was found to be a strong positive correlation between the total number of resources a student used and her reflective score (Pearson's *r*: 0.703, *p*-value: 0.001). The relationship between individual linguistic resources and reflective score was also examined, with some found to be a greater predictor of a high reflective score than others. The number of resources used by students was then compared in two groups, high-scoring and low-scoring, and it was found that the high-scoring group tended to use more of each resource type than the low-scoring group did.

A comparison was made between the blog and journal groups, in terms of the number of linguistic resources used by each. Both groups used a similar quantity of each type of resource. However, the journal group only wrote 40% as many words as the blog group; in this context, it can be seen that the journal-writers had a much higher resource to word count ratio than the bloggers did. There was no significant difference in the type of language used in blogs vs. journals, except in two cases: bloggers used more comparison/contrast language and journal-writers used more future tense verbs.

Finally, the linguistic resources used in the first post were compared with those used in the sixth post. It was found that there were slightly less resources used in the sixth post. This corresponds to the reflective scores for this sample: for these 18 blogs and journals, the sixth post scored 6% lower than the first. A paired t-test confirmed that this slight difference is not statistically significant.

In Chapter 8, the findings from both the content analysis and linguistic analysis are discussed in more detail and compared to similar results from related research.

Chapter 8 : Evaluation of Findings

8.0 Chapter Introduction

This chapter evaluates the findings laid out in the previous chapter. It compares the results to those found in similar studies that used an instrument to assess reflective writing (Section 8.1). It examines the results from the linguistic analysis in the context of the available literature (Section 8.2). It also evaluates the likely impact of integrating technology into the reflective writing and assessment process (Section 8.3).

8.1 Assessing reflection

A content analysis was carried out where the Reflective Writing Assessment Instrument was used to examine the reflective writing in 27 blogs and journals. Levels of reflection in students' writing were identified in relation to each of the reflection indicators. Each blog and journal was assigned a reflective score, and the degree to which this changed over time was considered. The effect of feedback on reflective scores was also examined. This section discusses these findings. The validity and reliability of the Reflective Writing Assessment Instrument are also evaluated and it is compared with other instruments that assess reflective writing.

8.1.1 Levels of reflection identified

Levels of reflection were examined in several different ways. First of all, the amount of text that was found to be reflective (rather than descriptive) was evaluated. Then, the degree to which students used reflection indicators in their writing was examined; these findings are compared to those from related studies. Finally, levels of reflection were compared in two groups: blogs and journals.

8.1.1.1 How much of the writing was reflective?

The majority of the text (39%) examined in the content analysis was coded to the descriptive category of writing (Indicator 1). The second largest quantity of text (28%) was coded to low-level reflection indicators (2, 3 and 4). Text that represented medium-level reflection (Indicators 5, 6 and 7) comprised 16% of the total. Finally, the text coded to high-level reflection indicators (8 to 12) made up 17% of the total.

There was found to be a strong negative correlation (Pearson's *r*: -0.551) between text coverage and indicator weighting; in other words, the majority of the writing done by students tends to be either descriptive or contains a low level of reflection. Examples of medium to high-level reflection, on the other hand, are represented much less (in terms of the amount of text that relates to these indicators). The negative correlation between text coverage and indicator weighting was found in both the blog and journal groups. This result is not statistically significant, but is interesting nonetheless. Several other studies have also found that most of the writing done by students tends to be descriptive in nature (Findlay, 2010; Yeşilbursa, 2011).

8.1.1.2 How much did each student reflect?

The degree to which students were reflective is now considered. References to reflection indicators were grouped by into four categories to allow for ease of comparison with related studies: description, low-level reflection, medium-level reflection and high-level reflection.

Every student's writing had at least one reference to Indicator 1 (clear description of context) meaning that 100% of students achieved this level. Examples of low-level reflection (Indicators 2 to 4) were found in, on average, 61.7% of blogs and journals. Medium-level reflection indicators (5 to 7) accounted for 40.7% of the total, while evidence of high-level reflection was found in 36.3% of the blogs and journals examined. A summary of the levels of reflection identified in the content analysis is presented in Table 8.1.

Table 8.1: Summary of levels of reflection found

Level of reflection	Average
Description	100.0%
Low-level reflection (Indicators 2-4)	61.7%
Medium-level reflection (Indicators 5-7)	40.7%
High-level reflection (Indicators 8-12)	36.3%

There are a number of studies in the literature on reflective writing assessment that performed similar research to that which was conducted in this thesis (see Table 8.2 for summary). The results of these studies are now compared with the findings from the content analysis that was conducted in this thesis.

In the content analysis performed as part of this research, all 27 students had examples of descriptive writing in their blogs or journals. Pee and colleagues (2002) also reported that 100% of students showed evidence of descriptive writing. In a similar way to the results reported by Pee *et al.* (2002), Plack *et al.* (2007) found that almost all (93.5%) students were able to achieve the lowest level defined in their study (Knowledge and Comprehension). Dunfee and colleagues (2008) refer to this level as Data Gathering and presented results similar to those found by Plack *et al.* (2007), with 97.5% of students achieving this level.

The majority of students in the study described in this thesis showed evidence of at least some level of reflection (26 out of 27 students), with many students demonstrating high levels of reflection. In contrast, the studies conducted by Wong *et al.* (1995), Plack *et al.* (2005) and Chirema (2007) reported a greater number of students who demonstrated no evidence of reflection in their writing (13.3%, 14.7% and 21.4% of students, respectively). Findlay, Dempsey and Warren-Forward (2010) found that 14.6% of students in their first year were non-reflectors. However, only 7.8% of third-year students were found to be non-reflectors (Findlay, Dempsey and Warren-Forward, 2010). Finally, a study by Fischer *et al.* (2011) classified 13.5% of students' writing as non-reflective.

Table 8.2: Summary of findings (related research on levels of reflection)

Author, Year	Number of journals	Unit of assessment	Amount of reflection found
Wong *et al.* (1995)	45	Paragraph (1st level) *and* Student (2nd level)	*At 2nd level (Student level):* 13.3% Non-reflectors 75.6% Reflectors 11.1% Critical reflectors
Chirema (2007)	42	Paragraph (1st level) *and* Student (2nd level)	*At 2nd level (Student level):* 21.4% Non-reflectors 66.7% Reflectors 11.9% Critical reflectors
Findlay, Dempsey & Warren-Forward (2010)	97	Journal	7.8 – 14.6% Non-reflectors 76.7 – 84.4% Reflectors 4.2 – 17.2% Critical reflectors
Pee *et al.* (2002)	14	Journal	Descriptive writing in 100% Descriptive reflection in 100% Dialogic reflection in 86% Critical reflection in 64%
Plack *et al.* (2005)	27	Text *and* Journal	14.7% No reflection 43.4% Reflection 41.9% Critical reflection
Plack *et al.* (2007)	21	Journal entry	93.5% (Level 1) 68.9% (Level 2) 48.3% (Level 3)
Dunfee *et al.* (2008)	7	Discussion thread entry	97.5% (Level 1) 84.2% (Level 2) 58.8% (Level 3)
Fischer *et al.* (2011)	95	Blog posts (n=50) Reflective essays (n=45)	Non reflective (13.5%) Reflection on experience low (21.3%) and high (58.7%) Reflection on awareness (6.5%)
Results from this study	27	*Blog post/journal entry*	*Description (100%)* *Low-level reflection (61.7%)* *Medium-level reflection (40.7%)* *High-level reflection (36.3%)*

In the content analysis performed in this thesis it was found that, on average, the number of blogs or journals that had references to low-level reflection indicators was 16.67 (61.7%). Fewer blogs and journals showed evidence of medium-level reflection (n=11, 40.7%).

The amount of low to medium reflection found in other studies varies quite a bit: Findlay, Dempsey and Warren-Forward (2010) examined students' reflective writing in three different years of a course and stated that between 76.7% and 84.4% of students

were reflectors (as opposed to non-reflectors or critical reflectors). Their results were similar to those found by Wong *et al.* (1995) and Chirema (2007) who reported that 75.6% and 66.7% (respectively) of students were reflectors. Pee and colleagues stated that all students showed evidence of descriptive reflection and 86% of students engaged in dialogic reflection (Pee *et al.*, 2002). Plack *et al.* (2005), on the other hand, found that only 43.4% engaged in medium-level reflection. In their subsequent study (2007), Plack and colleagues found that 68.9% of students engaged in the second level of reflection (Analysis). Using a similar instrument, Dunfee *et al.* (2008) reported a greater number of students writing reflectively at the second level (84.2%). Finally, Fischer *et al.* (2011) found that 21.3% of students showed evidence of writing at the level they defined as 'reflection on experience – low', while a greater number (58.7%) reflected at a higher level (reflection on experience – high).

In the study conducted in this thesis the fewest number of students achieved high-level reflection: an average of 9.8 blogs or journals (36.3%) contained high-level reflection indicators. Similar results are found in other studies, with the highest level of reflection being the least commonly achieved (when compared with low or medium reflection) in all the related research examined.

However, there is a degree of variation in the amount of high-level reflection identified. Pee and colleagues (2002) found evidence of critical reflection in 64% of the journals examined. Plack *et al.* (2005) reported that 41.9% of students achieved critical reflection in their writing. In their 2007 study, 48.3% of students achieved the highest level, entitled 'Synthesis and Evaluation' (Plack *et al.*, 2007). Dunfee and colleagues (2008) refer to this level as 'Conclusion Drawing' and state that 58.8% of students reached this level. In contrast, several studies report a lesser degree of high-level or critical reflection. Wong *et al.* (1995) report that only 11.1% of students are 'critical reflectors'. Chirema (2007) identified a similar number of critical reflectors (11.9%). Findlay, Dempsey and Warren-Forward (2010) saw the number of critical reflectors increase from 4.2% of first-year students to 17.2% of students in their third year.

8.1.1.3 How did blogs and journals compare?

In Chapter 7: Results it was seen that blogs contained a far greater number of reflection indicators that relate to description and both low-level and medium-level reflection. Journals, on the other hand, had more references to high-level reflection indicators. Table 8.3 shows the differences in the levels of reflection found in blogs and journals. It is interesting to see that the journal group contained a greater amount of high-level reflection than low or medium-level reflection. This is an unusual finding when compared with the studies discussed above (which all reported more evidence of low to medium level reflection than high-level reflection).

Table 8.3: Levels of reflection (Blogs vs. Journals)

Level of reflection	Blogs	Journals
Description	100.0%	100.0%
Low-level reflection (Indicators 2-4)	70.6%	46.7%
Medium-level reflection (Indicators 5-7)	45.1%	33.3%
High-level reflection (Indicators 8-12)	28.2%	50.0%

The amount of reflection found in blogs and journals was found to be significantly different. The variation in terms of descriptive writing was significant at the 0.01 level as was the difference in the amount of low-level reflection. The effect size was strong in both cases. There was also a disparity between the amount of medium-level reflection and high-level reflection found in blogs when compared with that found in journals. Both medium and high-level reflection were found to be significantly different at the 0.05 level (with effect sizes of moderate and strong, respectively).

There were several differences between the groups examined in the content analysis. As well as using different media for reflective writing (blogs vs. journals) the groups were from different disciplines (Computing vs. Nursing) and had differing amounts of reflective writing experience. Therefore, it is difficult to determine which of these factors can be held accountable for the differences seen here.

Fischer *et al.* (2011) compared the level of reflection found in 50 blogs and 45 reflective essays. As discussed in Chapter 3: Related Research they examined four levels: non-reflection, reflection on experience: low, reflection on experience: high and reflection on awareness. They reported that the blog group contained more examples of the non-reflective level (14.5%, compared with 11.1% in the essay group) and the lower level of reflection on experience (24.5%, while the essay group contained only 13.3%). The essay group, on the other hand, demonstrated slightly more evidence of the reflection on experience: high level (64.4%, while the blog group had 56.4%) and the reflection on awareness level (11.1%, compared with only 4.5% in the blogs). Fischer and colleagues found, however, that the difference between the levels of reflection in the blogs and essays was not a statistically significant one.

The results found by Fischer *et al.* are in contrast to those described in Chapter 7 of this thesis. In this study, there was a significant difference found between the blog and journal groups (at all levels). However, both groups in the sample used by Fischer *et al.* (2011) were third year students on a medical clerkship and therefore all the students would have had a similar degree of experience in writing reflectively. The groups of students whose reflective writing was examined in this thesis had very different amounts of experience in this regard: the journal-writers would have had three or four years reflective writing experience, whereas the bloggers did not have any. Yeşilbursa (2011) states that inexperienced reflective writers typically write in a largely descriptive way. The lack of experience that the blog group had may account for the lesser degree of high-level reflection seen in their writing.

8.1.2 Reflective scores

This section examines the reflective scores that were given to blogs and journals. It discusses, first of all, the correlation between word count and reflective score. It then considers the degree to which the reflective writing improved over time.

8.1.2.1 Does writing more result in a higher score?

The average word count of the 27 blogs and journals examined was 908 words; the average reflective score (for all 27) was 0.83733. The average reflective score given to journals was higher (0.9317, compared with 0.7818 for the blog group) despite the fact that the blog group had a higher word count (1,184 word average, versus 438 words in the journals, on average).

There was found to be only a moderate positive correlation (Pearson's *r*: 0.325) between word count and reflective score. This means that a longer piece of writing (in terms of word count) does not necessarily guarantee the student a higher reflective score; it would be better to write a short passage that contained frequent references to high-level reflection indicators (e.g. showing evidence of self-awareness, discussing plans to revise practice). This demonstrates that the Reflective Writing Assessment Instrument assigns a reflective score based on the quality of the writing, rather than its quantity.

8.1.2.2 Did scores improve over time?

It was expected that, in the analysis of the first and sixth posts of the 27 blogs and journals, an improvement over time would be seen. However, the opposite turned out to be true. Overall, the scores for the sixth post were 23% worse than those for the first post. This is contrary to results reported in the literature on reflective writing assessment. Each of the studies discussed in Table 8.4 report an improvement in reflection over time, albeit a small one.

Williams *et al.* (2000) report a small increase in the amount of reflection they found in the first half of student journals when compared with the second half. They state that the mean score increased from 2.49 to 2.55, which is not a significant improvement (Williams *et al.*, 2000). Wessel and Larin implemented Williams' instrument in their 2006 study, with similar results. They noted a small, insignificant increase in the mean score from 2.02 to 2.21 (Wessel & Larin, 2006).

Table 8.4: Summary of findings (related research on improvement of reflection)

Author, Year	Number of journals	Unit of assessment	Amount of reflection found
Duke & Appleton (2000)	62	Journal	No statistics on amount of reflection, notes that reflections improved over time
Williams *et al.* (2000)	58	Journal (each half scored separately)	First half mean score 2.49/5 Second half mean score 2.55/5
Wessel & Larin (2006)	15	Journal entry	Mean score 2.02/5 (1st clinical placement) Mean score 2.21/5 (2nd clinical placement)
Fund, Court and Kramarski (2002)	20	Journal entry	Overall levels not reported; however, increase in critical bridging and decrease in description were seen
Findlay, Dempsey & Warren-Forward (2010)	97	Journal	Non-reflectors (14.6% Year 1, 7.8% Year 3); Reflectors (81.3% Year 1, 76.7% Year 3); Critical reflectors (4.2% Year 1, 17.2% Year 3)
Results from this study	*27*	*Blog post/journal entry*	*Increase in description; Decrease in low, medium and high reflection (not statistically significant)*

The study by Findlay, Dempsey and Warren-Forward (2010) reported an increase in the number of critical reflectors (from 4.2% in Year 1 students to 17.2% in Year 3 students). The number of reflectors dropped slightly, as did the number of non-reflectors (from 14.6% in Year 1, down to 7.8% in Year 3).

Other studies noted a difference over time in the type of reflection that was seen. Duke and Appleton (2000) report that certain elements of reflection improved over time (critical description; analysis of feelings, knowledge and content; synthesis; learning implications; and referencing). They found, however, that there was no significant improvement in other elements that they examined (focus, practice implications, action

planning, clarity and self-evaluation)[9]. Fund, Court and Kramarski (2002) reported a decrease in description over time and a corresponding increase in critical bridging.

This is contrast to the findings presented in Chapter 7: Results, where an increase in description was seen between the first and sixth posts. The amount of reflection (low, medium and high) decreased from the first post to the sixth. Paired *t*-tests were performed to assess whether there was a difference in the quantity of reflection indicators used in the first and sixth posts. It was found that there was no significant difference over time in the numbers of reflection indicators used.

In summary, although there was a slight dissimilarity in the reflective scores and type of writing seen in the first and sixth posts, there was no statistical evidence of a significant difference over time.

A factor worth noting is that most of the students did not receive any feedback on their reflections. In their study, which assessed improvement over time, Williams *et al.* (2000) talk about interactive journaling and recommend that students should receive regular feedback if an improvement is to be seen. The next section (8.1.3) assesses the effect that feedback had on reflective score (for the students who did receive feedback). First, the improvement over time in the blog and journal groups is considered.

8.1.2.3 How did blogs and journals compare?

The degree to which the reflective score changed over time was examined in terms of the blog and journal groups. It was found that both the blog and journal groups scored lower in the sixth post (26% lower and 19% lower, respectively). An independent samples *t*-test was performed that compared reflective scores by medium. It was found that there was no significant difference in the scores assigned to blogs and journals (either for the total score, Post 1 score or Post 6 score).

---

[9] Duke and Appleton (2000) do not report the degree to which each element improved (or did not, as the case may be).

The changes over time in the type of writing described above were also seen in both the blog and journal groups. That is, the amount of descriptive writing increased over time in both groups, while the amount of reflective writing decreased. Paired *t*-tests assessed the differences between the quantity of reflection indicators present in the first and sixth posts. They revealed that there was no significant difference in the types of reflection indicators used over time. Unfortunately there is no opportunity to compare the results with related literature; the only study which presented empirical data on the differences between reflective blogging and more traditional forms of reflective writing (Fischer *et al.*, 2011) did not evaluate improvement over time. The effect of feedback on improvement over time is now discussed.

8.1.2.4 Comparison of reflective scores and original grades

In order to triangulate the findings, the reflective scores assigned by the Reflective Writing Assessment Instrument were compared with the original grades given to students. In the blog group, there was found to be a strong, statistically significant, correlation between the score assigned by the instrument and the original grade (Pearson's r: 0.719; p value: 0.001).

For the journal group, there was found to be a modest correlation between the score assigned by the instrument and the original grade (Pearson's r: 0.226; p value: 0.531). This is in contrast to the strong relationship between scores and grades that was seen in the blog group. However, it should be noted that the original grade for the journal group was for the entire module; information on the breakdown of grades was not available. The reflective journal constituted only 25% of this module; therefore, 75% of this grade was for other activities that relate to the Applying Caring in Practice module. The grade for the blogs, on the other hand, solely relates to the reflective blogging assignment. Therefore, it is unsurprising that a lesser correlation would be seen in the journal group when compared with the blog group.

The results for the blog group are more accurate in this instance as they compare like with like; that is, they compare the reflective scores and original grades for the

assignment itself, rather than the whole module. The correlation between reflective scores and original grades helps to confirm the efficacy of the Reflective Writing Assessment Instrument in assessing reflective writing.

8.1.3 Effect of feedback

Of the 27 students whose writing was examined in the Content Analysis, there were 8 included in the analysis on the effect of feedback. The Nursing students (i.e. the journal group) did not receive any feedback while on their work placement. The students in the blog group received feedback only if they began their reflective writing assignment early and posted regularly (which over half the students did not, only adding blog posts in the last couple of days before the assignment deadline).

However, for the eight students who did receive feedback, there was found to be a strong positive correlation between the number of comments they received and the degree to which their reflective score improved. This relationship is statistically significant at the 0.05 level. The number of days between the first and sixth posts was also correlated with improvement in score (to determine whether scores would have improved over time regardless of the number of comments received). There was only a moderate correlation between improvement in score and the number of days from Post 1 to Post 6. This demonstrates that the improvement in score can most likely be attributed to the number of comments that a student received.

The changes over time in the type of writing (descriptive or reflective) were also examined for the group of students who received feedback. With these students it was found that, like the overall cohort, the amount of descriptive writing increased over time. However, the quantities of low, medium and high-level reflection were maintained between the first and sixth posts; this is in contrast to the rest of the cohort, where decreases in all types of reflection were seen.

It is difficult to say whether the feedback that these students received was the sole reason for the maintenance of their levels of low, medium and high reflection over time.

It is possible that these students were more motivated from the beginning of the assignment (demonstrated by the fact that they posted to their blogs on a regular basis from the start). Nonetheless, the results discussed here present an interesting argument for the provision of regular feedback on reflective writing. These results suggest that formative feedback can influence the degree to which students' reflective writing improves over time.

8.1.4 Reflective Writing Assessment Instrument Evaluation

The results from related studies that assessed reflective writing were discussed above. Now, the instruments developed in those studies are compared with the Reflective Writing Assessment Instrument that was developed in this thesis.

The instruments developed (all of which are discussed in Chapter 3: Related Research) are listed here and grouped in terms of their goal or purpose i.e. what the instrument does. They fall into three categories:

- Instruments that determine the level at which students are reflecting (e.g. non-reflectors, reflectors, critical reflectors):
    - Wong *et al.* (1995); Chirema (2007); Findlay, Dempsey and Warren-Forward (2010); Pee *et al.* (2002); Plack *et al.* (2005); Plack *et al.* (2007); Fischer *et al.* (2011)
- Instruments that define elements of reflection, with a view to developing guidelines that support the reflective process, provide criteria for assessors to work with or provide students with feedback on how they could improve their reflections:
    - Duke and Appleton (2000); Fund, Court and Kramarski (2002); Fischer *et al.* (2011); Dunfee *et al.* (2008); Plack *et al.* (2005); Plack *et al.* (2007)
- Instruments that define elements of reflection and also assign a score:
    - Williams *et al.* (2000); Wessel & Larin (2006)

– However, in both of these studies the method used to assign the score is not explained; it does not appear that the score is calculated based on the elements of reflection that were identified.

All of the instruments listed above are based on models of reflection described in the literature. In contrast to this, the Reflective Writing Assessment Instrument put forth in this thesis was developed independently of existing models. Instead, reflection indicators were generated in consultation with people who assess reflective writing (ensuring that the criteria developed accurately represent assessment practice, rather than theory). However, comparisons were made with literature-based models of reflective learning later on in the process to confirm that all aspects of reflective writing and its assessment were effectively covered by the Reflective Writing Assessment Instrument.

The Reflective Writing Assessment Instrument defines elements of reflection (reflection indicators) and in a similar way to those developed in other studies, these indicators can be used as either an aid for assessors or a set of guidelines for students. However, the Reflective Writing Assessment Instrument is the only instrument to assign weightings to elements of reflection, based on the depth of reflection they represent. It is also the only instrument that gives a quantitative score that is calculated based on the reflection indicators found in a student's writing, and therefore represents the overall depth of reflection (by taking the indicator weightings into account). It has been shown, through the discussion in this section, that the instrument assesses the quality of reflective writing, not the quantity. In summation, it can be said that the Reflective Writing Assessment Instrument assigns a quantitative score to a piece of reflective writing based on the quality and depth of the reflection that it contains.

The validity and reliability of the Reflective Writing Assessment Instrument are now discussed. Validity is the degree to which the analysis measured what it intended to measure (Robson, 2002). A great deal of consideration went into the development of the reflection indicators, including consultation with Reflective Practice experts and examination of the literature on reflective writing. This process of deliberation ensured

that the reflection indicators accurately describe the characteristics of reflective writing, thus confirming the validity of the Reflective Writing Assessment Instrument. In Chapter 6: Analysis of Reflective Writing, the reliability of the instrument was assessed. To ensure inter-coder reliability a paired *t*-test was performed for each of the 12 reflection indicators. In each case, it was found that there was no significant difference between the coders' judgements at the 0.05 level of significance.

In the next section, the results of the linguistic analysis are discussed and the relationships between linguistic resources and reflection indicators are explored.

8.2 Linguistic Structure

This section evaluates the findings from the linguistic analysis. 18 blogs and journals were selected for this analysis (the nine highest-scoring and the nine lowest-scoring). The total word count of the text that was analysed was 14,100 (compared with 11,689 in the sample assessed by Reidsema and Mort, 2009). In this text, a total of 1,310 linguistic resources were identified. Ten types of linguistic resources were examined, based on the model put forward by Ryan (2011).

The results from the linguistic analysis are first discussed in terms of the relationship between the use of linguistic resources and overall reflective score. These findings are compared with results from similar studies. Next, the language used in the blog group is compared with that used by the journal-writers. The relationship between reflection indicators and linguistic resources is then explored and a version of the Reflective Writing Assessment Instrument that includes expected linguistic resources is presented.

8.2.1 Linguistic resources and reflective score

It was found that the total number of resources used by a student has a strong correlation with reflective score; this correlation is statistically significant at the 0.01

level (Pearson's *r*: 0.703; *p*-value: 0.001). This shows that a student who uses linguistically richer language is likely to also show evidence of reflection (and have a higher reflective score).

In her analysis of the discourse features of reflective writing, Luk (2008) found that higher-scoring reports contained more linguistic resources. Luk examined the use of linguistic devices in reflective writing, specifically linking devices, hedges and intensifiers. She grouped linking devices into four categories: contrastive, additive, causative and resultative (Luk, 2008). The first two of these four categories, contrastive and additive, correspond to the SFL 05 resource examined in this study (the language of comparison/contrast). There was found to be only a modest correlation (Pearson's *r*: 0.296) between SFL 05 resources and reflective score. Luk, on the other hand, stated that higher-scoring texts contained more examples of the use of contrastive linking devices. However, it must be noted that the sample in Luk's study consisted of only six reflective reports, and that the relationship between linguistic resources and score was not assessed statistically.

The third and fourth linking devices examined by Luk, causative and additive devices, relate to the category 'causal links' (SFL 06) examined in this study. Luk again notes that higher-scoring reports contained more examples of these linguistic resources. The results presented in Chapter 7 also show a strong correlation (significant at the 0.01 level) between causal links and total reflective score (Pearson's *r*: 0.621; *p*-value: 0.006).

Luk (2008), in addition to examining the use of linking devices, reported on the use of hedges and intensifiers. These correspond to the seventh type of resource examined in this study, appraisal and reasoning adjectives and adverbs. Again, a strong, statistically significant relationship was found between SFL 07 resources and reflective score (Pearson's *r*: 0.650; *p*-value: 0.004), supporting Luk's finding that high-scoring reports contained more resources of this type.

The study performed by Reidsema and Mort (2009) used a larger sample, comparable to the one examined in this thesis. They examined three types of resources: causal, appraisal and temporal. These correspond to the SFL 06, SFL 07 and SFL 08 categories examined in this thesis, respectively.

Reidsema & Mort (2009) found that higher-scoring texts used significantly more causal and appraisal resources and slightly more temporal resources than low-scoring texts did. As discussed above, there was found to be a strong relationship between reflective score and the use of both SFL 06 resources (causal links) and SFL 07 resources (appraisal and reasoning adjectives/adverbs). These are similar findings to those described by Reidsema and Mort (although they do not report the degree to which their results are significant in statistical terms). The results presented by Reidsema and Mort in relation to the use of temporal resources are also similar to those seen in Chapter 7 of this thesis. That is, higher-scoring texts contained slightly more temporal resources than low-scoring texts did. There was found to be a moderate correlation between SFL 08 resources and reflective score (Pearson's r: 0.476; p-value: 0.046).

In general, the results reported in this thesis confirm the findings of the earlier studies by Luk (2008) and Reidsema and Mort (2009). It can be said overall that students whose writing is linguistically richer also tend to have higher reflective scores. However, these studies only examined four types of resources: comparison/contrast, causal, appraisal and temporal. The linguistic analysis described in this thesis also assessed six other types of resource, based on the model of Academic Reflective Writing set out by Ryan (2011). These were: first person voice (SFL 01), thinking and sensing verbs (SFL 02), nominalisations (SFL 03), professional nouns/noun groups (SFL 04), future tense verbs (SFL 09) and impact-related adverbials (SFL 10).

Out of these categories, the ones which had a strong or very strong relationship with reflective score were the use of first person voice, thinking and sensing verbs, future tense verbs and impact-related adverbials. It is perhaps unsurprising that these types of linguistic resources should be related to reflective score. The highest weighted indicators in the Reflective Writing Assessment Instrument are 'Revisions to future

practice are discussed' and 'Self-awareness is evident'. It stands to reason that students who are using first person voice and thinking and sensing verbs might be demonstrating self-awareness (e.g. 'I feel', 'I believe') and that students who are discussing plans to revise their practice would use future tense verbs and adverbials that describe the possible impact of their planned actions.

The use of nominalisations (SFL 03) and professional nouns/noun groups (SFL 04) had only a moderate or weak relationship with reflective score (respectively). SFL 04 resources were seen to have a moderate negative correlation with the two highest-weighted indicators (Revisions to future practice are discussed and Self-awareness is evident). It is interesting that professional noun groups are the least related to score; this type of resource is most closely linked to the language of the discipline in which the student is studying or practicing. Linguistic resources that represent more 'general' reflection (i.e. that are not discipline-specific), on the other hand, tend to have a greater correlation with reflective score (for example, the use of first person voice and thinking and sensing verbs). Later, the relationships between reflection indicators and linguistic resources are explored. First, the language used in blogs and journals is compared.

8.2.2 Language used in blogs vs. journals

The sample examined in the linguistic analysis contained nine blogs and nine journals. In Chapter 7, it was seen that, in terms of quantity, the blogs used slightly more linguistic resources than the journals did. However, the average word count of the nine blogs in this sample was 1,115 words; the average word count of the nine journals was 452 words. The language used in the journals was 'denser' in terms of these linguistic resources. The journal group was also the higher-scoring group, confirming once again the link between linguistically rich text and high reflective score.

The reasons for this difference are unclear. As noted earlier, there were several differences between the two groups in the sample; the amount of reflective writing experience that the students had could be a significant factor in determining how much reflection their writing contains (Yeşilbursa, 2011). Therefore, it is difficult to say

whether the use of different media (blogs vs. journals) is responsible for the differences in the quantity of linguistic resources used.

The type of language used by the bloggers and journal-writers was also examined. In eight out of the ten linguistic resources there was no significant difference between the blogs and journals. However, there was a difference seen in two of the resources: bloggers used significantly more comparison/contrast language, while journal-writers used more future tense verbs. This corresponds to the type of reflection evident in each group's writing. Bloggers showed evidence of greater amounts of low to medium-level reflection. As discussed in the next section, the language of comparison/contrast is correlated with indicators that are representative of these levels of reflection. Likewise, the use of future tense verbs is correlated with several high-level reflection indicators.

Although some slight differences were seen in the writing done by the blog and journal groups, on the whole it can be said that the language they used was similar (as there was no significant difference seen in eight out of the ten linguistic resources examined). This is in contrast to the findings of several studies which reported that blogs encourage the use of more informal language (Ellison & Wu, 2008; Farmer, Yue & Brooks, 2008). However, reports from other studies support the findings of this thesis i.e. that there is no significant difference in the language used in blogs when compared with traditional media (Nilsson, 2003; Nowson, 2006; Fischer *et al.*, 2011).

8.2.3 Linguistic resources and reflection indicators

The linguistic analysis performed in this thesis examined ten types of linguistic resources, based on the Academic Reflective Writing model developed by Ryan (2011). Correlations between each of these linguistic resources and the 12 reflection indicators were assessed. The study by Ryan (2011) describes categories of linguistic resources in the context of a framework of reflective writing (which has three stages: report and respond; relate and reason; and reconstruct). However, she does not report any quantitative analysis using her Academic Reflective Writing model, nor does she

attempt to link linguistic resources directly to the stages of reflection described in the model. Therefore, there is no opportunity to compare the correlations found here with existing literature.

In Chapter 7, results were presented that correlate each linguistic resource to the 12 reflection indicators and statistically significant relationships were noted. The full set of data can be seen in Appendix F: Linguistic Resources and Reflection Indicators (Pearson's *r* and *p*-values). Here, each linguistic resource is discussed in turn and the relationship it has with reflection indicators is elucidated. It should be noted that a correlation between a reflection indicator and a linguistic resource does not necessarily mean that the two always appear together. A strong correlation between the use of first person voice and Indicator 8 Learning is evident, for example, simply means that the student frequently used first person voice in their writing and also frequently demonstrated evidence of learning; an overlap between the two is not a given, even if there is a strong correlation. However, the discussion below will present examples from the blogs and journals analysed, to make sense of the correlations found between the reflection indicators and linguistic resources. Each example presented may contain more than one type of linguistic resource; the linguistic resource under discussion is identified using ***bold italic***.

SFL 01 First person voice

The use of first person voice was examined and it was found that it has a strong positive correlation with reflection indicators 2, 5 and 8, meaning that if a student frequently uses this type of linguistic resource it is also likely that their writing will show evidence of learning, identification of issues and consideration of the implications of actions.

The following examples demonstrate the use of first person voice in relation to Indicators 2, 5 and 8. Here, the student uses first person voice while identifying an issue (an area that requires attention or an opportunity for learning): "***I*** don't know very much about how the human brain stores information". Students can also be seen to refer to themselves in the first person when discussing their learning (e.g. "***I'm*** a bit the

wiser"). Another example shows the student using first person voice while considering the implications of their actions: "This experience has made *me* realise the importance of participating in, and questioning new situations".

The use of first person voice was the most frequently identified linguistic resource (364 resources); many examples of this linguistic resource were seen in the text coded to each of the reflection indicators. Similar findings were discussed by Shaheed and Dong (2006) who reported that reflective bloggers frequently referred to themselves in the 1st person.

SFL 02 Thinking and sensing verbs

There were significant correlations found between thinking and sensing verbs and Indicators 2 (Issues are correctly identified), 5 (Implications of actions are considered), 10 (Changes in beliefs or understanding are evident) and 12 (Self-awareness is evident).

In the excerpt below the student demonstrates self-awareness by considering her emotional reaction to a situation where a patient required amputation surgery ("I *felt* nervous"). She also considers the implications of her actions (regarding the importance of reassurance) while also demonstrating a change in her understanding ("I am now more *aware*"). She also identifies an issue that requires attention (that the patient will need to adjust to her new body image). Thinking and sensing verbs are used frequently in this excerpt.

> *"I had never cared for someone that needed this surgery before. **I felt nervous** about caring for the patient because she would need a lot of support and understanding from the health care team to help her accept and adjust to the altered body image. [...] **I felt that** by looking after this patient, **I am now more aware** of how important the relationship between nurse and patient really is. We can provide great reassurance and help the patient accept their new altered image."*

SFL 03 Nominalisations

A strong correlation was found between the use of nominalisations and Indicator 5 (Implications of actions are considered). Here, the student considers the implications of

actions (the importance of communication) and uses nominalisations to write in a succinct way: "After the incident, my preceptor commended me on my actions and spoke about *the importance of communication* between peers".

In addition to Indicator 5, the use of nominalisations was found to have relationships with Indicators 6 (Multiple perspectives are examined), 7 (Links are made to broader social structures) and 9 (Insightful understanding is evident). These indicators were also strongly correlated with the use of professional nouns (or groups of nouns). Nominalisations and professional nouns frequently occur close together, as can be seen in the example in the next section SFL 04 Professional nouns (where both nominalisations and professional nouns are noted).

SFL 04 Professional noun(s)

A student who frequently uses professional nouns or noun groups (i.e. a student who uses discipline-specific language) also tends to show evidence of the examination of multiple perspectives and broader social structures and also demonstrates evidence of an insightful understanding. As stated above, nominalisations frequently occur in conjunction with discipline-specific language. In the excerpt below nominalisations are italicised and professional nouns are emboldened. The student is discussing recent research on facial recognition (examining multiple perspectives) while also referring to social structures ("human rights and privacy"). The discussion displays an insightful understanding of the topic.

> "They have applied a new **break-through technology** to recognize faces by scanning and mapping as a **three-dimensional surface**. This provides a far more accurate reference for identifying a person than current systems, most of which rely on **two-dimensional images**. What I find exciting about this type of **biometric technique** is that it does not require *participation* from the individual i.e. one does not have to offer a fingerprint. Therefore if it could be perfected without infringing on our human rights and privacy, I think it could be a useful weapon against the global threat of terror."

SFL 05 Comparison/contrast

There was found to be a significant correlation between the use of linguistic resources for comparison and contrast and Indicators 1 (Clear description of context), 2 (Issues are correctly identified), 3 (Analysis is evident), 4 (Creative synthesis is evident) and 6 (Multiple perspectives are examined).

The following example demonstrates how the student used the language of comparison and contrast (words such as also, like and unlike) to evaluate their experience (which shows evidence of analysis):

> *"What was good about this experience was the way the nurses eased me into the routine. **It was also good** that I overcame my apprehension and my confidence increased from this."*

Here, the student uses comparison/contrast linguistic resources while first providing a description of context ("I used to work in a call centre*"*) and identifying issues ("previous experience can lead you to react **differently**").

> *"Previous experience of something can lead you to react **differently** to things. I used to work in a call centre that had a strict scripted approach. But generally, **the more experienced** you got, **the more you could** take the superfluous questions out and get to the heart of the matter."*

Similarly, in the following example the student first describes a research study (showing examination of multiple perspectives) and then goes on to suggest that this research has applications in user interface design (showing evidence of creative synthesis). Several examples of the language of comparison/contrast are seen throughout.

> *"The research used an iris-tracking monitor which calculated which products the shopper was looking at and for how long [...and] **also** looked at the type of packaging, each product's position on the shelf and position in the aisle **as well as** other factors [...] The results [found that] men and women shop **differently** and older people shop **differently** to younger people. The results of the research were later used to change the layout of the supermarket. This type of research is **also** useful is in the design of user interfaces (UI) for computer systems."*

SFL 06 Causal links

The use of causal links was found to have a strong correlation with Indicators 2 (Issues are correctly identified), 3 (Analysis is evident), 5 (Implications of actions are considered), 6 (Multiple perspectives are examined) and 7 (Links are made to broader social structures) and a moderate correlation with Indicator 9 (Insightful understanding is evident).

Causal links (words such as because, so and therefore) are often used for explanation (Ryan, 2011). The following examples demonstrate the use of this linguistic resource for explanation in students' writing. Here, a student evaluates the significance of an event she witnessed, demonstrating evidence of analysis, and also considers the impact of the event on her personal and professional development: "***However***, witnessing the event was definitely positive for my own personal and professional development".

In the following excerpt, the discussion by the student displays an insightful understanding of the topic. He identifies a relevant issue (in relation to the effects of divided attention) and references a relevant research study (examining multiple perspectives) while also making links to broader social structures (in this case, the law). The use of causal links can be seen throughout.

> *"There has actually been a study carried out on using a mobile phone while driving. They discovered that **even though** the two processes are two separate brain functional activities (one verbal, one visuo-spatial), "both tasks also have a working memory component, both requiring monitoring, planning, retrieving information from long term memory etc." If this is true why isn't driving while talking on a mobile phone **even if** you are using a hands free kit illegal."*

SFL 07 Appraisal/reasoning

Strong, statistically significant correlations were found between the use of appraisal and reasoning resources and Indicators 2 (Issues are correctly identified), 3 (Analysis is evident), 6 (Multiple perspectives are examined), 7 (Links are made to broader social structures) and 9 (Insightful understanding is evident).

Students often use appraisal resources when performing an evaluation of a topic to state not only what they thought of something (the website was "useful") but also the degree to which they found their opinion to be true ("very"). In the following excerpt the student discusses her evaluation of the FAS eCollege website, showing evidence of analysis and examination of multiple perspectives. She identifies a relevant issue (that websites should be accessible) and makes links to broader social structures (noting that there are accessibility guidelines which must be adhered to, especially by Government bodies).

> *"The website I chose to evaluate was the FAS eCollege website and I found it **very useful** to examine it using the 12 concepts above. Overall I found it to be an **excellent** design. [...] Each Irish Government website is designed in accordance with these accessibility guidelines, thus making them some of the **most accessible** websites available."*

Appraisal adjectives and adverbs can also be seen in this excerpt, which demonstrates an insightful understanding of the topic under discussion:

> *"I believe that the future of software lies in creating **easy-to-use, efficient and secure** interfaces which will also be adaptable to the **ever-changing** technology trends."*

SFL 08 Temporal links

Statistically significant relationships were found between the use of temporal links and Indicators 2 (Issues are correctly identified) and 8 (Learning is evident). It is perhaps unsurprising to see that there is a correlation between temporal links and evidence of learning, as this type of writing normally consists of a student describing something they know *now* that they did not know *before*. In the following excerpt the student discusses a relevant topic (language development in children), providing an example, and also shows evidence of learning i.e. knowing something that they previously did not know ("I never knew"):

> *"I never knew that a baby could recognize his mother's voice **the minute** he was born. And the pace that kids learn things is amazing. I can relate to this as I have seen three of my youngest cousins grow up around me. You see that even **in the space of a few days** they can pick up new words, they repeat what you say and copy your actions."*

References to learning are often more overt than this. It is often seen that the student explicitly says "I learned", as in the following example: "***then*** by discussing the topic with each other, I learned things that I had not already known".

SFL 09 Future tense verbs

Relationships were also identified between the use of future tense verbs and the reflection indicators. There was a strong correlation between this type of linguistic resource and Indicators 7 (Links are made to broader social structures), 9 (Insightful understanding is evident) and 11 (Revisions to future practice are discussed) and a moderate correlation between future tense verbs and Indicator 12 (Self-awareness is evident).

In the following excerpt, the student demonstrates an insightful understanding of the topic under discussion while also making links to broader social structures (by referring to human rights and privacy).

> *"Therefore if **it could be** perfected without infringing on our human rights and privacy, I think **it could be** a useful weapon against the global threat of terror."*

The use of 'could' does not exactly constitute a future tense verb; however, it is a modal auxiliary verb which can be used to convey a range of possibilities in the future (Seely, 2004). Therefore it was seen to be relevant to this category of linguistic resource, and was coded as such.

Unsurprisingly, students frequently use future tense verbs when discussing revisions to future practice. Here, the student states her intention ("to always ask questions") and also demonstrates evidence of self-awareness by referring to her own thought processes ("I have learned that I *can* learn"):

> *"From doing this I have learned that **I can learn** so much from the wide array of professionals in the multidisciplinary team. **I intend to** always ask questions to the members of the team as I have learned so much from doing so."*

SFL 10 Impact-related adverbials

Finally, a strong correlation was found between the use of impact-related adverbials and Indicator 5 (Implications of actions are considered). Again, this relationship is not unexpected; it stands to reason that students would use language that suggests impact when considering implications of their actions. The type of language coded to this resource generally consisted of two parts (A and B) and considered the impact one has on the other. For example, in the following excerpt the student states that "encouraging independence" (A) leads to "an earlier discharge date" (B).

> *"It also made me realise that **encouraging independence** with the older adult during their hospital stay **will lead to an earlier discharge date**."*

The above discussion considered the statistically significant relationships between linguistic resources and reflection indicators and demonstrated that the occurrence of a particular linguistic resource can be used to predict related reflection indicators. Therefore it can be said that, in general, reflective writing does have a predictable structure. Table 8.5 summarises the significant relationships in terms of the linguistic resources that can be expected in relation to each reflection indicator. The subsequent section considers the implications of these findings for the Reflective Writing Assessment Instrument.

Table 8.5: Reflection Indicators and Expected Linguistic Resources

Reflection indicator	Expected linguistic resource(s)	Pearson's r[10]	p-value
01 Clear description of context	SFL 05 Comparison/contrast	0.670**	0.002
02 Issues are correctly identified	SFL 01 First person voice SFL 02 Thinking and sensing verbs SFL 05 Comparison/contrast SFL 06 Causal links SFL 07 Appraisal and reasoning SFL 08 Temporal links	0.548* 0.576* 0.732** 0.641** 0.827** 0.470*	0.019 0.012 0.001 0.004 0.000 0.049
03 Analysis is evident	SFL 05 Comparison/contrast SFL 06 Causal links SFL 07 Appraisal and reasoning	0.539* 0.551* 0.720**	0.021 0.018 0.001
04 Creative synthesis evident	SFL 05 Comparison/contrast	0.583*	0.011
05 Implications of actions are considered	SFL 01 First person voice SFL 02 Thinking and sensing verbs SFL 03 Nominalisations SFL 06 Causal links SFL 10 Impact adverbials	0.514* 0.492* 0.599** 0.560* 0.542*	0.029 0.038 0.009 0.016 0.020
06 Multiple perspectives are examined	SFL 03 Nominalisations SFL 04 Professional noun(s) SFL 05 Comparison/contrast SFL 06 Causal links SFL 07 Appraisal and reasoning	0.559* 0.579* 0.692** 0.608** 0.612**	0.016 0.012 0.001 0.007 0.007
07 Links are made to broader social structures	SFL 03 Nominalisations SFL 04 Professional noun(s) SFL 06 Causal links SFL 07 Appraisal and reasoning SFL 09 Future tense verbs	0.508* 0.481* 0.526* 0.539* 0.521*	0.032 0.043 0.025 0.021 0.027
08 Learning is evident	SFL 01 First person voice SFL 08 Temporal links	0.608** 0.506*	0.007 0.032
09 Insightful understanding evident	SFL 03 Nominalisations SFL 04 Professional noun(s) SFL 06 Causal links SFL 07 Appraisal and reasoning SFL 09 Future tense verbs	0.513* 0.524* 0.476* 0.588* 0.509*	0.029 0.026 0.046 0.010 0.031
10 Changes in beliefs or understanding are evident	SFL 02 Thinking and sensing verbs	0.477*	0.045
11 Revisions to future practice are discussed	SFL 09 Future tense verbs	0.545*	0.019
12 Self-awareness is evident	SFL 02 Thinking and sensing verbs SFL 09 Future tense verbs	0.502* 0.495*	0.034 0.037

---

[10]*Correlation is significant at the 0.05 level
 ** Correlation is significant at the 0.01 level

8.2.4 Reflective Writing Assessment Instrument Scoresheet

In the previous section the significant correlations between reflection indicators and linguistic resources were discussed. These findings have implications for the Reflective Writing Assessment Instrument, as they can provide educators with information on the kind of linguistic resources they can expect to see in a student's writing in relation to each reflection indicator. A scoresheet has been developed which incorporates all aspects of the Reflective Writing Assessment Instrument developed in this thesis. This includes the reflection indicators and their weightings, assessment criteria for each indicator and finally, the linguistic resources that are expected in relation to each indicator. This scoresheet is presented later in this section.

First, however the indicator weightings are discussed. In order to develop a scoresheet that can be easily used by educators to assess reflective writing, it was decided to adapt the indicator weightings to make them more readable (having only one decimal place instead of five). This is done purely for the purposes of creating a usable scoresheet; the original weightings have been maintained throughout the rest of the thesis. The revised weightings were obtained by multiplying the original weighting by one hundred and rounding to one decimal place. The revised weightings can be seen in Table 8.6.

Table 8.6: Revised weighting (for scoresheet)

Reflection Indicator	Original weighting	Weighting for scoresheet
1. Clear description of context is given	0.01304	1.3
2. Issues are correctly identified	0.02901	2.9
3. Analysis is evident	0.03561	3.6
4. Creative synthesis is evident	0.04602	4.6
5. Implications of actions are considered	0.05105	5.1
6. Multiple perspectives are examined	0.05854	5.9
7. Links are made to broader social structures	0.06936	6.9
8. Learning is evident	0.10977	11.0
9. Insightful understanding evident	0.11713	11.7
10. Changes in beliefs or understanding evident	0.12459	12.5
11. Revisions to future practice are discussed	0.13734	13.7
12. Self-awareness evident	0.20855	20.8[11]
	1.00000	**100.0**

---

[11] When multiplied by 100 and rounded to one decimal place, the weightings totalled 100.1. Therefore, it was decided to round the weighting for Indicator 12 Self-awareness is evident down to 20.8 (instead of up to 20.9).

The revised weightings were then evaluated to determine the effect that rounding to one decimal place had on the reflective scores assigned by the instrument. Scores were recalculated using the revised weightings. In Table 8.7 the revised scores can be seen. Original scores have also been multiplied by one hundred and presented for comparative purposes. It can be seen that the largest increase in any score was half a mark; the largest decrease in score was 0.3. Therefore, it can be said that the effect that moving the decimal place in the indicator weighting has on reflective score is negligible.

Table 8.7: Revised weighting: effect on scores

Student	Original score	Original score (multiplied by 100)	Score using revised weighting (for comparison)	Difference
JournalAuthor01	0.0261	2.6	2.6	0.0
JournalAuthor07	0.1136	11.4	11.4	0.0
BlogAuthor09	0.2169	21.7	21.7	0.0
JournalAuthor06	0.2871	28.7	28.8	0.1
BlogAuthor04	0.3271	32.7	32.8	0.1
BlogAuthor15	0.3579	35.8	35.9	0.1
BlogAuthor10	0.4827	48.3	48.3	0.0
BlogAuthor11	0.5440	54.4	54.4	0.0
BlogAuthor07	0.6553	65.5	65.8	0.3
BlogAuthor17	0.7083	70.8	71.1	0.3
BlogAuthor02	0.7227	72.3	72.4	0.1
BlogAuthor13	0.7542	75.4	75.7	0.3
BlogAuthor01	0.7673	76.7	76.9	0.2
BlogAuthor03	0.8231	82.3	82.5	0.2
JournalAuthor04	0.8234	82.3	82.3	0.0
BlogAuthor16	0.8509	85.1	85.1	0.0
BlogAuthor05	0.9301	93.0	92.9	-0.1
BlogAuthor06	0.9456	94.6	94.8	0.2
JournalAuthor05	1.0034	100.3	100.2	-0.1
JournalAuthor03	1.1320	113.2	113.1	-0.1
JournalAuthor09	1.2328	123.3	123.2	-0.1
BlogAuthor14	1.2443	124.4	124.7	0.3
BlogAuthor08	1.3285	132.8	133.0	0.2
JournalAuthor08	1.3787	137.9	137.6	-0.3
JournalAuthor10	1.5679	156.8	156.8	0.0
BlogAuthor12	1.6318	163.2	163.7	0.5
JournalAuthor02	1.7524	175.2	174.9	-0.3

In Table 8.7, it can be seen that the (revised) scores assigned by the instrument range from 2.6 to 174.9. It is up to educators to decide for themselves the score that

represents an acceptable standard for their purposes. However, it is worth noting that the students who were placed in the high-scoring group in this study (the nine with the highest scores) all achieved a reflective score greater than 100. The nine students with the lowest scores were placed in the low-scoring group; these students all received a score of less than 70. The median score was 82.5. These results may be useful as an initial benchmark for any educators or researchers who might use the Reflective Writing Assessment Instrument in the future.

In Table 8.8 the Reflective Writing Assessment Instrument scoresheet is presented. Reflection indicators are colour-coded in terms of the level of reflection that they represent, based on the levels described in Chapter 7:

- Description: Indicator 1 (Red)
- Low-level reflection: Indicators 2 – 4 (Amber)
- Medium-level reflection: Indicators 5 – 7 (Green)
- High-level reflection: Indicators 8 – 12 (Blue)

Under each reflection indicator, assessment criteria (which were developed in Section 5.9) are listed. The expected linguistic resources (based on the statistically significant correlations presented in Chapter 7 and discussed above) are noted for each reflection indicator. In the cases where there was only one statistically significant correlation other strong or moderate correlations are listed in brackets, to give more information on the type of language that might be expected in relation to that particular reflection indicator. The revised weighting for each indicator is shown. A box is provided for assessors to enter the 'count', that is, the number of times the student makes a reference to a particular reflection indicator. The subtotal for each indicator is obtained by multiplying the count by the indicator weighting. The total reflective score (seen at the end of the scoresheet) is calculated by adding together all of the subtotals.

Table 8.8: Reflective Writing Assessment Instrument Scoresheet

Indicator 1: Clear description of context				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student provides a description of an event or topic – The description provided identifies points where reflection could occur – The description provides the context and background for reflective writing	Comparison (some causal, appraisal, temporal)	*1.3*		

Indicator 2: Issues correctly identified				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student demonstrates an awareness that there are issues which require attention – The student identifies issues and discusses them in more detail – The student provides a relevant example related to the event or topic	1st person, thinking, comparison, causal, appraisal, temporal	*2.9*		

Indicator 3: Analysis is evident				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student asks questions related to the event or topic – There is evidence of analysis e.g. the student compares/contrasts	Comparison, causal, appraisal	*3.6*		

Indicator 4: Creative synthesis is evident				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student combines two or more alternate perspectives in a creative way – The student makes unexpected links between alternative perspectives	Comparison (some temporal)	*4.6*		

Indicator 5: Implications of actions are considered				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student considers the implications of his/her own actions – The student analyses his/her own actions in comparison to those of others	1st person, thinking, nominalisation, causal, impact	*5.1*		

Indicator 6: Multiple perspectives are examined				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student refers to alternative viewpoints – The student refers to one or more external perspectives (e.g. related literature, alternative approaches or attitudes of others) – External ideas are present and these views are reflected on	Nominalisation, professional nouns, comparison, causal, appraisal	*5.9*		

Indicator 7: Links are made to broader social structures				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student sets the event or topic in a historical, social, ethical or legal context	Nominalisation, professional nouns, causal, appraisal, future tense	*6.9*		

Indicator 8: Learning is evident				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student demonstrates evidence of learning – The student corrects previous misunderstandings – The student states that he/she has gained knowledge	1st person, temporal	*11.0*		

Indicator 9: Insightful understanding is evident				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student demonstrates an insightful understanding of an event or topic e.g. a discussion of an event or topic that shows a deep understanding of that event or topic – The student states an opinion or judgement on the event or topic that demonstrates an understanding of that event or topic	Nominalisation, professional nouns, causal, appraisal, future tense	*11.7*		

Indicator 10: Changes in beliefs or understanding are evident				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student discusses changes in his/her beliefs – The student discusses changes in his/her understanding	Thinking (some 1st person, future tense)	*12.5*		

Indicator 11: Revisions to future practice are discussed				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student discusses a new understanding that has caused him/her to consider the revision of future practices – The student states his/her intention to do something differently in the future	Future tense (some thinking verbs, impact adverbials)	*13.7*		

Indicator 12: Self-awareness is evident				
Criteria	*Expected linguistic resources*	*Weighting*	*Count*	*Subtotal*
– The student notes his/her emotional reactions to an event – The student assesses the influence of his/her emotional reactions – The student explores motives or reasons for his/her behaviour – The student discusses his/her own thought processes or learning processes	Thinking, future tense (some 1st person, impact adverbials)	*20.8*		

Total Reflective Score: *(multiply weighting by count, then add all subtotals)*	

In this section, the findings of the linguistic analysis were presented. The relationship between the use of linguistic resources and reflective score was examined and was compared with results from related literature. The correlations between each linguistic resource and reflection indicator were examined and it was concluded that reflective writing does have a predictable linguistic structure.

The Reflective Writing Assessment Instrument was adapted to reflect the findings on the linguistic resources that can be expected in relation to each reflection indicator. Also, the indicator weightings were adapted for ease of readability, and a scoresheet was presented that combines all of the elements discussed in this thesis (reflection indicators, criteria, weightings and expected linguistic resources). It would be interesting to examine the degree to which educators find the Reflective Writing Assessment Instrument scoresheet easy to use; however, that was beyond the scope of this study. This possibility is discussed further in Chapter 9: Conclusions and Future Work.

As well as adding value to the Reflective Writing Assessment Instrument, the findings on the structure of reflective writing have implications for the integration of technology in the reflective process: in particular, in the fields of automated writing evaluation or intelligent tutoring. The following section examines the impact of the integration of technology in the reflective writing and assessment process.

8.3 Impact of technology integration

In this section, the use of technology for reflective writing and its assessment is considered. The first section, 8.3.1, summarises the differences between the blog and journal groups examined in this thesis and discusses the advantages and disadvantages of integrating blogs in the reflective process. A model is presented which provides recommendations for the use of blogs as a tool for reflective writing. Then, in Section 8.3.2, the implications of the findings from the linguistic analysis are examined.

Recommendations are made with regard to the inclusion of automated formative assessment in the reflective writing and assessment process.

8.3.1 The use of blogs for reflective writing

In the content analysis results (Chapter 7) it was seen that blogs contained significantly more descriptive writing and low or medium-level reflection than journals did. Journals, on the other hand, contained significantly greater quantities of high-level reflection indicators and had a higher overall reflective score. Neither group showed improvement over time, and both groups showed an increase in descriptive writing and a decrease in reflective writing between the first and sixth posts. The group of students who received feedback, on the other hand, did not show a decrease in reflection over time. This may demonstrate that regular feedback can encourage students to maintain their levels of motivation throughout a reflective writing assignment. There was found to be a strong correlation between the number of comments a student received and the degree to which their score improved over time.

In terms of the linguistic resources used, it was found that although blogs had a far greater word count, they used only slightly more linguistic resources than journals did. Therefore it can be said that the language in journals was linguistically 'denser'. However, in terms of the type of language used, there was found to be no significant difference between the blogs and journals in eight out of the ten linguistic resources examined; in other words, both groups used the same type of language, in general.

There were several differences between the groups examined in the content analysis. As well as using different media for reflective writing (blogs vs. journals) the groups were from different disciplines (Computing vs. Nursing). Also, the two groups of students had differing amounts of reflective writing experience: the journal-writers had three or four years reflective writing experience, whereas the bloggers did not have any. Yeşilbursa (2011) states that inexperienced reflective writers typically write in a largely descriptive way. The lack of experience that the blog group had may account for the lesser degree of high-level reflection seen in their writing.

To enable students to write reflectively (at the highest level possible) it is important to provide them with reflective guidelines (or prompts) and to ensure that they get the opportunity to practise this type of writing on a regular basis. However, once these supports are in place, blogs provide a number of benefits over handwritten journals. These are now discussed, along with a number of additional issues to consider.

Benefits:

Blogs (via their commenting feature) provide educators with a way to easily provide students with regular, formative feedback. It was seen in this thesis that the provision of feedback can impact the degree to which students' reflective writing improves over time. Blogs can be particularly useful for supporting interactions between distance learners (or students on work placement) and their tutors. Chretien, Goldman and Faselis (2008) state that reflective blogs enable students to receive feedback and support from their tutor when critical events occur (while they are away from college on work placement). The Nursing students whose journals were examined in this thesis did not receive any feedback on their reflective writing while on placement, as collecting and assessing (and then returning) handwritten journals on a regular basis would not have been feasible. Blogs, however, provide RSS (Really Simple Syndication) feeds, meaning that tutors can aggregate new blog posts from all their students and view them in one place (thus eliminating the need to collect and return journals from/to students).

Issues:

An important issue that must be considered when using blogs for reflective writing is that of privacy. In the study described in this thesis the students in the blog group were advised to password-protect their posts (and provide the password only to their tutor). Fourteen students out of seventeen did this. For students in a discipline such as Nursing the protection of blogs becomes more important as it is necessary to ensure that sensitive patient information is not disclosed publicly. It is recommended that blogging software that provides the option to password-protect blog posts is chosen (Birney, Barry & Ó hÉigeartaigh, 2007).

Several studies warn that blogs may encourage a more informal style of writing (Ellison & Wu, 2008; Farmer, Yue & Brooks, 2008) while others report that the language found in blogs is representative of the language that is used in general (Nilsson, 2003; Nowson, 2006). In the linguistic analysis performed in this study no significant difference was seen in the language used by bloggers and journal-writers (in eight out of the ten linguistic resources examined). This could be because the students in the blog group were being formally assessed (and therefore they treated it as such and wrote in a formal way). A recent study by Fischer *et al.* (2011) reports a change in perception with regard to the blogging format and states that "… the expansion of methods of electronic communication, such as instant messaging, and micro-blogging sites, such as Twitter, has resulted in perceptions of blogging as a relatively structured and formal mode of electronic communication" (Fischer *et al.*, 2011, p. 172). Nonetheless, it is important to reinforce the idea that formal language should be used (if this is indeed a requirement of the reflective writing assignment that has been set).

Figure 8.1 presents a model of the reflective process that demonstrates how blogs can be used for reflective writing and assessed using the instrument developed in this thesis. It consists of three stages: pre-reflection, reflection and post-reflection. There are eight steps in this process, which are now discussed.

Stage One: Pre-reflection

This stage of the reflective writing and assessment process includes two steps:

1. *Tutor sets reflective writing assignment*
2. *Student engages in discussion about reflective guidelines*

The provision of guidelines on how to write reflectively is important and should be included at the beginning of a reflective writing assignment. The pre-reflection stage consists of a dialogue between tutor and student, where the reflective writing assignment is discussed and students are given the opportunity to ask questions. The

reflection indicators and their associated assessment criteria could be used at this stage as a framework to guide students' reflective writing. Training on the setup and use of blogs should also be given at this stage.
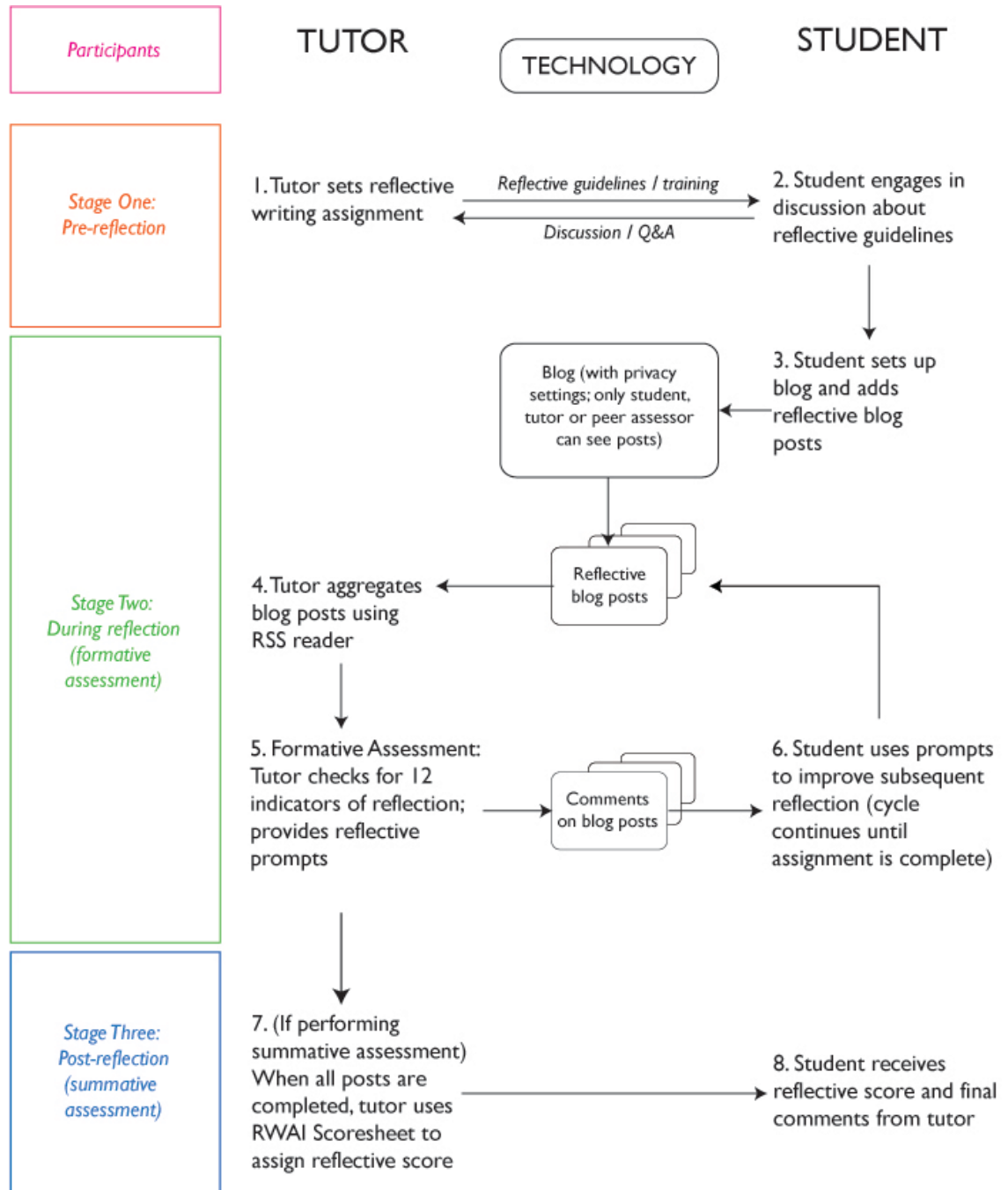
Figure 8.1: Technology in the reflective process: proposed integration model

Stage Two: Reflection (formative assessment)

The 'reflection' stage of the process consists of four steps which form a cycle and can be repeated a number of times (based on the requirements of the reflective writing assignment). Formative assessment occurs at this stage.

3. *Student sets up blog and adds reflective blog posts*

   When setting up a blog, it is recommended that students make use of the privacy settings to ensure that only the student, his tutor and possibly a peer assessor can access the blog. This is particularly important in situations where students may be discussing sensitive information (e.g. patient details).

4. *Tutor aggregates blog posts using RSS reader*

   The tutor makes use of RSS feeds to aggregate new blog content from all of her students (thus removing the need to check each blog individually for new content).

5. *Formative assessment: Tutor checks for 12 indicators of reflection and provides reflective prompts*

   The tutor checks the blog post for the 12 reflection indicators; if some elements are missing, he/she can provide the student with reflective prompts. For example if the tutor did not see evidence of Indicator 6 (Multiple perspectives are examined) in the student's writing she could prompt: "try to consider this situation from another perspective and provide references to relevant sources that support your argument". The commenting feature of blogs provides an easy way for tutors to deliver this feedback.

6. *Student uses prompts to improve subsequent reflection*

   The student should respond to reflective prompts by either revising the current blog post or addressing prompts in future blog posts.

Stage Three: Post-reflection (summative assessment)

Finally, the post-reflection stage is where summative assessment occurs. This stage is optional, as reflective writing assignments are not always assessed in this way. The post-reflection stage consists of two steps.

7. *Summative assessment: When all posts are completed, tutor uses RWAI scoresheet to assign a reflective score*
8. *Student receives reflective score and final comments from tutor*

The tutor can use the Reflective Writing Assessment Instrument scoresheet developed in this study to assign a reflective score. This should be provided to students along with some final comments which they can use to develop their reflective writing further in the future.

Earlier in the thesis, it was argued that reflective learning is an activity underpinned by cognitive constructivist theory, but that social constructivist theory was also relevant for activities that incorporate reflective dialogue. The model presented in Figure 8.1 makes use of reflective dialogue (with a tutor) in the pre-reflection stage and (with a tutor or peer) in the reflection stage, and demonstrates the use of reflective blogs to facilitate the social aspect of this process.

In the next section, the integration of automated assessment technologies in this model is considered.

8.3.2 Implications of findings re: structure of reflective writing

In Chapter 2, automated assessment technologies were discussed. A number of benefits of automated assessment were elucidated, including the provision of formative feedback to students (Sukkarieh, Pulman & Raikes, 2003; Pérez-Marín, Pascual-Nieto & Rodríguez, 2009; Warschauer, 2010) and the reduction of the workload involved in

assessment from a staff perspective (Mitchell *et al.*, 2003; Higgins & Bligh, 2006). While earlier automated assessment systems were used to mark closed questions (e.g. multiple-choice questions) much of the research in recent years has focused on the assessment of freeform responses. Open-ended responses (either short answers of one or more lines or longer answers in an essay format) can be used to assess higher-order learning (Valenti, Neri & Cucchiarelli, 2003; Pérez-Marín, Pascual-Nieto & Rodríguez, 2009; Dreher, Reiners & Dreher, 2011). Therefore, the types of technologies that can assess freeform responses were examined in more detail.

These technologies were grouped into two types: systems that assess short freeform responses and systems that assess essay-type responses. It was seen that systems which assess short freeform responses (e.g. C-Rater, Automarking and CarmelTC) require the answer to be objective and depend on the availability of clear-cut right/wrong criteria (Sukkarieh, Pulman & Raikes, 2003; Siddiqi & Harrison, 2008). These systems work well with causal domains (e.g. Physics) where word order is important.

On the other hand, systems that assess essay-type responses (e.g. E-Rater, IEA, JESS and BETSY) can assess more subjective, complex subject matter (Pérez-Marín, Pascual-Nieto & Rodríguez, 2009). This is more akin to the content of reflective writing, in that there are no clear-cut right or wrong answers. Therefore, a number of options for essay-type assessment were considered further. However, each of the technologies examined has a number of weaknesses.

Systems like the Intelligent Essay Assessor developed by Landauer *et al.* (1997) and the Japanese Essay Scoring System (JESS) (Ishioka & Kameda, 2004) have had success using Latent Semantic Analysis (LSA). However, LSA requires a very large corpus of text for training (generally millions of words). Obtaining the required dataset may prove difficult. Therefore, implementation of this type of technology is only worthwhile when the assessment is to be used with a large class and repeated over a number of years (Heinrich *et al.*, 2006).

The E-rater system (which is based on Natural Language Processing techniques) has been successful in automated essay scoring and is widely used for assessing GMAT examinations. However, E-rater cannot score an essay if it is not long enough or is too different from the others (Burstein *et al.*, 1998). As seen in Chapter 7, the word count of the blogs and journals examined in this thesis varied greatly; the shortest post/entry was only 42 words. This may be problematic for a system such as E-rater.

Bayesian networks might provide some advantages over these systems for essay type assessment (Rudner & Liang, 2002). First of all, fewer samples are needed for training (although several hundred are still required). Also, essays of shorter lengths can be assessed. Rudner and Liang (2002) claim that their system (BETSY) can be applied to any text classification task in a wide range of areas. However, both their system and the one developed by Larkey (1998) are used to do just that: classify text. Larkey's system defined essays as 'good' or 'bad' whereas BETSY classified responses as either appropriate, partially appropriate or inappropriate. There is no evidence that these systems could be adapted to either provide formative feedback or assign a summative grade. Therefore, the degree to which they are actually useful is questionable, particularly in the context of the model presented in Figure 8.1 which incorporates both formative and summative assessment.

In summary, none of the systems described here can readily assess reflective writing. Further research is required in this area to deal with issues like the variable word length of reflective blog posts/journal entries. Nonetheless, the findings of the linguistic analysis carried out in this thesis have interesting implications in this area. Automated assessment of essay-type questions works in one of two ways: by comparing students' answers with a model answer or by training a system using a set of graded essays. Both of these methods assume that a 'correct' student essay will have similarities either with the model answer or other highly-scored essays. To date, there has been very little research on the structure of reflective writing; it was not known whether reflective writing contained any discernible patterns.

However, it has been seen in this thesis that reflective writing does have a predictable linguistic structure. Relationships were found between specific linguistic resources and the indicators of reflection developed in this thesis. Therefore, it can be expected that a 'correct' reflective essay (in this case, a blog post or journal entry that contains high levels of reflection) would have similar textual features to other highly-scored reflective essays, or a model answer. This demonstrates that reflective writing does have the required structure for assessment by these types of technologies.

Although each of the current automated assessment systems examined earlier have a number of drawbacks, research in this field is continuing. JISC, in their 'Roadmap for e-Assessment', recommended the funding of further work in this area (Whitelock & Brasher, 2006). They opine that these systems should be used primarily for formative feedback, a view also held by many other researchers and educators (Sukkarieh, Pulman & Raikes, 2003; Whitelock & Watt, 2008; Pérez-Marín, Pascual-Nieto & Rodríguez, 2009; Warschauer, 2010)

Earlier, in Figure 8.1, a model of the reflective writing and assessment process was presented, which included the use of blogs as a tool to support reflective writing. The addition of a system that automates the provision of regular, formative feedback would be complementary to this model. Figure 8.2 demonstrates how automated assessment could be incorporated in the reflective process to provide regular formative feedback to students (and reduce some of the workload on the tutor). Although such a system does not yet exist, the intention of this model is to recommend how it should be integrated with reflective practices if/when it does become available.

The model takes into account the issues with automated assessment examined in Chapter 2. These included the perceptions about automated assessment held by staff and students, the degree to which automated assessment systems are trusted and the reliability of these systems. The model presented here addresses these concerns. Firstly, it does not remove human assessment from the process (easing the minds of both tutors and students). Secondly, it does not rely on automated assessment for high-

stakes summative assessment. Instead human assessment is still performed at this stage, assuring quality, which is important from an institutional standpoint.
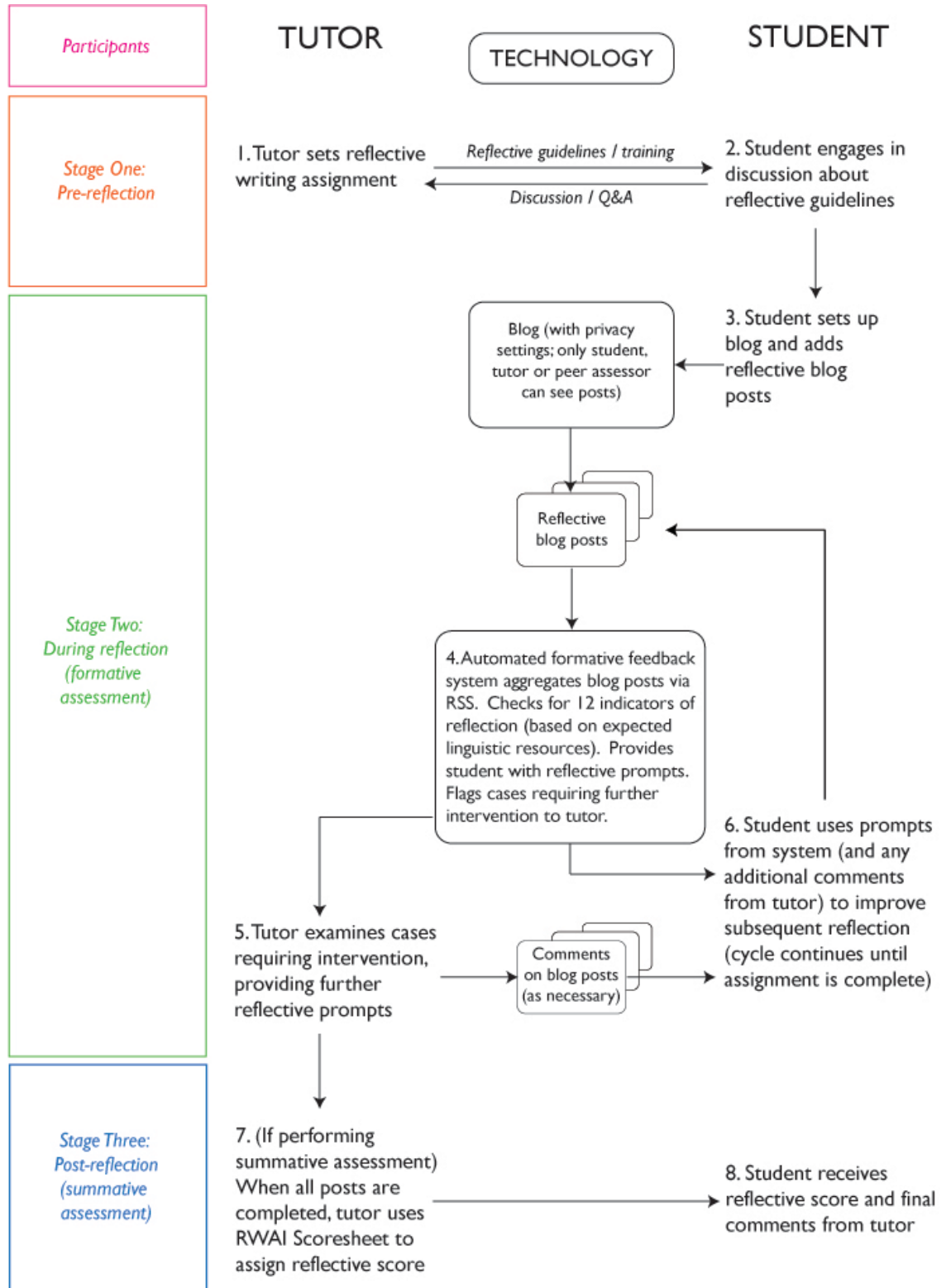
Figure 8.2: Technology in the reflective process: integration model (with automation)

The stages of the model seen in Figure 8.2 are now discussed.

Stage One: Pre-reflection

The steps at this stage of the reflective writing and assessment process remain the same as those described earlier. It is still important that reflective guidelines and technical training are provided and that the students are presented with the opportunity to discuss the reflective writing assignment.

Stage Two: Reflection (formative assessment)

The 'reflection' stage in this model also consists of four steps which form a cycle and can be repeated several times. Step 3, as before, involves the student setting up (and password-protecting) a blog. Steps 4, 5 and 6 are affected by the introduction of the automated system.

4. *Automated formative feedback system*

   The system aggregates blog content using RSS. It uses the expected linguistic resources identified in this study to determine whether elements of reflection are present. If they are not, it provides the students with reflective prompts. For example, a lack of future tense verbs could indicate that the student has not considered how the event/topic will affect their practice in the future. The system could prompt: "what would you do differently in the future, knowing what you now know?" In cases where no evidence of reflection (or very little evidence of reflection) has been found, the system would send notification to the tutor that intervention is required.

5. *Tutor examines cases requiring intervention, providing further reflective prompts*

   The workload on the tutor is reduced, as he/she need only respond to cases where little/no reflection has been found by the system. The tutor might also choose to perform 'spot checks' to verify the judgements made by the system.

However, the need to reply to every blog post would be eliminated, thereby greatly reducing the workload (while the student is still provided with the same level of feedback, if not more).

6. *Student uses prompts from system (and any additional comments from tutor) to improve subsequent reflection*

The student receives regular, timely feedback from the automated system and additional support from their tutor (if required). As before, prompts are used to either revise the current post or are addressed in future posts.

Stage Three: Post-reflection (summative assessment)

Summative assessment is performed (using the Reflective Writing Assessment Instrument) in the post-reflection stage; it is recommended that this type of high-stakes assessment should be performed manually (Sukkarieh, Pulman & Raikes, 2003; Whitelock & Watt, 2008; Pérez-Marín, Pascual-Nieto & Rodríguez, 2009; Warschauer, 2010). The tutor uses the Reflective Writing Assessment Instrument scoresheet to assign a reflective score, which is provided to students along with comments that they can use to develop their reflective writing further in the future.

8.4 Chapter Review

This chapter evaluated the findings from both the content analysis and the linguistic analysis and compared the results to those found in the literature on related research. It also considered the impact of the integration of technology in the reflective writing and assessment process. The main conclusions and outcomes of this thesis will now be discussed in Chapter 9, as will the research contribution and directions for future research.

Chapter 9 : Conclusions and Future Work

9.0 Chapter Introduction

In this thesis, a Delphi study was performed with a group of Reflective Practice experts to determine the criteria they use to assess reflective writing. In the first round, 12 reflection indicators were identified. These were returned to experts in a second round and ranked according to the depth of reflection that they represented. These indicators formed the basis of a coding scheme which was used to analyse the writing in 27 reflective blogs and journals. A further analysis was then performed to assess the linguistic structure of students' reflective writing.

Section 9.1 summarises the findings and outcomes from the Delphi study, content analysis and linguistic analysis in the context of the three research questions that were set out at the beginning of the thesis. These were:

1. What constructs most accurately describe the characteristics of a piece of reflective writing?

2. Does reflective writing have a predictable linguistic structure?

3. What is the likely impact of the integration of technology in the reflective writing and assessment process?

The subsequent section (9.2) addresses the limitations of the study and states how the scope set out in Chapter 1 has been met. Section 9.3 discusses the contribution of the research (to methodology, theory and practice). Finally, Section 9.4 suggests directions for future work in this area.

9.1 Conclusions and outcomes

This section sets out the major findings and outcomes of this research in the context of the three research questions that were posed in Chapter 1. First, the Reflective Writing Assessment Instrument is discussed and the results from its implementation in the content analysis are summarised.

9.1.1 Reflective Writing Assessment Instrument

The first research question asked:

1. *What constructs most accurately describe the characteristics of a piece of reflective writing?*

A Delphi study was conducted with a group of experts to determine the criteria they use to assess reflective writing. The first round of the study resulted in 12 indicators of reflection; these were returned to experts in a second round, where they were ranked and weighted according to the depth of reflection that they represent.

Other instruments that assess reflective writing (as discussed in Section 3.1) base their assessment criteria on models of reflection described in the literature. In contrast to this, the reflection indicators developed in this thesis were obtained independently of existing models. Consulting with educators who assess reflective writing ensured that the reflection indicators accurately represent assessment practice. However, reflective writing frameworks were also examined later on, confirming that all aspects of reflective writing are represented in the Reflective Writing Assessment Instrument.

The consultation with Reflective Practice experts and examination of the literature on reflective writing ensured that the reflection indicators accurately describe the characteristics of reflective writing, thus confirming the validity of the Reflective

Writing Assessment Instrument. The reliability of the instrument was also assessed (see Chapter 6). A paired *t*-test was performed to confirm inter-coder reliability for each of the 12 reflection indicators. In each case, it was found that there was no significant difference between the two coders' judgements at the 0.05 level of significance.

The Reflective Writing Assessment Instrument was implemented in a content analysis of 27 reflective blogs and journals. The levels of reflection found were comparable to those seen in other studies (as discussed in Section 8.1). It was found that a large amount of the writing done by students was descriptive. The majority of students demonstrated evidence of low-level reflection, while medium-level reflection was seen in fewer blogs/journals. Examples of high-level reflection were seen least often (although some differences between blogs and journals were seen in this regard).

The Reflective Writing Assessment Instrument was also used to assign each blog/journal a reflective score. Compared with other instruments (which were examined in Section 3.1) it is the only one to assign a quantitative score to a piece of reflective writing based on the depth of reflection that the writing contains. Only a moderate correlation between word count and reflective score was found, demonstrating that a larger amount of writing does not necessarily result in a high score. Therefore, it can be said the instrument rewards quality, rather than quantity, of reflective writing.

9.1.2 Linguistic structure of reflective writing

The second research question asked:

2. *Does reflective writing have a predictable linguistic structure?*

In order to answer this question, an additional linguistic analysis was performed on 18 of the 27 reflective blogs and journals (total word count: 14,100). Ten types of linguistic resources were examined, based on the model proposed by Ryan (2011). There was found to be a strong correlation between the total number of linguistic

resources used by students and their reflective scores, showing that students who use linguistically richer language also tend to show evidence of reflection in their writing.

Specific linguistic resources were also correlated with individual reflection indicators. This demonstrated that reflective writing does have a predictable structure, in that particular patterns of writing can be seen in relation to each reflection indicator.

This finding also extends the Reflective Writing Assessment Instrument by providing assessors with information on the type of language that can be expected in relation to each reflection indicator. A scoresheet was developed that incorporates expected linguistic resources with the 12 reflection indicators. The instrument developed in this thesis is the only one to map linguistic resources to specific elements of reflection based on statistical evidence.

9.1.3 Technology in the reflective writing and assessment process

The third research question asked:

3. *What is the likely impact of the integration of technology in the reflective writing process?*

To answer this question, a number of technologies were considered. First, the use of blogging as a tool to support reflective writing was examined. Then, technologies that could assist in the assessment of reflective writing were examined. Finally, a model was presented that proposed the best way in which to incorporate technology in the reflective process.

In the content analysis of reflective blogs and journals, differences were seen in the amount of reflection found in blogs and journals. It was found that blogs contained significantly more descriptive writing and low or medium-level reflection. Journals, on the other hand, demonstrated significantly more evidence of high-level reflection. However, there were a number of differences between the groups including the medium

used for reflection, the discipline under discussion and the amount of reflective writing experience that the students had. It is not possible to say which of these factors accounts for the differences seen in the levels of reflection.

In both groups, there was a decrease in students' reflective scores over time. In addition to this, it was seen that descriptive writing increased over time while the amount of reflective writing was diminished. However, the students in the blog group that received feedback on their reflective writing maintained their levels of reflection over time. Also, a correlation was seen between the number of comments a student received and the degree to which their score improved over time. This confirms the benefits of providing feedback.

Therefore, the model presented in Chapter 8 (see Figure 8.1) recommends the use of blogs as a reflective writing tool. It was recommended that privacy issues be addressed by utilising the security settings of blogging software. Another commonly cited issue with the use of blogs for reflective writing is that they may promote more informal language. However, in this study it was found that both blogs and journals used the same type of language; no significant difference was seen in eight out of the ten linguistic resources examined.

Section 2.5 reviewed a number of automated assessment systems. It was concluded (in Section 8.3) that none of these systems can readily assess reflective writing. Each of the current systems has a number of drawbacks; however, research in this field is continuing. The findings of the linguistic analysis carried out in this thesis have implications for this area. It has been seen in this thesis that reflective writing does have a predictable linguistic structure; therefore, it can be said that reflective writing has the required structure for assessment by these types of technologies.

Therefore, a second version of the integration model was presented, which demonstrated how automated assessment could be incorporated in the reflective process. This type of system could provide regular formative feedback to students while reducing some of the workload on the tutor. The model takes into account the

issues with automated assessment examined in Chapter 2. These included the perceptions about automated assessment held by staff and students, the degree to which automated assessment systems are trusted and the reliability of these systems. The integration model addresses these issues by ensuring that the human is not removed from the reflective writing assessment process.

9.2 Scope of research

Reflective writing takes place in many contexts; however, the focus of this study was reflective writing (and its assessment) in a higher education setting. This thesis specifically examined academic reflective writing that was done by students to satisfy part of their coursework requirements. Accordingly, the experts selected for the Delphi study were all involved in higher education. Also, the reflective blogs and journals examined were all written by students who were engaging in reflective writing as part of their studies in a higher education institution.

The goal of this thesis was to improve the current understanding of reflective writing. This was achieved by the development of detailed reflective writing assessment criteria and the identification of related linguistic features in students' writing. While recommendations were made in the thesis about the ways in which technology (including automated assessment) might be integrated in the reflective writing and assessment process, the development of automated assessment tools was deemed to be far beyond the scope of this project. Issues and recommendations for future research in this area are noted in Section 9.4.

9.3 Research contribution

This thesis makes a number of contributions to methodology, theory and practice. Each of these is now discussed.

9.3.1 Methodological contribution

The research instrument developed in this study makes a contribution to methodology as it can be utilised in future studies in the area of reflective writing assessment. The Reflective Writing Assessment Instrument developed in this thesis assigns a quantitative score to a piece of reflective writing based on the depth of reflection that is evident in the writing. The validity and reliability of the Reflective Writing Assessment Instrument have been confirmed.

9.3.2 Theoretical contribution

The research conducted in this thesis also makes a contribution to knowledge. It adds to the body of published research on use of Web 2.0 technologies in education (where there is a lack of empirical research). It also contributes to the understanding of the structure of reflective writing. The Reflective Writing Assessment Instrument developed in this study correlates linguistic resources to specific elements of reflection based on statistical evidence. This contribution adds to the body of knowledge on the structure of reflective writing, and has implications for the fields of automated writing evaluation and intelligent tutoring.

9.3.3 Contribution to practice

The Reflective Writing Assessment Instrument developed in this thesis can be used by educators to assess reflective writing. As well as providing educators with reflective writing assessment criteria (which are weighted according to the depth of reflection that they represent) the instrument includes information on the linguistic resources that can be expected in relation to each reflection indicator. A scoresheet was developed that incorporates all of these elements. In addition to this, a model of the reflective process

was developed which demonstrates how technology can be incorporated to support reflective writing and assessment.

9.3.4 Research publications

This research has made a contribution that furthers knowledge in the fields of reflective writing assessment and educational technology. The work conducted in this thesis has been disseminated at international conferences, including the EdMedia World Conference on Educational Multimedia, Hypermedia & Telecommunications and the Association for Learning Technology Conference (ALT-C) and has been presented at a symposium run by the National Academy for the Integration of Research, Teaching and Learning (NAIRTL). The abstracts for these publications are included in Appendix G: Publications. It is also planned to submit papers to relevant journals in order to further disseminate the results of this research.

9.4 Limitations

This study examined reflective writing; specifically, its style (i.e. the linguistic features of the writing, how it was written) and its content (what the writing was about). Furthermore, the writing that was analysed in this study was writing that was presented as evidence of reflection for assessment (and accreditation) purposes. However, it is acknowledged that writing is not the only means of expressing reflection. Evidence of reflection expressed through other modes was not evaluated in this thesis.

In addition to this, the degree to which a student's writing is reflective may not necessarily evince how reflective they are as a person. A variety of sociolinguistic factors may affect the way a student uses language (e.g. age, ethnicity, socioeconomic class); these factors were not considered in this study. A student's reflective writing may also be affected when they are writing in a language other than their native language. English was the first language of all the students whose writing was

examined in this study. However, students writing in English as a foreign language may find it difficult to express themselves as effectively as they would in their native language. It follows that the writing of these students may show less evidence of reflection; however, this difference could be attributed to the language barrier and may not mean that the students themselves are less reflective.

The focus on written work as evidence of learning may be a shortcoming of the education system on the whole, rather than just being a limitation of this study. Students are, more often than not, judged based on the written work that they submit for assessment, whether it is a reflective journal, an exam or an essay. Therefore, a student's grade often depends upon not only her knowledge of a given subject but also her use of language and her ability to adequately express her meaning through the written word.

This issue warrants further investigation; additional research in this area could examine the relationship between the levels of reflection evident in a student's writing and how reflective the student is in general (which may be best determined using qualitative modes of research e.g. interviews).

9.5 Future work

Evaluation of the scoresheet by assessors:
In this thesis, measures were taken to make the Reflective Writing Assessment Instrument scoresheet more 'user-friendly'. It would be interesting to conduct a study with assessors to evaluate the degree to which they find the scoresheet to be useful (and easy to use) when assessing reflective writing.

Evaluation of reflective prompts by students:
In the model of the reflective writing and assessment process set out in Chapter 8, it was noted that elements of the Reflective Writing Assessment Instrument could be rephrased and presented to students as prompts to guide their reflections. A further study might

assess students' perceptions of these reflective prompts and their usefulness in supporting the reflective writing process.

Issues/areas of focus for automated assessment:

In this thesis, automated writing evaluation systems were reviewed and the automated assessment of reflective writing was considered. However, further research is required in this area to deal with issues like the variable word length of reflective blog posts/journal entries. It is recommended that future research should focus on these issues. In addition to this, it was proposed that any system developed to automate the assessment of reflective writing would support the reflective writing and assessment process by providing regular, formative feedback to students.

This suggestion is in line with the recommendations put forward by Whitelock and Brasher in JISC's "Roadmap for e-Assessment" report (2006). This roadmap identifies key areas on which the research of computer-assisted assessment (including automated assessment) should focus and sets out a vision for e-Assessment in 2014. The authors propose that computer-assisted assessment can significantly lessen the assessment burden on educators, and suggest that automated writing evaluation systems would be best utilised to provide students with formative feedback (Whitelock & Brasher, 2006).

However, the report acknowledges that, even when that 2014 arrives, research in automated assessment is likely to be an underdeveloped area (Whitelock & Brasher, 2006). The authors suggest additional funding to boost work in this field; however, given the significant worsening of economic conditions since the report was written in 2006, the availability of increased funding for this (or any) research area seems unlikely in the near future.

Nonetheless, it is hoped that the work completed in this thesis will prove useful to future researchers who might attempt to automate the evaluation of reflective writing, as it provides an insight into its linguistic structure and the specific features of reflective writing that relate to varying levels of reflective depth.

List of References

Abidin, M. J. Z., Pour-Mohammadi, M. & Hamid, F. B. A. (2011) 'Blogging: Promoting Peer Collaboration in Writing', *International Journal of Business, Humanities and Technology*, 1(3), 98-105.

Adenekan, S. (2005) *Academics give lessons on blogs*, BBC News. Available from: http://news.bbc.co.uk/2/hi/uk_news/education/4194669.stm [February 12th 2007].

Alvermann, D. E., Rezak, A. T., Mallozzi, C. A., Boatright, M. D. & Jackson, D. F. (2011) 'Reflective Practice in an Online Literacy Course: Lessons Learned from Attempts to Fuse Reading and Science Instruction', *Teachers College Record*, 113(1), 27-56.

Anderson, J. R. (2004) *Cognitive Psychology and its Implications*, 6th ed., New York, NY: Worth.

Anderson, L. W. & Krathwohl, D. R. (2001) *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*, New York: Longman.

Anderson, T. (2005) 'Distance learning – social software's killer ap?' in *Proceedings of the 17th Biennial Conference of the Open and Distance Learning Association of Australia*, Adelaide, 9-11 November.

Anderson, T. & Kanuka, H. (2002) *E-research: Issues, strategies and methods*, Boston: Allyn and Bacon.

Badger, J. (2010) 'Assessing reflective thinking: pre-service teachers' and professors' perceptions of an oral examination', *Assessment in Education: Principles, Policy & Practice*, 17(1), 77-89.

Bain, J. D., Ballantyne, R., Mills, C. & Lester, N. C. (2002) *Reflecting on practice: Student teachers' perspectives*, Flaxton: Post Pressed.

Barr, R. B. & Tagg, J. (1995) 'From Teaching to Learning - A New Paradigm for Undergraduate Education', *Change*, 27(6), 12-25.

Barthélemy, J. P. & Guénoche, A. (1991) *Trees and Proximity Representations*, New York: Wiley.

Baum, N. (2012) 'Reflective Writing Assignment to Help Social Work Trainees Work Through Poor Supervisory Relationships', *Social Work Education: The*

International Journal, 31(1), 110-124.

Bhushan, N. & Rai, K. (2004) *Strategic Decision Making: Applying the Analytic Hierarchy Process*, London: Springer-Verlag.

Biggs, J. (1999) *Teaching for Quality Learning at University*, Buckingham: Open University Press.

Biggs, J. & Collis, K. (1982) *Evaluating the Quality of Learning: the SOLO taxonomy*, New York: Academic Press.

Birney, R., Barry, M. & Ó hÉigeartaigh, M. (2006) 'The Use of Weblogs as a Tool to Support Collaborative Learning and Reflective Practice in Third-Level Institutions', in *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, Orlando, FL, June 26-30.

Birney, R., Barry, M. & Ó hÉigeartaigh, M. (2007) 'Privacy Considerations in the Selection of Blogging Software', in *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications*, Vancouver, BC, June 27 – July 1.

Black, P. (1999) 'Assessment, Learning Theories and Testing Systems', in Murphy, P. (Ed.), *Learners, Learning & Assessment*, London: Sage.

Black, P. & Wiliam, D. (2009) 'Developing the theory of formative assessment'*, Educational Assessment, Evaluation and Accountability*, 21(2009), 5-31.

Black, P. E. & Plowright, D. (2010) 'A multi-dimensional model of reflective learning for professional development', *Reflective Practice*, 11(2), 245-258.

Bloom, B. S. (1956) *Taxonomy of Educational Objectives, the classification of educational goals - Handbook I: Cognitive Domain*, New York: McKay.

Boud, D. (2001) 'Using journal writing to enhance reflective practice', *New Directions for Adult and Continuing Education*, (90), 9-18.

Boud, D., Keogh, R. & Walker, D. (1985) *Reflection: Turning Experience Into Learning*, Milton Keynes: Taylor Francis.

Bourner, T. (2003) 'Assessing Reflective Learning', *Education and Training*, 45(4/5), 267-273.

Brandon, B. (2003), ' Using RSS and Weblogs for e-Learning: An Overview', *The e-Learning Developers' Journal*, May 19. Available from:
http://www.elearningguild.com/pdf/2/051903DEVH.pdf [5th September 2006].

Brandt, D. S. (1997) 'Constructivism: Teaching for Understanding of the Internet', *Communications of the ACM*, 40(10), 112-117.

Brew, A. (1999) 'Towards autonomous assessment: using self-assessment and peer assessment', in Brown, S. & Glasner, A. (Eds.), *Assessment Matters in Higher Education*, Buckingham: Open University Press.

Brookfield, S. (1987) *Developing critical thinkers: Challenging adults to explore alternative ways of thinking and acting*, San Francisco, CA: Jossey-Bass.

Brookfield, S. (1990) *The Skillful Teacher*, San Francisco, CA: Jossey-Bass.

Brookfield, S. (1995) *Becoming a critically reflective teacher*, San Francisco, CA: Jossey-Bass.

Brown, S. (1999a) 'Institutional Strategies for Assessment', in Brown, S. & Glasner, A. (Eds.), *Assessment Matters in Higher Education*, Buckingham: Open University Press.

Brown, S. (1999b) 'Assessing Practice', in Brown, S. & Glasner, A. (Eds.), *Assessment Matters in Higher Education*, Buckingham: Open University Press.

Bruner, J. (1966) *Toward a Theory of Instruction*, Cambridge, MA: Harvard University Press.

Buchanan, E. (2003) 'Online assessment in higher education: Strategies to systematically evaluate student learning', in Discenza, R., Howard, C. & Schenk, K. D. (Eds.), *Distance Learning and University Effectiveness: Changing Educational Paradigms for Online Learning*, London: Idea Group.

Burrell, G. & Morgan, G. (1979) *Sociological Paradigms and Organizational Analysis*, London: Heinemann Educational Books.

Burstein, J. (2003) 'Automated Essay Scoring', in Shermis, M. & Burstein, J. (Eds.), *Automated Essay Scoring: A Cross-Disciplinary Perspective*, Mahwah, NJ: Lawrence Erlbaum.

Burstein, J., Kukich, K., Wolff, S., Lu, C., Chodorow, M. & Braden-Harder, L. (1998) 'Automated scoring using a hybrid feature identification technique', in *36th Annual Meeting of the Association of Computational Linguistics*, Montreal, Canada.

Burstein, J. C., Leacock, C. & Swartz, R. (2001) 'Automated Evaluation of Essays and Short Answers', in *Proceedings of the 5th Computer-Assisted Assessment (CAA)*

Conference, Loughborough, 2-3 July, 2001.

Butler, E., Tatner, M. & Tierney, A. (2010) 'Online reflective diaries - using technology to strengthen the learning experience', in *Improving University Teaching: 35th International Conference*, Washington, DC, 30 June - 3 July.

Calvo, R. A. & Ellis, R. A. (2010) 'Students' Conceptions of Tutor and Automated Feedback in Professional Writing', *Journal of Engineering Education*, 99(4), 427-438.

Carlile, O. & Jordan, A. (2005) 'It works in practice but will it work in theory? The theoretical underpinnings of pedagogy', in O' Neill, G., Moore, S. & McMullin, B. (Eds.), *Emerging Issues in the Practice of University Learning and Teaching*, Dublin: AISHE.

Carlile, O. & Jordan, A. (2007) 'Reflective Writing: Principles and Practice', in O' Farrell, C. (Ed.), *Teaching Portfolio Practice in Ireland: A Handbook*, Dublin: CAPSL/AISHE.

Chan, K. K. & Ridgway, J. (2005) 'Blog: a tool for reflective practice in teacher education?' in *Proceedings of the 3rd International Conference on Education and Information Systems: Technologies and Applications*, Orlando, 14-17 July. pp 333-337.

Chen, H. L. (2004) 'Applications of Folio Thinking and the Learning Landscape Model', in *Proceedings of the e-Portfolio 2004 Conference*, University of British Columbia, 19 November.

Chen, H. L., Cannon, D., Gabrio, J., Leifer, L., Toye, G. & Bailey, T. (2005) 'Using Wikis and Weblogs to Support Reflective Learning in an Introductory Engineering Course', in *American Society for Engineering Education Annual Conference & Exposition*, Portland, 12-15 June.

Chirema, K. (2007) 'The use of reflective journals in the promotion of reflection and learning in post-registration nursing students', *Nurse Education Today*, 27(3), 192-202.

Chretien, K. C., Chheda, S. G., Torre, D. & Papp, K. K. (2012) 'Reflective Writing in the Internal Medicine Clerkship: A National Survey of Clerkship Directors in Internal Medicine', *Teaching and Learning in Medicine*, 24(1), 42-48.

Chretien, K. C., Goldman, E. & Faselis, C. (2008) 'The reflective writing class blog:

using technology to promote reflection and professional development', *Journal of General Internal Medicine*, 23(12), 2066-70.

Churchill, D. (2007) 'Web 2.0 and possibilities for educational applications', *Educational Technology*, 47(2), 24-29.

Clark, R. E. (1983) 'Reconsidering Research on Learning from Media', *Review of Educational Research*, 53(4), 445-459.

Clegg, F. (1990) *Simple Statistics: A course book for the social sciences*, Cambridge: Cambridge University Press.

Clouder, L. (2009) Promotion of Reflective Learning, Teaching and Assessment through Curriculum Design, *Occasional Paper 10: Connecting Reflective Learning, Teaching and Assessment*, Higher Education Academy Centre for Health Sciences and Practice.

Cohen, J. (1988) *Statistical Power Analysis for the Social Sciences*, 2nd ed., Lawrence Erlbaum: Hillsdale, NJ.

Cohen, L., Manion, L. & Morrison, K. (2000) *Research Methods in Education*, 5th ed., London: Routledge-Falmer.

Conole, G. (2010) Review of pedagogical models and their use in e-learning, *A report for the HEFCE e-Learning task force*.

Conole, G. & Alevizou, P. (2010) A literature review of the use of Web 2.0 tools in Higher Education, *A report commissioned by the HEA*.

Conole, G., Dyke, M., Oliver, M. & Seale, J. (2004) 'Mapping pedagogy and tools for effective learning design', *Computers & Education*, 43(2004), 17-33.

Conole, G., Oliver, M., Falconer, I., Littlejohn, A. & Harvey, J. (2006) 'Designing for learning', in Conole, G. & Oliver, M. (Eds.), *Contemporary Perspectives in E-Learning Research: Themes, Methods and Impact on Practice*, Abingdon, UK: Routledge.

Creswell, J. (2009) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, London: Sage.

Creswell, J. & Plano Clark, V. L. (2007) *Designing and Conducting Mixed Methods Research*, London: Sage.

Crook, C., Cummings, J., Fisher, T., Graber, R., Harrison, C., Lewin, C., Logan, K., Luckin, R., Oliver, M. & Sharples, M. (2008) Web 2.0 technologies for learning:

The current landscape - opportunities, challenges and tensions, *BECTA*.

Cross, J. (2004) 'An Informal History of eLearning', *On the Horizon*, 12(3), 103-110.

Cuppernull, L., Marquez, M., Confessore, S. J. & Greenberg, L. (2004) 'Teaching medical students the lifelong skill of reflection through journaling: a pilot study', in *Pediatric Academic Societies' Annual Meeting*, San Francisco, CA, May 1–4.

Dalley, J. (2009) Getting marks for written reflection, *Occasional Paper 10: Connecting Reflective Learning, Teaching and Assessment*, Higher Education Academy Centre for Health Sciences and Practice.

Davis, M. (2003) 'Barriers to reflective practice', *Active Learning in Higher Education*, 4(3), 243-255.

Deng, L. & Yuen, A. H. K. (2011) 'Towards a framework for educational affordances of blogs', *Computers & Education*, 56(2011), 441-451.

Devore, J. & Peck, R. (1990) *Introductory Statistics*, St. Paul, MN: West Publishing Company.

Dewey, J. (1922) *Human Nature and Conduct: An Introduction to Social Psychology*, New York, NY: Modern Library.

Dewey, J. (1933) *How We Think. A restatement of the relation of reflective thinking to the educative process*, Boston: Heath.

di Gregorio, S. & Davidson, J. (2008) *Qualitative Research Design for Software Users*, Milton Keynes: Open University Press.

Divitini, M., Haugaløkken, O. & Morken, E. M. (2005) 'Blog to support learning in the field: lessons learned from a fiasco', in *Fifth IEEE International Conference on Advanced Learning Technologies (ICALT 2005)*, Kaohsiung, Taiwan, 5-8 July.

Downes, S. (2005), 'Elearning 2.0', *Elearn Magazine*, Available from: http://www.elearnmag.org/subpage.cfm?section=articlesandarticle=29-1 [14th April 2012].

Dreher, C., Reiners, T. & Dreher, H. (2011) 'Investigating Factors Affecting the Uptake of Automated Assessment Technology', *Journal of Information Technology Education*, 10, 161-181.

Drucker, P. F. (1973) School Around the Bend, *The Hoya*, Georgetown University; Washington, DC.

Du, H. S. & Wagner, C. (2005) 'Learning with Weblogs: An empirical investigation', in

38th International Conference on System Sciences, Hawaii, 3-6 January.

Duke, S. & Appleton, J. (2000) 'The use of reflection in a palliative care programme: a quantitative study of the development of reflective skills over an academic year', *Journal of Advanced Nursing*, 32(6), 1557-68.

Dunfee, H., Rindflesch, A., Driscoll, M., Hollman, J. & Plack, M. M. (2008) 'Assessing Reflection and Higher-order Thinking in the Clinical Setting Using Electronic Discussion Threads', *Journal of Physical Therapy Education*, 22(2), 60-67.

Dyke, M., Conole, G., Ravenscroft, A. & de Freitas, S. (2006) 'Learning theory and its application to e-learning', in Conole, G. & Oliver, M. (Eds.), *Contemporary Perspectives in E-Learning Research: Themes, Methods and Impact on Practice*, Abingdon, UK: Routledge.

Dyment, J. E. & O' Connell, T. S. (2011) 'Assessing the quality of reflection in student journals: a review of the research', *Teaching in Higher Education*, 16(1), 81-97.

Edwards, R. & Cunningham, S. (2009) Achieving shared understanding of assessment criteria in reflection, *Occasional Paper 10: Connecting Reflective Learning, Teaching and Assessment*, Higher Education Academy Centre for Health Sciences and Practice.

Efimova, L. & Hendrick, S. (2005) *In search for a virtual settlement: An exploration of weblog community boundaries*. Available from:
 https://doc.novay.nl/dsweb/Get/Document-
46041/weblog_community_boundaries.pdf [17th November 2006].

Eggins, S. (2004) *An Introduction to Systemic Functional Linguistics*, 2nd ed., London: Continuum International Publishing Group.

El-Dib, M. A. B. (2007) 'Levels of Reflection in Action Research: An Overview and an Assessment Tool', *Teaching and Teacher Education*, 23(1), 24-35.

Ellison, N. B. & Wu, Y. (2008) 'Blogging in the Classroom: A Preliminary Exploration of Student Attitudes and Impact on Comprehension', *Journal of Educational Multimedia and Hypermedia*, 17(1), 99-122.

Enonbun, O. (2010) 'Constructivism and Web 2.0 in the Emerging Learning Era: A Global Perspective', *Journal of Strategic Innovation and Sustainability*, 6(4), 17-27.

Ertmer, P. A. & Newby, T. J. (1993) 'Behaviourism, Cognitivism, Constructivism:

Comparing Critical Features from an Instructional Design Perspective', *Performance Improvement Quarterly*, 6(4), 50-72.

Falchikov, N. (1995) 'Improving feedback to and from students', in Knight, P. (Ed.), *Assessment for Learning in Higher Education*, Oxon: Routledge Falmer.

Farmer, B., Yue, A. & Brooks, C. (2008) 'Using blogging for higher order learning in large-cohort university teaching: A case study', in *Ascilite 2007*, Singapore

Fenwick, T. J. (2001) Experiential learning: A critical review of theory and practice, *Information Series No. 385*, Columbus, OH, ERIC Clearinghouse on Adult, Career, and Vocational Education.

Ferdig, R. E. & Trammell, K. D. (2004), 'Content Delivery in the Blogosphere', *Technological Horizons in Education Journal*, February. Available from: http://thejournal.com/articles/16626 [26th May 2006].

Findlay, N., Dempsey, S. & Warren-Forward, H. (2009) 'Development of the Newcastle reflective analysis tool', *Focus on Health Professional Education*, 11(1), 32-40.

Findlay, N., Dempsey, S. & Warren-Forward, H. (2010) 'Validation and use of the Newcastle Reflective Analysis Tool: a three-year longitudinal study of RT students' reflective journals', *Reflective Practice*, 11(1), 83-94.

Findlay, N., Dempsey, S. & Warren-Forward, H. (2011) 'Development and validation of reflective inventories: assisting radiation therapists with reflective practice', *Journal of Radiotherapy in Practice*, 10, 3-12.

Finlay, L. (2008) Reflecting on 'Reflective Practice', *Practice-based Professional Learning Centre, Paper 52*, CETL.

Fischer, M. A., Haley, H., Saarinen, C. L. & Chretien, K. C. (2011) 'Comparison of blogged and written reflections in two medicine clerkships', *Medical Education*, 45, 166-175.

Frey, L., Botan, K. & Kreps, G. (2000) *Investigating communication*, New York: Allyn & Bacon.

Fund, Z., Court, D. & Kramarski, B. (2002) 'Construction and Application of an Evaluative Tool to Assess Reflection in Teacher-Training Courses', *Assessment & Evaluation in Higher Education*, 27(6), 485-499.

Gardner, H. (1999) *Intelligence Reframed. Multiple intelligences for the 21st century*, New York, NY: Basic Books.

Gardner, S. (2010) 'SFL: A theory of language for Dynamic Assessment of EAL', *NALDIC Quarterly*, 8(1), 37-41.

Garrison, D. R. & Anderson, T. (2003) *E-Learning in the 21st century*, London: Routledge.

George, S. (2002) 'Learning and the Reflective Journal in Computer Science', in *Twenty-Fifth Australasian Computer Science Conference*, Melbourne, Australia, January/February.

Ghaye, T. (2011) *Teaching and Learning Through Reflective Practice*, 2nd ed., Oxon: Routledge.

Gibbs, G. (1988) *Learning by Doing: A guide to teaching and learning methods*, Oxford: Oxford Polytechnic.

Gibbs, G. R., Friese, S. & Mangabeira, W. C. (2002), 'The Use of New Technology in Qualitative Research', *Forum: Qualitative Social Research*, 3(2). Available from: http://www.qualitative-research.net/fqs-texte/2-02/2-02hrsg-e.htm

Gogoulou, A., Gouli, E. & Grigoriadou, M. (2008) 'Adapting and personalizing the communication in a synchronous communication tool', *Journal of Computer Assisted Learning*, 24(3), 203–216.

Gordinier, C., Conway, K. & Journet, A. (2006) 'Facilitating Teacher Candidates' Reflective Development Through the Use of Portfolios, Teacher Work Sample and Guided Reflections', *Teaching & Learning*, 20(2), 89-105.

Gunter, B. (2000) *Media Research Methods: Measuring audiences, reactions and impact*, London: Sage.

Habermas, J. (1971) *Knowledge and human interests*, Boston: Beacon.

Halliday, M. A. K. & Hasan, R. (1985) *Language, context and text: Aspects of language in a social semiotic perspective*, Victoria: Deakin University Press.

Halliday, M. A. K. & Matthiessen, C. M. (1999) *Construing experience through meaning: a language-based approach to cognition*, London: Cassell.

Hargreaves, J. (2004) 'So how do you feel about that? Assessing reflective practice', *Nurse Education Today*, 24(3), 196-201.

Harris, M. (2008) 'Scaffolding reflective journal writing - Negotiating power, play and position', *Nurse Education Today*, 28(3), 314-326.

Harrison, P. A. & Fopma-Loy, J. L. (2010) 'Reflective Journal Prompts: A Vehicle for

Stimulating Emotional Competence in Nursing', *Journal of Nursing Education*, 49(11), 644-652.

Hashemi, M. & Najafi, V. (2011) 'Using Blogs in English Language Writing Classes', *International Journal of Academic Research*, 3(4), 599-604.

Hatton, N. & Smith, D. (1995) 'Reflection in teacher education: Towards definition and implementation ', *Teaching and Teacher Education*, 11(1), 33-49.

Hatzipanagos, S. & Warburton, S. (2007) 'Closing the loop: Exploring the links between formative assessment and social software in distance education', in *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications (EdMedia) 2007*, Vancouver, Canada, 25-29 June.

Haykin, S. (2008) *Neural Networks and Learning Machines*, 3rd ed., New York: Prentice Hall.

HE Academy (2005) *Assessing Reflection Special Interest Group Report*. Available from:www.health.heacademy.ac.uk/sig/old-critical-reflection/assessingreflection_july05 [12th December 2008].

He, Y., Hui, S. C. & Quan, T. T. (2009) 'Automatic summary assessment for intelligent tutoring systems', *Computers & Education*, 53(2009), 890-899.

Hearst, M. (2000) 'The debate on automated essay grading', *IEEE Intelligent Systems*, (Sept/Oct), 22-37.

Heckerman, D. (1995) A Tutorial on Learning with Bayesian Networks, *Technical Report MSR-TR-95-06*, Redmond, WA, Microsoft Research Advanced Technology Division.

Heinrich, E., Milne, J., Crooks, T., Granshaw, B. & Moore, M. (2006) Literature review on the use of e-learning tools for formative essay-type assessment, Massey University, report for eCDF (e-Learning Collaborative Development Fund).

Herring, S. C., Kouper, I., Paolillo, J. C., Scheidt, L. A., Tyworth, M., Welsch, P., Wright, E. & Yu, N. (2005) 'Conversations in the Blogosphere: An Analysis "From the Bottom Up"', in *38th Hawaii International Conference on System Sciences*, Hawaii, 3-6 January.

Higgins, C. A. & Bligh, B. (2006) 'Formative Computer Based Assessment in Diagram Based Domains', in *Innovation and Technology in Computer Science Education (ITiCSE) Conference*, Bologna, Italy

Hijmans, E. (1996) 'The Logic of Qualitative Media Content Analysis: A Typology', *Communications*, 21(1996), 93-108.

Hobbs, V. (2007) 'Faking it or hating it: can reflective practice be forced?' *Reflective Practice*, 8(3), 405-417.

Huffaker, D. (2005) 'The educated blogger: Using weblogs to promote literacy in the classroom.' *AACE Journal*, 13(2), 91-98.

Hume, A. & Coll, R. K. (2009) 'Assessment of learning, for learning, and as learning: New Zealand case studies', *Assessment in Education: Principles, Policy & Practice*, 16(3), 269-290.

Hung, J. (2012) 'Trends of e-learning research from 2000 to 2008: Use of text mining and bibliometrics', *British Journal of Educational Technology*, 43(1), 5-16.

Ishioka, T. & Kameda, M. (2004) 'Automated Japanese Essay Scoring System: JESS', in *15th International Workshop on Database and Expert Systems Applications*, Washington, DC, Aug 30 - Sep 3.

Jackson, K. M. & Trochim, W. M. K. (2002) 'Concept Mapping as an Alternative Approach for the Analysis of Open-Ended Survey Responses', *Organizational Research Methods*, 5(4), 307-336.

Jarvis, P. (1987) *Adult Learning in the Social Context*, London: Croom Helm.

Jarvis, P. (2004) *Adult education and lifelong learning: theory and practice*, London: Routledge Falmer.

Jenkins, A. (2004) 'The design of reflective journals as course evaluation instruments - an Information Systems case study', in *Proceedings of the 10th Americas Conference on Information Systems*, New York, 5-8 August.

Johns, C. (1994) 'Guided reflection', in Palmer, A., Burns, S. & Bulman, C. (Eds.), *Reflective Practice in Nursing. The Growth of the Professional Practitioner*, Oxford: Blackwell Science.

Jones, C. (2008) 'Infrastructures, institutions and networked learning', in *Proceedings of the 6th International Conference on Networked Learning*, Halkidiki, Greece, 5th-6th May 2008.

Jones, C., Aoki, K., Rusman, E. & Schlusmans, K. (2009) 'A comparison of three Open Universities and their acceptance of Internet Technologies', in *Proceedings of the 23rd ICDE World Conference on Open Learning and Distance Education*,

Maastricht, Netherlands, 7-10 June 2009.

Jones, D. (2006) *Enhancing the learning journey for distance education students in an introductory programming course*. Available from: http://cq-pan.cqu.edu.au/david-jones/Publications/Papers_and_Books/react1.pdf [23rd February 2007].

Kakkonen, T., Myller, N. & Sutinen, E. (2004) 'Semi-Automatic Evaluation Features in Computer-Assisted Essay Assessment', in *7th IASTED Int'l Conf. on Computers and Advanced Technology in Education*, Kauai, Hawaii, USA, 16-18 August. pp 456–461.

Kakkonen, T., Myller, N. & Sutinen, E. (2006) 'Applying Part-of-Speech Enhanced LSA to Automatic Essay Grading', in *Proceedings of the 4th IEEE International Conference on Information Technology: Research and Education (ITRE 2006)*, Tel Aviv, Israel, 16-19 Oct.

Kakkonen, T., Myller, N., Timonen, J. & Sutinen, E. (2005) 'Automatic essay grading with probabilistic latent semantic analysis', in *Proceedings of the Second Workshop on Building Educational Applications Using NLP*, University of Michigan, 29 June, 2005.

Kamel Boulos, M. N. & Wheeler, S. (2007) 'The emerging Web 2.0 social software: an enabling suite of sociable technologies in health and health care education', *Health Information & Libraries Journal*, 24(1), 2-23.

Kanuka, H. & Anderson, T. (2007) 'Ethical issues in qualitative e-learning research', *International Journal of Qualitative Methods*, 6(2).

Katz, S., Allbritton, D. & Connelly, J. (2003) 'Going beyond the problem given: How human tutors use post-solution discussions to support transfer', *International Journal of Artificial Intelligence in Education*, 13(1), 79-116.

Keeney, S., Hasson, F. & McKenna, H. (2006) 'Consulting the oracle: ten lessons from using the Delphi technique in nursing research', *Journal of Advanced Nursing*, 53(2), 205-212.

Kember, D., Jones, A., Loke, A. Y., McKay, J., Sinclair, K., Tse, H., Webb, C., Wong, F. K. Y., Wong, M. & Yeung, E. (1999) 'Determining the Level of Reflective Thinking from Students' Written Journals Using a Coding Scheme Based on the Work of Mezirow', *International Journal of Lifelong Education*, 18(1), 18-30.

Kember, D., McKay, J., Sinclair, K. & Wong, F. K. Y. (2008) 'A four-category scheme for coding and assessing the level of reflection in written work', *Assessment & Evaluation in Higher Education*, 33(4), 369-379.

Kemmis, S. & McTaggart, R. (1988) *The Action Research Planner*, 2nd ed., Geelong, Victoria: Deakin University Press.

Kennedy, D. (2007) *Writing and Using Learning Outcomes: A Practical Guide*, Cork: University College Cork.

Kennedy, H. P. (2004) 'Enhancing Delphi research: methods and results', *Journal of Advanced Nursing*, 45(5), 504-511.

Kim, H. N. (2008) 'The phenomenon of blogs and theoretical model of blog use in educational contexts', *Computers & Education*, 51(2008), 1342-1352.

Kinsella, E. A. (2006) 'Constructivist underpinnings in Donald Schön's theory of reflective practice: echoes of Nelson Goodman', *Reflective Practice*, 7(3), 277-286.

Knowles, M. (1980) *The Modern Practice of Adult Education. From pedagogy to andragogy*, 2nd ed., Englewood Cliffs: Prentice Hall/Cambridge.

Kolb, D. A. (1984) *Experiential Learning*, Englewood Cliffs, NJ: Prentice Hall.

Kolb, D. A., Boyatzis, R. & Mainemelis, C. (2001) 'Experiential learning theory: previous research and new directions', in Sternberg, R. & Zhang, L. (Eds.), *Perspectives on cognitive learning and thinking styles*, Mahwah, NJ: Lawrence Erlbaum.

Krippendorff, K. (2004) *Content Analysis: An Introduction to its Methodology*, Thousand Oaks, CA: Sage.

Krueger, R. A. (1994) *Focus groups: A practical guide for applied research*, 2nd ed., London: Sage.

Kunz, P., Dewstow, R. & Moodie, P. (2003) 'A generic tool to set up metacognitive journals and their serendipitous use', in *Proceedings of the 20th annual conference of the Australian Society for Computers in Learning in Tertiary Education*, Adelaide, Australia, 7-10 December.

Landauer, T. K., Laham, D. & Foltz, P. W. (2003) 'Automatic essay assessment', *Assessment in Education: Principles, Policy & Practice*, 10(3), 295-308.

Landauer, T. K., Laham, D., Rehder, B. & Schreiner, M. E. (1997) 'How well can

passage meaning be derived without using word order? A comparison of Latent Semantic Analysis and humans', in *19th Annual Meeting of the Cognitive Science Society*, Mahwah, NJ, 7-10 August.

Larkey, L. (1998) 'Automatic essay grading using text categorization techniques', in *21st Annual International Conference on Research and Development in Information Retrieval*, New York, 90–95.

Laurillard, D. (2002) *Rethinking University Teaching: a conversational framework for the effective use of learning technologies*, 2nd ed., London: Routledge Falmer.

Lave, J. & Wenger, E. (1991) *Situated Learning. Legitimate peripheral participation*, Cambridge: University of Cambridge Press.

Laverty, J. (2012) 'Reflective learning within clinical physiology: the student's perspective on the usefulness of reflection as a learning tool', *Reflective Practice*, 13(1), 131-147.

Le Cornu, A. (2005) 'Building on Jarvis: Towards a holistic model of the processes of experiential learning', *Studies in the Education of Adults*, 37(2), 166-181.

Lebow, D. (1993) 'Constructivist Values for Systems Design: Five Principles Toward a New Mindset', *Educational Technology Research and Development*, 41, 4-16.

Lee, L. (2010) 'Fostering reflective writing and interactive exchange through blogging in an advanced language course', *ReCALL: The Journal of the European Association for Computer Assisted Language Learning*, 22(2), 212-227.

Lewins, A. & Silver, C. (2007) *Using Software in Qualitative Research: A Step-by-Step Guide*, Los Angeles, CA: Sage.

Light, G. & Cox, R. (2001) *Learning and Teaching in Higher Education: The Reflective Professional*, London: Paul Chapman Publishing.

Lindahl, C. & Blount, E. (2003) 'Weblogs: Simplifying Web Publishing', *Computer*, 36(11), 114-116.

Lindsay, G., Kell, L., Ouellette, J. & Westall, H. (2010) 'Using 'I' in scholarly writing: how does reflecting on experience matter?' *Reflective Practice*, 11(3), 271-283.

Lockwood, F. (2007) 'Foreword', in Conole, G. & Oliver, M. (Eds.), *Contemporary perspectives in e-learning research: themes, methods and impacts on practice*, London: Routledge.

Lui, A. K., Choy, S. O., Cheung, Y. & Li, S. (2006) 'A Study on the Perception of

Students towards Educational Weblogs', *Informatics in Education*, 5(2), 233–254.

Luján-Mora, S. (2006) 'A Survey of Use of Weblogs in Education', *Current Developments in Technology-Assisted Education*, 255-259.

Luk, J. (2008) 'Assessing teaching practicum reflections: Distinguishing discourse features of the "high" and "low" grade reports', *System*, 36(4), 624-641.

MacColl, I., Morrison, A., Muhlberger, R., Simpson, M., Viller, S. & Wyeld, T. (2005) 'Reflections on reflection: Blogging in undergraduate design studios', in *Proceedings of the 2005 Blogtalk Down Under Conference*, Australia, 19-22 May.

Martin, J. R. (1992) *English text: System and structure*, Amsterdam: Benjamins.

Martin, J. R. (2000) 'Beyond Exchange: APPRAISAL Systems in English', in Hunston, S. & Thompson, G. (Eds.), *Evaluation in Text: Authorial Stance and the Construction of Discourse*, Oxford: Oxford University Press.

Martin, J. R. (2004) 'Sense and sensibility: Texturing evaluation', in Foley, J. (Ed.), *Language, education and discourse: Functional approaches*, London: Continuum.

Mason, O. & Grove-Stephenson, I. (2002) 'Automated free text marking with paperless school', in *Sixth International Computer Assisted Assessment Conference*, Loughborough, UK.

Mayes, T. & De Freitas, S. (2004) Stage2 - Review of e-learning theories, frameworks and models, *JISC: Elearning Models Desk Study*, Manchester, Joint Information Systems Committee.

Maykut, P. S. & Morehouse, R. (1994) *Beginning qualitative research: A philosophic and practical guide*, London: Falmer Press.

McCrindle, A. R. & Christensen, C. A. (1995) 'The impact of learning journals on metacognitive and cognitive processes and learning performance', *Learning and Instruction*, 5(2), 167-185.

McGuinness, C. & Brien, M. (2007) 'Using reflective journals to assess the research process', *Reference Services Review*, 35(1), 21-40.

McMurray, A. R. (1994) 'Three decision making aids – brainstorming, nominal group and the Delphi technique', *Journal of Nursing Staff Development*, 10(2), 62-65.

Mezirow, J. (1991) *Transformative Dimensions of Adult Learning*, San Francisco: Jossey-Bass.

Michaelson, R. (2002) 'Re-thinking Laurillard: universities, learning and technology', *International Journal of Management Education*, 2(2), 15-29.

Miller, J., Kovacs, P. J., Wright, L., Corcoran, J. & Rosenblum, A. F. (2005) 'Field education: Student and field instructor perceptions of the learning process', *Journal of Social Work Education*, 41(1), 131-145.

Ming, P. Y., Mikhailov, A. A. & Kuan, T. L. (2000) 'Intelligent essay marking system', in *Learners Together*, Singapore, 2000.

Mitchell, T., Aldridge, N., Williamson, W. & Broomhead, P. (2003) 'Computer Based Testing of Medical Knowledge', in *7th International CAA Conference*, Loughborough, UK.

Mitchell, T., Russell, T., Broomhead, P. & Aldridge, N. (2002) 'Towards Robust Computerised Marking of Free-Text Responses', in *Proceedings of the 6th Computer-Assisted Assessment (CAA) Conference*, Loughborough, 9-10 July, 2002.

Moallem, M. (2001) 'Apply Constructivist and Objectivist Learning Theories in the Design of a Web-Based Course: Implications for Practice', *Educational Technology & Society*, 4(3), 113-125.

Moon, J. (1999a) *Learning Journals: A Handbook for Academics, Students and Professional Development*, London: Routledge Falmer.

Moon, J. (1999b) *Reflection in Learning and Professional Development*, London: Routledge.

Moon, J. (2004) *A Handbook of Reflective and Experiential Learning: Theory and Practice*, London: Routledge-Falmer.

Moon, J. (2007) 'Getting the measure of reflection: considering matters of definition and depth', *Journal of Radiotherapy in Practice*, 6(2007), 191-200.

Muijs, D. (2011) *Doing Quantitative Research in Education with SPSS*, 2nd ed., London: Sage.

Nardi, B. A., Schiano, D. J. & Gumbrecht, M. (2004) 'Blogging as Social Activity, or, Would You Let 900 Million People Read Your Diary?' in *ACM Conference on Computer Support Cooperative Work*, Chicago, IL, 6-10 November, 222-231.

National Qualifications Authority of Ireland (NQAI) (2002) Towards a National Framework of Qualifications: establishment of policies and criteria, Dublin, NQAI.

Neuendorf, K. (2002) *The Content Analysis Guidebook*, Thousand Oaks, CA: Sage.

Nilsson, S. (2003) The function of language to facilitate and maintain social networks in research weblogs, Umea Universitet.

Novak, J. D. & Musonda, D. (1991) 'A twelve-year longitudinal study of science concept learning', *American Educational Research Journal*, 28(1), 117-153.

Nowson, S. (2006) The Language of Weblogs: A study of genre and individual differences, University of Edinburgh.

Nückles, M., Schwonke, R., Berthold, K. & Renkl, A. (2004) 'The use of public learning diaries in blended learning', *Journal of Educational Media*, 29(1).

O' Neill, S., Scott, M. & Conboy, K. (2011) 'A Delphi study on collaborative learning in distance education: The faculty perspective', *British Journal of Educational Technology*, 42(6), 939-949.

Olofsson, A. D., Lindberg, J. O. & Hauge, T. E. (2011) 'Blogs and the design of reflective peer-to-peer technology-enhanced learning and formative assessment', *Campus-Wide Information Systems*, 28(3), 183-194.

Otienoh, R. O. (2009) 'Reflective practice: the challenge of journal writing', *Reflective Practice*, 10(4), 477-489.

Otienoh, R. O. (2010) 'Feedback on teachers' journal entries: a blessing or a curse?' *Reflective Practice*, 11(2), 143-156.

Page, E. B. (1966) Grading essays by computer: Progress Report, *Invitational Conference on Testing Problems*, Princeton, NJ, Educational Testing Service.

Page, E. B. (2003) 'Project Essay Grade: PEG', in Shermis, M. D. & Burstein, J. C. (Eds.), *Automated Essay Scoring: A Cross-Disciplinary Perspective*, Mahwah, NJ: Lawrence Erlbaum.

Pask, G. (1975) *Conversation, Cognition and Learning*, Amsterdam: Elsevier.

Paul, J., Lewis, S. & Supon, P. (1994) 'Improving Education Through Improved Assessment', in *Frontiers in Education, 24th Annual Conference*, San Jose, CA, November.

Pee, B., Woodman, T., Fry, H. & Davenport, E. S. (2002) 'Appraising and assessing

reflection in students' writing on a structured worksheet ', *Medical Education*, 36(6), 575-585.

Pérez-Marín, D., Alfonseca, E., Rodríguez, P. & Pascual-Nieto, I. (2006) 'Willow: Automatic and Adaptive Assessment of Student's Free-Text Answers', in *22nd International Conference of the Spanish Society for Natural Language Processing*, Zaragoza, Spain.

Pérez-Marín, D., Pascual-Nieto, I. & Rodríguez, P. (2009) 'Computer-assisted assessment of free-text answers', *The Knowledge Engineering Review*, 24(4), 353-374.

Philip, L. (2006) 'Encouraging reflective practice amongst students: a direct assessment approach', *Planet*, 17(December), 37-39.

Pilgrim, M. (December 18th 2002) *XML.com: What is RSS?* Available from: http://www.xml.com/pub/a/2002/12/18/dive-into-xml.html [26th May 2006].

Plack, M. M., Driscoll, M., Blissett, S., McKenna, R. & Plack, T. P. (2005) 'A Method for Assessing Reflective Journal Writing', *Journal of Allied Health*, 34(4), 199-208.

Plack, M. M., Driscoll, M., Marquez, M., Cuppernull, L., Maring, J. & Greenberg, L. (2007) 'Assessing Reflective Writing on a Pediatric Clerkship by Using a Modified Bloom's Taxonomy ', *Ambulatory Pediatrics*, 7(4), 285 - 291.

Polias, J. (2010) 'Pedagogical resonance: improving teaching and learning', *NALDIC Quarterly*, 8(1), 42-49.

Poling, C. (2005) 'Blog On: Building Communication and Collaboration among Staff and Students', *Learning & Leading with Technology*, 32(6), 12-15.

Race, P. (1995) 'What has assessment done for us - and to us?' in Knight, P. (Ed.), *Assessment for Learning in Higher Education*, Oxon: Routledge Falmer.

Race, P. (2007) *The Lecturer's Toolkit: A Practical Guide to Learning, Teaching and Assessment*, Oxon: Routledge Falmer.

Ramasamy, K. K. (2002) 'Promoting reflective practice in higher education: A dilemma', in *Proceedings of the 11th Annual Teaching & Learning Forum*, Western Australia, 5-6 February.

Ray, B. & Hocutt, M. M. (2006) 'Reflection and the Middle School Blogger: Do Blogs Support Reflective Practices?' *Meridian Middle School Computer Technologies*

Journal, 9(1).

Ray, B. B. & Coulter, G. A. (2008) 'Reflective practices among language arts teachers: The use of weblogs', *Contemporary Issues in Technology and Teacher Education*, 8(1).

Redecker, C., Ala-Mutka, K., Bacigalupo, M., Ferrari, A. & Punie, Y. (2009) Learning 2.0: The Impact of Web 2.0 Innovations on Education and Training in Europe, *JRC European Commission*, Institute for Prospective Technological Studies.

Regmi, K. (2010) 'Assessing students' written work: experience of a student practice lecturer in the UK', *Reflective Practice*, 11(1), 107-114.

Reidsema, C. & Mort, P. (2009) 'Assessing reflective writing: Analysis of reflective writing in an engineering design course', *Journal of Academic Language and Learning*, 3(2), 117-129.

Reis, S. P., Wald, H. S., Monroe, A. D. & Borkan, J. M. (2010) 'Begin the BEGAN (The Brown Educational Guide to the Analysis of Narrative) - A framework for enhancing educational impact of faculty feedback to students' reflective writing', *Patient Education and Counselling*, 80(2010), 253-259.

Richards, L. (2005) *Handling Qualitative Data: A practical guide*, London: Sage.

Riffe, D., Lacy, S. & Fico, F. (1998) *Analyzing Media Messages*, New Jersey: Lawrence Erlbaum.

Robertson, J. (2011) 'The educational affordances of blogs for self-directed learning', *Computers & Education*, 57(2011), 1628-1644.

Robson, C. (2002) *Real World Research*, 2nd ed., Oxford: Blackwell Publishing.

Rose, C. P., Roque, A., Bhembe, D. & Vanlehn, K. (2003) 'A hybrid text classification approach for analysis of student essays', in *Proceedings of the HLT-NAACL Workshop on Building educational applications using natural language processing*, Edmonton, Canada, May 31, 2003.

Rose, C. P. & Vanlehn, K. (2005) 'An Evaluation of a Hybrid Language Understanding Approach for Robust Selection of Tutoring Goals', *International Journal of Artificial Intelligence in Education*, 15(4), 325-355.

Rudner, L. M. & Liang, T. (2002) 'Automated essay scoring using Bayes' theorem', *The Journal of Technology, Learning and Assessment*, 1(2), 3-21.

Rutter, L. (2006) 'Supporting reflective, practice-based learning and assessment for

post-qualifying social work', *Reflective Practice*, 7(4), 469-482.

Ryan, M. (2011) 'Improving reflective writing in higher education: a social semiotic perspective', *Teaching in Higher Education*, 16(1), 99-111.

Saaty, T. L. (2000) *Fundamentals of Decision Making and Priority Theory*, 2nd ed., Pittsburgh: RWS Publications.

Saaty, T. L. & Vargas, L. G. (2001) *Models, Methods, Concepts & Applications of the Analytic Hierarchy Process*, Boston: Kluwer Academic.

Sabin, M. & Leone, J. (2009) 'IT Education 2.0', in *Proceedings of the 10th ACM conference on SIG-information technology education (SIGITE '09)*, Fairfax, VA, October 22-24, 91-99.

Saeed, N. & Yang, Y. (2008) 'Incorporating blogs, social bookmarks, and podcasts into unit teaching', in *Proceedings of Tenth Australasian Computing Education Conference (ACE2008)*, Wollongong, Australia, January 2008.

Saldana, J. (2009) *The Coding Manual for Qualitative Researchers*, London: Sage.

Samuel, M. & Betts, J. (2007) 'Crossing the threshold from description to deconstruction and reconstruction: using self-assessment to deepen reflection', *Reflective Practice*, 8(2), 269-283.

Sandars, J. (2006) 'Twelve tips for using blogs and wikis in medical education', *Medical Teacher*, 28(8), 680-682.

Schleppegrell, M. J. (2010) 'Supporting a "reading to write" pedagogy with functional grammar', *NALDIC Quarterly*, 8(1), 26-31.

Schön, D. (1983) *The Reflective Practitioner: How Professionals Think in Action*, New York: Basic Books.

Schön, D. A. (1987) *Educating the Reflective Practitioner*, San Francisco: Wiley.

Seely Brown, J. & Adler, R. P. (2008) 'Minds on Fire', *Educause Review*, January/February.

Seely, J. (2004) *Oxford A-Z of Grammar and Punctuation*, Oxford: Oxford University Press.

Sen, B. A. (2010) 'Reflective writing: a management skill', *Library Management*, 31(1/2), 79-93.

Shaheed, N. & Dong, A. (2006) 'Reflection and Analysis in Design Student Blogs', in *Proceedings of the DESIGN 2006 / 9th International Design Conference*,

Dubrovnik, 15-18 May.

Sharma, P. (2010) 'Enhancing student reflection using Weblogs: lessons learned from two implementation studies', *Reflective Practice*, 11(2), 127-141.

Shepard, L. A. (2000) The Role of Classroom Assessment in Teaching and Learning, *CSE Technical Report 517*, Los Angeles, CA, National Center for Research on Evaluation, Standards and Student Testing.

Shermis, M. & Burstein, J. (2003) 'Introduction', in Shermis, M. D. & Burstein, J. C. (Eds.), *Automated Essay Scoring: A Cross-Disciplinary Perspective*, Mahwah, NJ: Lawrence Erlbaum.

Shoffner, M. (2005) '"If you write it down, you have to think about it": Incorporating weblogs into pre-service teachers' reflective practice', in *Proceedings of the 2005 Society for Information Technology & Teacher Education (SITE) Conference*, Phoenix, Arizona, 1-5 March.

Siddiqi, R. & Harrison, C. (2008) 'A systematic approach to the automated marking of short answer questions', in *12th IEEE International Multitopic Conference*, Karachi, Pakistan, 23-24 December 2008.

Sim, J. W. S. & Hew, K. F. (2010) 'The use of weblogs in higher education settings: A review of empirical research', *Educational Research Review*, 5(2010), 151-163.

Smith, M. K. (2001) *David A. Kolb on experiential learning*. Available from: http://www.infed.org/b-explrn.htm [31st March 2012].

Snelson, C., Rice, K. & Wyzard, C. (2012) 'Research priorities for YouTube and video-sharing technologies: A Delphi study', *British Journal of Educational Technology*, 43(1), 119-129.

St. John, W. & Johnson, P. (2000) 'The Pros and Cons of Data Analysis Software for Qualitative Research', *Journal of Nursing Scholarship*, 32(4), 393-397.

Stacey, E. & Gerbic, P. (2003) 'Investigating the Impact of Computer Conferencing: Content Analysis as a Manageable Research Tool', in *Interact, integrate, impact: Proceedings of the 20th annual conference of the Australasian society for computers in learning in tertiary education*, Adelaide, 7–10 December 2003.

Stanley, G. (2004) 'Introducing your students to blogs', *IATEFL Issues*, April-May, 9.

Stergiou, C. & Siganos, D. (1996) *Neural Networks*. Available from: http://www.doc.ic.ac.uk/~nd/surprise_96/journal/vol4/cs11/report.html [13th

May 2009].

Sternberg, S. (1966) 'High-speed scanning in human memory', *Science*, 153, 652-654.

Stevens, R. H. & Casillas, A. (2006) 'Artificial Neural Networks', in Williamson, D. M., Mislevy, R. J. & Bejar, I. I. (Eds.), *Automated Scoring of Complex Tasks in Computer-Based Testing*, Mahwah, NJ: Lawrence-Erlbaum.

Stewart, J. (2001) 'Is the Delphi technique a qualitative method?' *Medical Education*, 35(10), 928-937.

Stiler, G. M. & Philleo, T. (2003) 'Blogging and blogspots: An alternative format for encouraging reflective practice among preservice teachers', *Education*, (Summer).

Stone, J. A. & Madigan, E. M. (2007) 'Integrating Reflective Writing in CS/IS', *Inroads: SIGCSE Bulletin*, 39(2).

Sukkarieh, J. Z., Pulman, S. G. & Raikes, N. (2003) 'Automarking: Using computational linguistics to score short, free-text responses', in *International Association for Educational Assessment (IAEA)*, Manchester, UK.

Sumison, J. & Fleet, A. (1996) 'Reflection: can we assess it? Should we assess it?' *Assessment & Evaluation in Higher Education*, 21(2), 121-130.

Suzuki, R. (2004) 'Diaries as introspective research tools: From Ashton-Warner to Blogs', *Teaching English as a Second or Foreign Language (TESL-EJ)*, 8(1).

Tallent-Runnels, M. K., Thomas, J. A., Lan, W. Y. & Cooper, S. (2006) 'Teaching Courses Online: A Review of the Research', *Review of Educational Research*, 76(1), 93-135.

Tan, Y. H., Teo, E. H., Aw, W. L. & Lim, W. Y. (2005) Portfolio Building in Chinese Language Learning Using Blogs, Singapore Ministry of Education.

Teddlie, C. & Tashakkori, A. (2009) *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioural Sciences*, London: Sage.

Tennant, M. (1997) *Psychology and Adult Learning*, 2nd ed., London: Routledge.

Toms, J. (2009) Supporting Markers in Assessing Reflective Writing: The development and evaluation of a marking pack, *Occasional Paper 10: Connecting Reflective Learning, Teaching and Assessment*, Higher Education Academy Centre for Health Sciences and Practice.

Tosh, D. & Werdmuller, B. (2004) *Creation of a Learning Landscape: weblogging and social networking in the context of e-portfolios*. Available from: http://www.eradc.org/papers/Learning_landscape.pdf [3rd September 2006].

Trammell, K. D. & Ferdig, R. E. (2004) 'Pedagogical implications of classroom blogging', *Academic Exchange Quarterly*, 8(4), 60-64.

Valenti, S., Neri, F. & Cucchiarelli, A. (2003) 'An Overview of Current Research on Automated Essay Grading', *Journal of Information Technology Education*, 2, 319 - 330.

Van Manen, M. (1977) 'Linking ways of knowing with ways of being practical', *Curriculum Inquiry*, 6, 205-228.

Vantage Learning (2006) MyAccess Efficacy Report, Newtown, PA, Vantage Learning Inc.

Vygotsky, L. (1934) *Thought and language*, Cambridge, MA: MIT Press.

Wagner, C. (2003) 'Put another B(log) on the Wire: Publishing Learning Logs as Weblogs', *Journal of Information Systems Education*, 14(2), 131-132.

Wald, H. S., Borkan, J. M., Taylor, J. S., Anthony, D. & Reis, S. P. (2012) 'Fostering and evaluating reflective capacity in medical education: developing the REFLECT rubric for assessing reflective writing', *Academic Medicine: Journal of the Association of American Medical Colleges*, 87(1), 41-50.

Wang, Y., Lin, H. & Liao, Y. (2012) 'Investigating the individual difference antecedents of perceived enjoyment in students' use of blogging', *British Journal of Educational Technology*, 43(1), 139-152.

Ward, J. & McCotter, S. (2004) 'Reflection as a visible outcome for preservice teachers', *Teaching & Teacher Education: An International Journal of Research and Studies*, 20(3), 243-257.

Warschauer, M. (2010), 'Invited Commentary: New Tools for Teaching Writing', *Language Learning & Technology*, 14(1). Available from: http://llt.msu.edu/vol14num1/commentary.pdf

Watts, M. & Lawson, M. (2009) 'Using a meta-analysis activity to make critical reflection explicit in teacher education', *Teaching and Teacher Education*, 25(2009), 609-616.

Watts, S. A. (2007) 'Evaluative Feedback: Perspectives on Media Effects ', *Journal of*

Computer-Mediated Communication, 12(2), 384-411.

Weller, M., Pegler, C. & Mason, R. (2005) 'Use of innovative technologies on an e-learning course', *Internet and Higher Education*, 8, 61-71.

Wessel, J. & Larin, H. (2006) 'Change in reflections of physiotherapy students over time in clinical placements', *Learning in Health and Social Care*, 5(3), 119-132.

West, R. E., Wright, G. A. & Graham, C. R. (2005) 'Blogs, Wikis, and Aggregators: A New Vocabulary for Promoting Reflection and Collaboration in a Preservice Technology Integration Course', in *Proceedings of the 2005 Society for Information Technology and Teacher Education (SITE)*, Phoenix, Arizona, 1-5 March.

Whitelock, D., Baldwin, C., Beagrie, C., Clark, M., Craw, I., Herrmann, F., Holt, J., McKillop, C., Pittaway, M., Price, C., Rey, J. & Watt, S. (2008) Open Comment - Final Report, *Computer Assisted Formative Assessment Project (CAFA)*, Open University.

Whitelock, D. & Brasher, A. (2006) Roadmap for e-assessment, *Report for JISC*.

Whitelock, D. & Watt, S. (2008) 'Putting Pedagogy in the Driving Seat with OpenComment: An Open Source Formative Assessment Feedback and Guidance Tool for History Students', in *Computer Assisted Assessment (CAA) Conference*, Loughborough University, 8-9 July, 347-356.

Williams, J. (1997) 'Scientific Dialogue as Evidence of Learning', in *Proceedings of the Annual Meeting of the American Educational Research Association*, Chicago, IL, 24-28 March.

Williams, R. & Dreher, H. (2004) 'Automatically grading essays with Markit©', *Journal of Issues in Informing Science and Information Technology*, 1, 693-700.

Williams, R. M., Sundelin, G., Foster-Seargeant, E. & Norman, G. R. (2000) 'Assessing the reliability of grading reflective journal writing', *Journal of Physical Therapy Education*, 14, 23-26.

Williamson, D. M., Mislevy, R. J. & Bejar, I. I. (2006) 'Automated Scoring of Complex Tasks in Computer-Based Testing: An Introduction', in Williamson, D. M., Mislevy, R. J. & Bejar, I. I. (Eds.), *Automated Scoring of Complex Tasks in Computer-Based Testing*, Mahwah, NJ: Lawrence Erlbaum.

Wilson, B. G. (1997) 'Reflections on Constructivism and Instructional Design', in Dills,

C. R. & Romiszowski, A. A. (Eds.), *Instructional Development Paradigms*, Englewood Cliff, NJ: Educational Technology Publications.

Wilson, B. G. & Myers, K. M. (2000) 'Situated Cognition in Theoretical and Practical Context', in Jonassen, D. & Land, S. (Eds.), *Theoretical Foundations of Learning Environments*, Hillsdale, NJ: Lawrence Erlbaum.

Wilson, J. P. (2008) 'Reflecting-on-the-future: a chronological consideration of reflective practice', *Reflective Practice*, 9(2), 177-184.

Wise, L. & Quealy, J. (2006) 'At the limits of social constructivism: Moving beyond LMS to reintegrate scholarship', in *23rd ASCILITE Conference: Whose learning? Whose technology?* Sydney, 3-6 December.

Wong, F. K. Y., Kember, D., Chung, L. Y. F. & Yan, L. (1995) 'Assessing the level of student reflection from reflective journals', *Journal of Advanced Nursing*, 22(1), 48-57.

Wood, W. B. (2009) 'Innovations in Teaching Undergraduate Biology and Why We Need Them', *Annual Review of Cell and Developmental Biology*, 25(93-112).

Xie, Y., Ke, F. & Sharma, P. (2008) 'The effect of peer feedback for blogging on college students' reflective learning processes', *Internet and Higher Education*, 11(1), 18-25.

Yang, S. H. (2009) 'Using Blogs to Enhance Critical Reflection and Community of Practice', *Educational Technology & Society*, 12(2), 11-21.

Yeşilbursa, A. (2011) 'Reflection at the Interface of Theory and Practice: an Analysis of Pre-Service English Language Teachers' Written Reflections', *Australian Journal of Teacher Education*, 36(3), 103-116.

Zawacki-Richter, O. (2009) 'Research Areas in Distance Education: A Delphi Study', *International Review of Research in Open and Distance Learning (IRRODL)*, 10(3).

Zhang, K. & Bonk, C. (2008) 'Addressing diverse learner preferences and intelligences with emerging technologies: Matching models to online opportunities', *Canadian Journal of Learning and Technology*, 34(2).

Appendices

Appendix A: Delphi Study Questionnaire

Dear Participant,

Thank you once again for agreeing to participate in this study.

Section A consists of some short preliminary questions which attempt to ascertain how you (or your students) use Reflective Practice. As this study includes Reflective Practitioners, Reflective Practice Teachers/Lecturers and Reflective Practice Researchers, some of the questions may be not applicable to your own area of expertise. If you feel this to be the case, please leave the question blank.

Section B is the first round of the Delphi Study. This consists of one open-ended question which asks you discuss the criteria you would use for assessing or examining Reflective Practice. **Although there is only one question in this section, it is the most important question overall so please give it the majority of your attention!**

Section A: Preliminary Questions

Q1: Area of Expertise	(a) Which of the following applies to your expertise of Reflective Practice? *(tick all that apply)*
	(click on a checkbox to make your selection) ☐ Reflective Practitioner ☐ Reflective Practice Teacher/Lecturer ☐ Reflective Practice Researcher
	(b) Please elaborate here if you wish: *(click on the grey underlined area and begin typing)*

Q2: Culture of Organisation	(a) Is the use of Reflective Practice encouraged throughout your organisation? *(tick one only)*
	☐ Yes ☐ No
	(b) Please elaborate here if you wish:

Q3: Reflective Process	(a) Do you see the reflective process as: *(tick one only)* ☐ individual ☐ collaborative ☐ both individual and collaborative? (b) Please elaborate here if you wish: ————

Q4: Benefits	In your opinion, what are the benefits of Reflective Practice? *(enter text in provided area)* ————

Q5: Barriers	In your opinion, what are the barriers to Reflective Practice? *(enter text in provided area)* ————

Q6: Purpose of reflection	What are the reasons that you (or your students) have used Reflective Practice? *(tick all that apply)* ☐ Reflection on learning (e.g. reflecting on a topic covered in class) ☐ Reflection on practice (e.g. while on a work placement) ☐ Personal/Professional Development ☐ Other (please elaborate) ————

Q7: Medium	What do you (or your students) use as the medium for Reflective Practice? *(tick all that apply)* ☐ Learning log (paper-based) ☐ Learning log (electronic format e.g. Word file) ☐ Reflective blog ☐ Learning portfolio ☐ Other (please elaborate) ————

Q8: Assessment	(a) Do you formally assess Reflective Practice (i.e. by giving students a grade)? *(tick one only)* ☐ Yes ☐ No (b) If yes, is the assessment formative (at regular intervals throughout the module i.e. continuous assessment) or summative (part of a final assessment occurring at the end of the module)? *(tick one only)* ☐ Formative assessment ☐ Summative assessment

Q9: Criteria	(a) Are your students given criteria/guidelines prior to a Reflective Practice assignment? *(tick one only)* ☐ Yes ☐ No (b) Please elaborate here if you wish: _____

Q10: Feedback	Are your students given feedback on their Reflective Practice assignment: *(tick all that apply)* ☐ Once when the assignment has been completed ☐ Once during the assignment ☐ Several times throughout the assignment ☐ They are not given feedback ☐ Other (please elaborate) _____

Section B: Delphi Study Round One

Q1: What criteria enable you to identify that a particular level of reflection has been reached? Please discuss these criteria in terms of different levels of reflection. The following levels described by Hatton & Smith (1995)[12] may provide some guidelines if necessary:

- descriptive writing,
- descriptive reflection,
- dialogic reflection and
- critical reflection.

Please type your answer here:

_____

Thank you for your continued participation in this study.

Please save this file and return to me by email (rbirney@wit.ie).

---

[12] Hatton, N. & Smith, D. (1995) 'Reflection in teacher education: Towards definition and implementation', *Teaching and Teacher Education*, 11(1), 33-49.

Appendix B: Analysis of Reflective Learning Journals – Consent Form

Analysis of Reflective Learning Journals – Consent Form

My name is Rosanne Birney. I am currently conducting a research project that analyses levels of reflective learning evident in the text of learning journals. My project is supported by the IRCSET Embark Initiative. I am directing the project and can be contacted by email at rbirney@wit.ie should you have any questions.

You are asked to participate in this study as you recently completed a learning journal assignment as part of your studies at WIT. I would like to emphasize that:

- your participation is entirely voluntary;
- you are free to refuse to allow your learning journal to be used in the study;
- you are free to withdraw at any time.

All data collected will be kept strictly confidential and will be available only to myself and the research supervisors (Dr. Mícheál Ó hÉigeartaigh and Mrs. Mary Barry). Excerpts from the learning journals may be made part of the final research report for demonstrative purposes, but under no circumstances will your name or any identifying characteristics be included in the report.

Please sign this form if you wish to participate in the study. Also, please enter your name and the date in the areas provided.

Signature: _____

Print Name: _____

Date: _____

If submitting this form by email, as an alternative to your signature, please tick the following box if you wish to participate in the study.

I hereby give consent for my learning journal to be used in this study. ☐

Please send a report on the results of the project:

YES ☐   NO ☐

Address for those requesting a research report:

_____

_____

_____

_____

Appendix C: Reflective Writing Assignments

Reflective Writing Assignment One:

Higher Diploma in Business Systems Analysis
Cognitive Science & HCI: Assignment One

- This assignment is worth 25% of your overall mark.

- To complete this assignment you will need to:
  - Set up a blog, and;
  - Create one post to your blog for six out of the seven sections of the module related to Cognitive Science (six blog posts in total).

- Blog posts should consist of the following:
  - State which section this blog post refers to and give a very brief overview of what was covered in that section.
  - Reflection: applying theory to practice
    - Choose at least one concept from this section that you wish to discuss in more detail.
    - Take the concept you have chosen and reflect on how this theory may be applied to practice.
    - Read other sources of information if necessary – include links to sources in your blog post.
    - Use the prompts below to guide you.
  - Prompts:
    - Why did you choose to discuss this particular concept in more detail? What about it interests you?
    - Are there any aspects of this concept that you feel you do not understand fully?
    - Having read other sources of information how has your understanding of this concept changed?
    - Give examples of where you have seen evidence of this concept applied to a real-world situation (this could be related to work, everyday situations etc.)
    - Give examples of how you think this concept *could be* applied to a real-world situation (this could be related to work, everyday situations etc.)
  - A rough guideline for the length of each post is **approximately** 300-500 words. Remember that quality is better than quantity!
  - Remember to write the blog posts from your own perspective – this assignment is about how you interpret the material we cover in class.

- Marking criteria (out of 100%):
  - Blog setup and overall appearance: 10 marks
  - Each blog post: 15 marks (x 6 posts = 90 marks)

- Also, it is important that you provide me with the both the URL of your blog and the password to view your reflective posts – **please send these to me as soon as you set up your blog.**

Reflective Writing Assignment Two:

BSc in Nursing Year 3
Applying Caring in Practice 2

The following elements form the assessment of the clinical module: Applying Caring in Practice 2.

a) Workbooks/short placement forms (25%)
b) Students will complete a reflection on a situation or scenario that identifies two domains of competence (2500 words) (40%)
c) Review of literature on Part B (2000 words) (35%)

a) Workbooks/short placement forms (25%): Submission Date [see date for Part B] to Sara Kennedy

b) Identify an issue/scenario from your practice that demonstrates your development of competence in the following two domains and demonstrates evidence of your critical reflection

1. Organisation and Management of Care
2. Personal and Professional Development

(2500 words) (40%)

Submission Part B: Monday 6th April 2009

c) Select one key issue that arises from the above situation/scenario and critically review this issue in relation to available literature and practice.

(2000 words) (35%)

Submission Part C: Monday 13th April 2009

NB: It is essential that patient/staff/unit/hospital confidentiality is maintained throughout your work for this module (and all other modules).

Part c) must relate to part b).

Appendix D: Coding Scheme

Reflective Writing Assessment Instrument: Coding Scheme

The following reflection indicators were developed using a Delphi study with Reflective Practice experts. The 12 indicators were identified from the first round of responses and then returned to participants for ranking in a second round. The following 12 indicators are ordered and weighted according to the depth of reflection that they represent.

Reflective Practice Indicators (ordered from least to most indicative of depth of reflection)	Reflective Practice Indicator Weightings	
1. Clear description of context is given	0.01304	1.3%
2. Issues are correctly identified	0.02901	2.9%
3. Analysis is evident	0.03561	3.6%
4. Creative synthesis is evident	0.04602	4.6%
5. Implications of actions are considered	0.05105	5.1%
6. Multiple perspectives are examined	0.05854	5.9%
7. Links are made to broader social structures	0.06936	6.9%
8. Learning is evident	0.10977	11.0%
9. Insightful understanding is evident	0.11713	11.7%
10. Changes in beliefs or understanding are evident	0.12459	12.5%
11. Revisions to future practice are discussed	0.13734	13.7%
12. Self-awareness is evident	0.20855	20.9%

The 12 reflection indicators listed above form part of a coding scheme for the assessment of reflection in the text of blogs and handwritten learning journals. Each of the indicators is now discussed, to elucidate what constitutes an example of each of the 12 indicators. A number of criteria in relation to each reflection indicator are set out. These are not intended to be exhaustive lists but are merely provided as a guide to the coders involved in the Content Analysis. An awareness of the type of material that will be coded to each reflection indicator aids the consistency of the coding.

In this document the word 'event' is used as a generic term which may describe either a physical event that took place or a learning event (depending on the context in the

student's journal). Also the word 'topic' is used to describe any topic that the student is discussing. This could be learning material or course content but could also be another topic that the student has examined.

1. **Clear description of context is given (0.01304)**

   - The student provides a description of an event or topic
   - The description provided identifies points where reflection could occur
   - The description provides the context and background for reflective writing

2. **Issues are correctly identified (0.02901)**

   - The student demonstrates an awareness that there are issues which require attention
   - The student identifies issues and discusses them in more detail
   - The student provides a relevant example related to the event or topic

3. **Analysis is evident (0.03561)**

   - The student asks questions related to the event or topic
   - There is evidence of analysis e.g. the student compares/contrasts

4. **Creative synthesis is evident (0.04602)**

   - The student combines two or more alternate perspectives in a creative way
   - The student makes unexpected links between alternative perspectives

5. Implications of actions are considered (0.05105)

- The student considers the implications of his/her own actions
- The student analyses his/her own actions in comparison to those of others

6. Multiple perspectives are examined (0.05854)

- The student refers to alternative viewpoints
- The student refers to one or more external perspectives (e.g. related literature, alternative approaches or attitudes of others)
- External ideas are present and these views are reflected on

7. Links are made to broader social structures (0.06936)

- The student sets the event or topic in a historical context
- The student sets the event or topic in a social context
- The student sets the event or topic in an ethical context
- The student sets the event or topic in a legal context

8. Learning is evident (0.10977)

- The student demonstrates evidence of learning
- The student corrects previous misunderstandings
- The student states that he/she has gained knowledge

9. Insightful understanding is evident (0.11713)

- The student demonstrates an insightful understanding of an event or topic e.g. a discussion of an event or topic that shows a deep understanding of that event or topic
- The student states an opinion or judgement on the event or topic that demonstrates an understanding of that event or topic

10. Changes in beliefs or understanding are evident (0.12459)

- The student discusses changes in his/her beliefs
- The student discusses changes in his/her understanding

11. Revisions to future practice are discussed (0.13734)

- The student discusses a new understanding that has caused him/her to consider the revision of future practices
- The student states his/her intention to do something differently in the future

12. Self-awareness is evident (0.20855)

- The student notes his/her emotional reactions to an event
- The student assesses the influence of his/her emotional reactions
- The student explores motives or reasons for his/her behaviour
- The student discusses his/her own thought processes or learning processes

Appendix E: Dendrograms

Participant C

Participant C Dendrogram
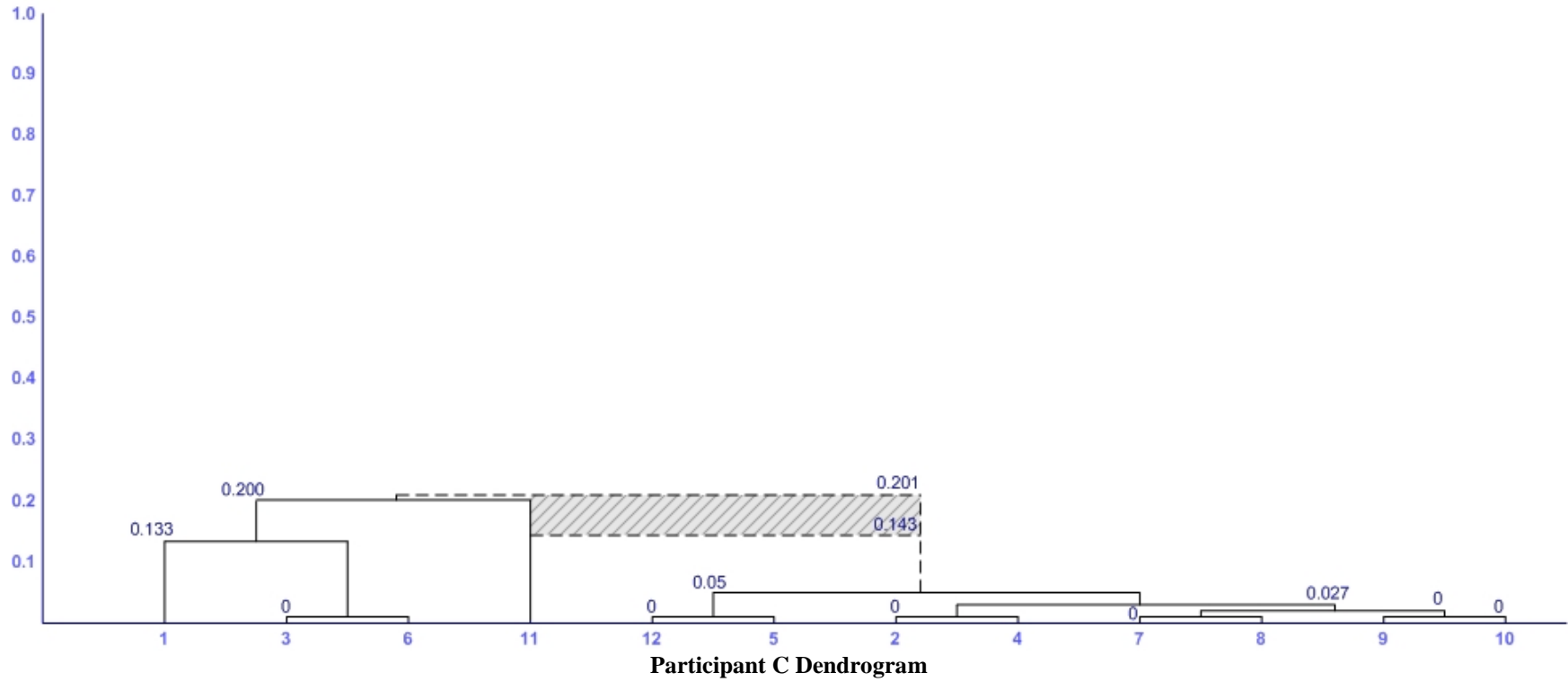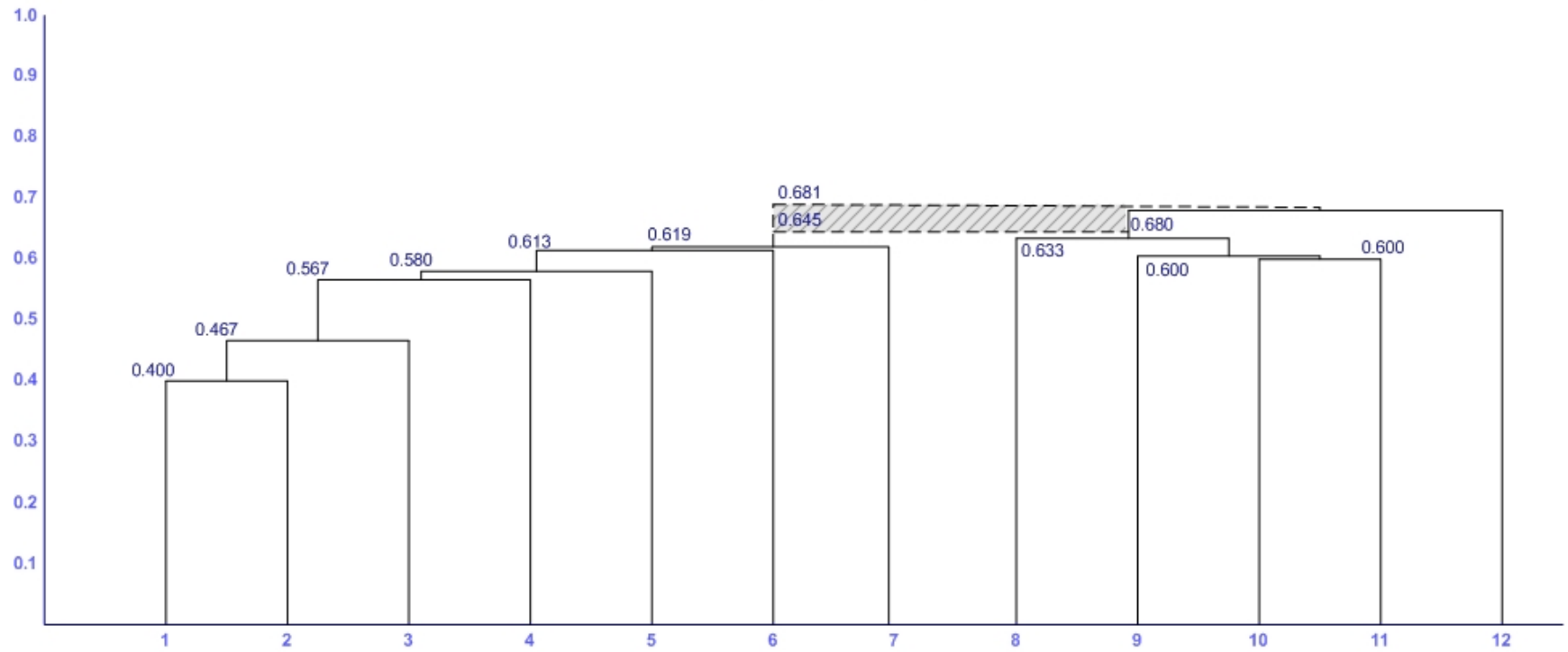
Participant F

Participant F Dendrogram

Participant H

Participant H Dendrogram
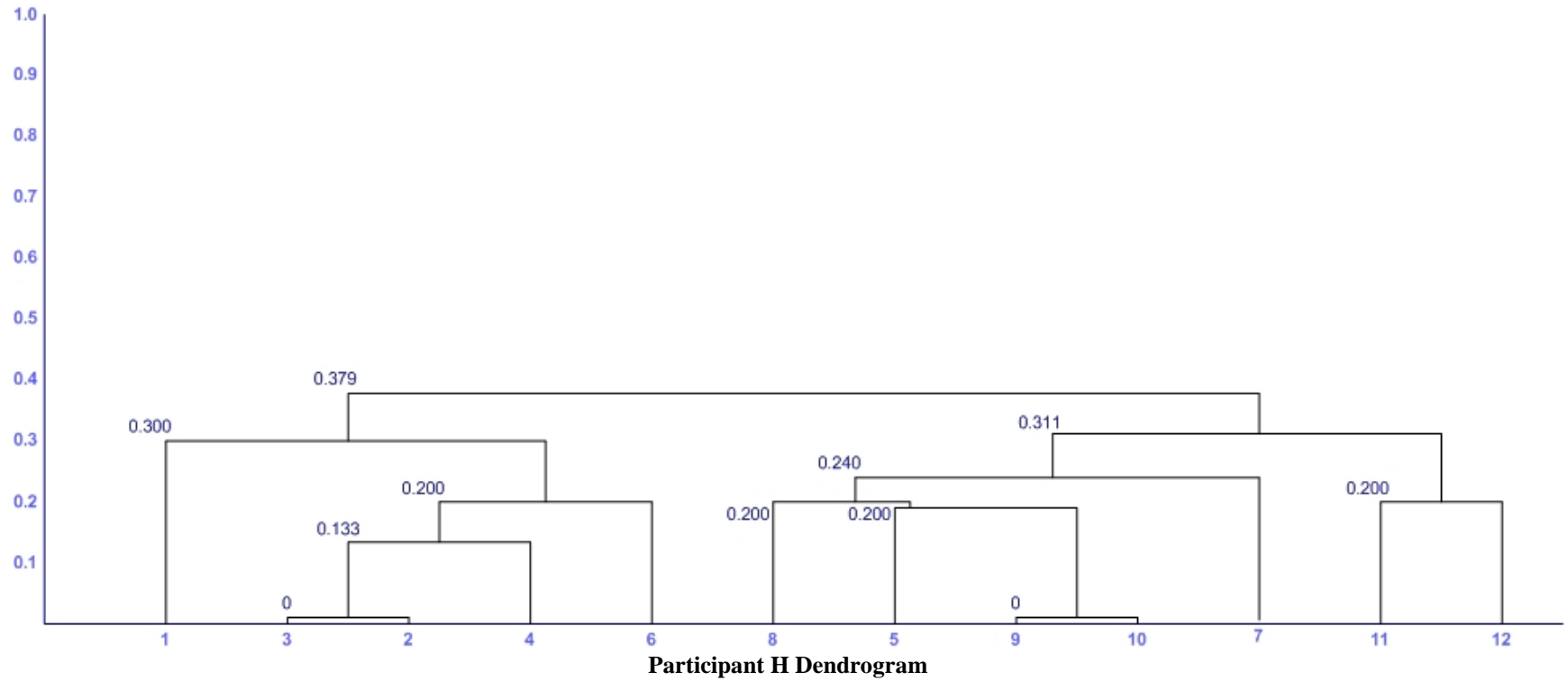
Appendix F: Linguistic Resources and Reflection Indicators (Pearson's *r* and *p*-values)

First person voice (SFL 01): correlations with Reflection Indicators

	SFL01 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	0	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	11	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	8	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	9	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	13	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	11	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	16	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	27	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	11	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	14	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	23	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	25	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	56	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	25	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	18	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	56	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	21	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	20	3	4	2	0	0	0	0	0	0	0	2	6
	Pearson's *r*	0.194	0.548*	0.321	-0.055	0.514*	0.264	-0.021	0.608**	0.013	0.325	0.191	0.354
	p-value	0.440	0.019	0.194	0.829	0.029	0.290	0.934	0.007	0.959	0.188	0.448	0.150

Thinking and sensing verbs (SFL 02): correlations with Reflection Indicators

	SFL02 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	0	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	1	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	3	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	1	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	6	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	5	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	9	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	10	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	1	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	5	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	13	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	13	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	20	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	14	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	13	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	23	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	15	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	11	3	4	2	0	0	0	0	0	0	0	2	6
	Pearson's *r*	0.162	0.576*	0.445	0.024	0.492*	0.300	0.163	0.441	0.219	0.477*	0.437	0.502*
	p-value	0.520	0.012	0.064	0.925	0.038	0.226	0.517	0.067	0.383	0.045	0.070	0.034

Nominalisations (SFL 03): correlations with Reflection Indicators

	SFL03 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	1	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	3	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	3	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	2	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	3	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	8	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	4	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	2	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	5	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	6	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	5	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	2	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	3	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	3	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	1	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	21	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	16	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	6	3	4	2	0	0	0	0	0	0	0	2	6
	Pearson's *r*	0.015	0.386	0.373	0.019	0.599**	0.559*	0.508*	-0.029	0.513*	0.154	-0.009	0.131
	p-value	0.952	0.113	0.128	0.939	0.009	0.016	0.032	0.909	0.029	0.541	0.972	0.605

Professional nouns/noun groups (SFL 04): correlations with Reflection Indicators

	SFL04 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	7	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	6	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	4	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	5	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	5	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	8	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	6	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	8	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	5	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	5	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	3	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	6	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	4	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	7	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	1	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	10	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	11	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	3	3	4	2	0	0	0	0	0	0	0	2	6
Pearson's *r*		0.007	0.321	0.369	0.252	0.325	0.579*	0.481*	-0.160	0.524*	-0.130	-0.432	-0.372
p-value		0.980	0.194	0.132	0.313	0.188	0.012	0.043	0.527	0.026	0.607	0.074	0.128

Language of comparison/contrast (SFL 05): correlations with Reflection Indicators

	SFL05 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	0	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	2	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	4	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	1	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	6	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	9	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	8	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	5	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	8	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	1	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	2	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	1	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	10	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	14	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	2	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	7	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	9	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	5	3	4	2	0	0	0	0	0	0	0	2	6
Pearson's *r*		0.670**	0.732**	0.539*	0.583*	-0.091	0.692**	0.146	-0.057	0.241	-0.134	-0.226	-0.089
p-value		0.002	0.001	0.021	0.011	0.719	0.001	0.564	0.824	0.336	0.596	0.367	0.726

Causal links (SFL 06): correlations with Reflection Indicators

	SFL06 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	0	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	2	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	3	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	4	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	1	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	7	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	7	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	11	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	7	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	11	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	8	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	7	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	13	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	8	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	3	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	15	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	16	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	5	3	4	2	0	0	0	0	0	0	0	2	6
Pearson's *r*		0.305	0.641**	0.551*	0.030	0.560*	0.608**	0.526*	0.308	0.476*	0.243	0.025	0.114
p-value		0.218	0.004	0.018	0.905	0.016	0.007	0.025	0.214	0.046	0.332	0.921	0.652

Appraisal and reasoning adjectives/adverbs (SFL 07): correlations with Reflection Indicators

	SFL07 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	0	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	1	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	7	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	3	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	8	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	9	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	9	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	6	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	3	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	6	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	9	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	7	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	16	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	9	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	6	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	13	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	19	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	8	3	4	2	0	0	0	0	0	0	0	2	6
Pearson's *r*		0.311	0.827**	0.720**	0.097	0.226	0.612**	0.539*	0.341	0.588*	0.093	0.063	0.125
p-value		0.209	0.000	0.001	0.701	0.368	0.007	0.021	0.165	0.010	0.714	0.803	0.621

Temporal links (SFL 08): correlations with Reflection Indicators

	SFL08 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	1	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	2	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	2	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	2	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	1	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	20	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	2	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	7	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	3	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	7	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	8	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	8	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	26	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	8	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	9	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	18	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	11	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	5	3	4	2	0	0	0	0	0	0	0	2	6
	Pearson's *r*	0.358	0.470*	0.246	0.319	0.217	0.383	0.101	0.506*	0.113	0.194	0.016	0.175
	p-value	0.145	0.049	0.325	0.197	0.386	0.117	0.691	0.032	0.654	0.441	0.948	0.487

Future tense verbs (SFL 09): correlations with Reflection Indicators

	SFL09 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	0	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	2	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	0	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	2	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	1	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	1	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	1	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	0	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	0	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	2	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	3	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	2	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	1	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	1	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	3	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	2	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	4	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	3	3	4	2	0	0	0	0	0	0	0	2	6
Pearson's *r*		-0.236	0.107	0.383	-0.169	0.219	0.146	0.521*	0.083	0.509*	0.371	0.545*	0.495*
p-value		0.346	0.672	0.117	0.504	0.382	0.562	0.027	0.744	0.031	0.130	0.019	0.037

Impact adverbials (SFL 10): correlations with Reflection Indicators

	SFL10 Refs	Indicator 01	Indicator 02	Indicator 03	Indicator 04	Indicator 05	Indicator 06	Indicator 07	Indicator 08	Indicator 09	Indicator 10	Indicator 11	Indicator 12
JournalAuthor01	0	2	0	0	0	0	0	0	0	0	0	0	0
JournalAuthor07	2	2	1	0	0	0	1	0	0	0	0	0	0
BlogAuthor09	1	5	4	1	0	0	0	0	0	0	0	0	0
JournalAuthor06	1	2	1	2	0	1	0	0	1	0	0	0	0
BlogAuthor04	2	5	2	1	0	0	1	0	1	0	0	0	0
BlogAuthor15	4	6	2	0	1	0	3	0	0	0	0	0	0
BlogAuthor10	6	2	6	1	0	1	1	0	0	0	0	1	0
BlogAuthor11	3	4	3	1	0	2	1	0	0	0	0	0	1
BlogAuthor07	2	10	3	1	0	1	6	0	0	0	0	0	0
JournalAuthor05	4	5	1	0	0	1	0	1	1	0	1	1	2
JournalAuthor03	3	3	1	1	0	2	0	0	1	0	1	2	2
JournalAuthor09	2	4	2	1	0	1	0	0	2	0	1	2	2
BlogAuthor14	2	8	9	3	0	0	4	0	3	0	0	0	1
BlogAuthor08	4	9	5	3	1	0	4	0	0	0	1	1	2
JournalAuthor08	1	5	1	0	0	1	0	0	0	0	1	2	4
JournalAuthor10	9	3	4	1	0	4	3	0	1	0	1	1	3
BlogAuthor12	4	6	9	6	0	1	10	3	0	2	0	0	0
JournalAuthor02	6	3	4	2	0	0	0	0	0	0	0	2	6
Pearson's *r*		-0.102	0.356	0.165	0.146	0.542*	0.216	0.129	-0.065	0.100	0.237	0.305	0.410
p-value		0.687	0.147	0.512	0.564	0.020	0.388	0.611	0.797	0.693	0.344	0.219	0.091

Appendix G: Publications

Citation:

Birney, R., Barry, M & Ó hÉigeartaigh, M. 2006, 'The Use of Weblogs as a Tool to Support Collaborative Learning and Reflective Practice in Third-Level Institutions', *Brief Paper presented at EdMedia World Conference on Educational Multimedia, Hypermedia & Telecommunications.* Orlando, FL, 26-30 June.

Abstract:

Weblogs can be used as a tool for learning support, providing additional features that are lacking in many Learning Management Systems (LMSs). This research aims to demonstrate that weblogs can enhance the learning experience by allowing students to reflect on their learning, and by allowing students to easily collaborate with their tutors and with one another. Laurillard's conversational framework is used a basis for describing how weblogs should be incorporated into the existing learning environment. In an initial study, students set up weblogs and created a weblog post each week over a 10-week period. Analysis of this study has begun, and preliminary results show that the use of weblogs with RSS (Rich Site Summary) helps to reduce tutor workload in comparison to the use of a Learning Management System, and helps to increase student involvement in learning.

Available from: http://eprints.wit.ie/891/

Citation:

Birney, R., Barry, M & Ó hÉigeartaigh, M. 2006, 'Blogs: Enhancing the Learning Experience for Technology Students', *Poster presented at EdMedia World Conference on Educational Multimedia, Hypermedia & Telecommunications.* Orlando, FL, 26-30 June.

Abstract:

Weblogs can be used to enhance the learning experience for technology students, by providing them with several features that are often absent in Learning Management Systems (LMSs). This research aims to demonstrate that weblogs can improve the learning experience by allowing students to reflect on their learning, and by allowing them to easily collaborate with their tutors and with one another. The incorporation of weblogs into the existing learning environment can provide several enhancements; Laurillard's conversational framework is used a basis for describing how this should be done. In an initial study, students set up weblogs and created a weblog post each week over a 10-week period. Initial feedback from the students suggests that their experience with the weblogs was a positive one.

Available from: http://eprints.wit.ie/1345/

Citation:

Birney, R., Barry, M & Ó hÉigeartaigh, M. 2006, 'Blogs: Collaborative Learning for the Next Generation', *Brief Paper presented at ALT-C 2006.* Edinburgh, Scotland, 5-7 September.

Abstract:

This study aims to determine the effectiveness of weblogs as a tool for collaborative learning in an online environment, with a particular focus on technology students. Some of the VLEs currently in use in third-level institutions restrict the way in which students interact with one another and with their tutors. The use of weblogs as a tool for collaborative learning can help to overcome several of the shortcomings of traditional VLEs by providing a dynamic, user-friendly way for students to peer-review one another's work and to communicate with their tutors and with one another.

An initial pilot study was conducted over a 10-week period. Salmon's online learning model was used as a theoretical basis for describing how weblogs could be incorporated into the existing learning environment. The first six sessions focused on the technical aspects of blogs (e.g. permalinks, backlinks, RSS feeds and RSS aggregators). The focus on weblog technology and related technologies (e.g. RSS, XML) was felt to be appropriate for the group as part of their Networks course. In the remaining four sessions, students used their blogs to review one another's class presentations and to share additional information on their own research with the rest of the class.

Preliminary findings show that the use of weblogs in a blended learning environment, in conjunction with classroom teaching and a VLE can enhance the learning experience for both students and tutor. The level of interaction between blogs was high, with students frequently commenting on and linking to one another's blogs, suggesting that weblogs promote collaborative learning in an online environment.

Available from: http://eprints.wit.ie/895/

Citation:

Birney, R., Barry, M & Ó hÉigeartaigh, M. 2006, 'Weblogs: Supporting the creation of learning networks in the technology classroom', *Poster presented at ALT-C 2006.* Edinburgh, Scotland, 5-7 September.

Abstract:

This study aims to determine the effectiveness of weblogs as a tool for collaborative learning in an online environment, with a particular focus on technology students. Some of the VLEs currently in use in third-level institutions restrict the way in which

students interact with one another and with their tutors. The use of weblogs as a tool for collaborative learning can help to overcome several of the shortcomings of traditional VLEs by providing a dynamic, user-friendly way for students to peer review one another's work and to communicate with their tutors and with one another.

An initial pilot study was conducted over a 10-week period with a group of technology students as part of their Networks course. The first six sessions focused on the technical aspects of blogs (e.g. permalinks, backlinks, RSS feeds, RSS aggregators). In the remaining four sessions, students used their blogs to review one another's class presentations and to share additional information on their own research with the rest of the class. Laurillard's conversational framework and Salmon's online learning model were used as a theoretical basis for describing how weblogs could be incorporated into the existing learning environment. Weblogs can be integrated into several stages of these models, enhancing the collaborative process and supporting the creation of learning networks.

Preliminary findings show that the use of weblogs in a blended learning environment, in conjunction with classroom teaching and a VLE can enhance the learning experience for both students and tutor. The level of interaction between blogs was high, with students frequently commenting on and linking to one another's blogs, suggesting that weblogs promote collaborative learning in an online environment. Initial feedback from students is also positive: they readily engaged with the new technology and were enthusiastic about its use.

Available from: http://eprints.wit.ie/1346/

Citation:

Birney, R., Ó hÉigeartaigh, M. & Barry, M. 2007, 'Privacy Considerations in the Selection of Blogging Software', *Brief Paper presented at EdMedia World Conference on Educational Multimedia, Hypermedia & Telecommunications.* Vancouver, Canada, 25-29 June.

Abstract:

There are several benefits to using weblogs in education to support both collaboration and reflective practice. Results from an initial study which examined the effectiveness of weblogs are discussed. These results have shown that weblogs are useful tools for collaboration and groupwork, but that deep reflection was not evident in weblogs. It is suggested that this may be due to the public nature of weblogs. In the design of a second study, several types of blogging software have been considered, based on the privacy options they can offer. Wordpress is recommended as a suitable blogging tool for both collaboration and reflection. It provides students with the option to password-protect reflective posts to their blog, while leaving the rest of their weblog posts open to the public, thereby providing a means for collaboration with classmates.

Available from: http://eprints.wit.ie/894/

Citation:

Birney, R., & Ó hÉigeartaigh, M. 2008, 'Reflective Practice and Blogs: Developing a new model for assessment', *Brief Paper presented at ALT-C 2008.* Leeds, UK, 9-11 September.

Abstract:

Reflective Practice, for many years, has been widely used as a learning activity in higher education. The introduction of blogs as a tool for reflection is more recent. In education, blogs can empower the learner by providing him/her with an individual learning space.

Studies have shown that blogs are effective as online learning journals and can bring an element of collaboration to the reflective learning process. To date, however, there has been no large-scale study which compares depth of reflection in blogs with depth of reflection in paper-based learning logs. This study aims to address this issue.

A Delphi study was conducted with a group of Reflective Practice experts. The experts involved in the study had experience of teaching or using Reflective Practice, and had published in this area. The purpose of this study was to develop a set of indicators which will be used to assess depth of reflection.

A content analysis will be conducted on samples of reflective text. These samples will be taken from both online learning journals, such as blogs, and 'offline' learning journals, such as paper-based learning logs. The samples will be assessed for depth of reflection and comparisons will be made.

Although this study is still in its early stages, the Delphi study has been completed. Results from this study show that, when assessing reflection, Reflective Practice experts tend to rely heavily on existing models of Reflective Practice. However, these models focus on reflection as a solitary activity rather than a collaborative one. In several recent studies, instruments for the assessment of reflective text have been developed. Again, these studies assess Reflective Practice as an isolated process and do not consider the effect of interaction and feedback on students' reflections.

The use of blogs brings a collaborative element to the process of Reflective Practice. Due to the interactive nature of blogs, students may receive more feedback from their tutors or peers on their reflections. Therefore existing models of Reflective Practice may need to be updated in order to effectively assess online learning journals, such as blogs.

The next phase of this study aims to develop an instrument which can effectively assess the depth of reflection in both online and offline learning journals. Using this instrument, a content analysis of reflective text will be conducted. Comparisons will be made between the depth of reflection in online learning journals, such as blogs, and offline learning journals, such as paper-based learning logs. It is hypothesised that

students who receive higher levels of feedback due to the online, interactive nature of blogs will improve the depth and quality of their reflections over the course of their studies.

Available from: http://eprints.wit.ie/1347/

Citation:

Birney, R., Ó hÉigeartaigh, M. & Barry, M. 2008, 'Blogs: Supporting Staff Development', *Poster & Selected Presentation at the NAIRTL Symposium on Bologna and Staff Development.* Dublin, Ireland, 5 December.

Abstract:

This poster aims to describe the uses of blogs from a staff development perspective and also to demonstrate how students can use blogs to fulfil learning outcomes.

A blog (or web log) is a website that contains dated entries (or posts) in reverse chronological order. Sandars (2006) summarised the three main uses of blogs in education as 'Read, Write and Interact'. A variety of educational blogging activities that can be undertaken by staff and students are described in terms of these three main uses of blogs.

In terms of the Bologna process, blogs can be useful in allowing students to demonstrate that they have met learning outcomes. The benefit of using a blog to demonstrate fulfilment of learning outcomes, rather than 'offline' forms of writing, is that blogs allow for regular, formative feedback from lecturers and/or peer assessors (Wagner, 2003).

In addition to being used by students as a learning tool, blogs are frequently used by staff for personal and professional development. In the field of education teachers or lecturers often use blogs to reflect on their teaching practice (West, Wright & Graham, 2005). In addition, blogs can afford staff the opportunity to interact with a wider research community.

A number of staff development workshops on the educational uses of blogs have been conducted at WIT. These workshops have encouraged staff to use blogs for their own personal and professional development and many staff have, in turn, encouraged students to use blogs as part of their coursework. Blogs can promote a culture of reflective teaching and learning throughout an institution and also encourage more frequent interaction between students, staff and a wider research community.

Available from: **http://eprints.wit.ie/1349/ (Poster)**
                         http://eprints.wit.ie/1348/ (Presentation)