Journal of Academic Language & Learning
Vol. 3, No. 2, 2009, A117-A129. ISSN 1835-5196

AALL
Association for Academic Language and Learning

Assessing reflective writing: Analysis of reflective writing in an engineering design course

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(Received 10 August 2009; Published online 30 November 2009)

Peer Review is used in a first year engineering design course to assess a series of reflective writing entries on the engineering design process and teamwork. Peer review can be beneficial for both reviewer and writer in increasing their awareness of how well they are communicating their learning, and, in providing opportunities to gain insights from each others' experiences and understandings of the engineering design process. However, there is limited literature on objective assessment of reflections about the engineering design process. This paper explores the question, what are the linguistic features that distinguish different levels of reflection? The first stage of the investigation was a text analysis of reflective writing representing both high and low peer review scores, to identify similar and dissimilar linguistic features in the texts. While the analysis is ongoing, preliminary findings have revealed clear differences between "good" and "poor" reflective writing. These differences have been found in writers' use of connectives and appraisal. Reflective texts that provide rich explanations and which are more likely to criticise (rather than praise) their own learning process are more likely to be rated high by peer reviewers. Future investigation will map linguistic features in reflective writing onto learning taxonomies such as Blooms and SOLO taxonomy to provide clear guidelines for assessing reflective writing on the engineering design process.

Key Words: reflective writing, engineering design process, causality, appraisal, assessment, peer review.

1. Introduction

Design is central to engineering as engineers are often faced with ill-structured or open design problems for which there are multiple solutions. The skills required for successful engineering design are described in Engineers Australia's Stage 1 competences (Engineers Australia, 2009), for example:

> *PE2.1 Ability to undertake problem identification, formulation, and solution*
> *PE3.1 Ability to communicate effectively with the engineering team* ….

At the University of New South Wales (UNSW), a common first year engineering course [ENGG1000] assesses students on their awareness and understanding of the above Stage 1

competencies via a series of reflective writings that are based on students' experiences throughout a design project.

> *You will study and experience Engineering Design as a multi-faceted activity, which requires considerable creativity, as well as judgment, decision making and problem solving skills. You will see the need to take context into account and be able to complete design projects on time and within budget. The problem solving and project management skills that you learn in this course will be invaluable for later courses in your degree, in your career and for life in general.* (Reidsema, 2008, p. 6)

Assessment in engineering disciplines is still mainly traditional with content being delivered, communicated and assessed, often with limited resources for marking and feedback. Hence "hard"/numerical evidence of student learning is preferred. Despite being recognised in the literature as an effective learning tool (Moon, 2004; Brockbank & McGill, 2007), reflective writing can still be viewed as "soft" assessment lacking objective or quantitative measurement criteria. The second issue is that even when academic staff acknowledge the value of reflective assessment tasks and are provided with training and detailed assessment rubrics, the marking is still perceived as tedious compared to calculation type assessments (Brodie, 2007). This issue is even more crucial for large classes managed by a single academic, which is the trend at some tertiary institutions.

Studies on identifying and evaluating knowledge of design from written and oral texts (during and after the engineering design process) are characterized by diverse approaches and methodologies. These include: mapping an expert's "thinking aloud" and observed behaviour onto an engineering model of the design process (Adams, Turns, & Atman, 2003); using computational text analysis of key words for characterizing design team performance (Hill, Dong, & Agogino, 2004) and classifying junior and senior engineering design students' styles of writing as evidence for types of thinking (Shaheed & Dong, 2006). Another approach (King, 2002) mapped the learning outcomes for engineering design onto Bloom's taxonomy and Biggs and Collis' SOLO taxonomy. These studies show the breadth of approaches being used to relate the language and thinking of the design process to pedagogy and even computing fields (AI/data mining). However, research on assessing knowledge of the engineering design process is still developmental and there is no agreed model/framework for describing, identifying and evaluating evidence of learning about the engineering design process.

One example of such a framework forms the basis of our study: since 2006, reflective writing in the form of three reflective writing tasks has been used in a first year project-based engineering course to develop and assess students' thinking and learning about the engineering design process (McAlpine, Reidsema, & Allen, 2007). The three writing tasks are based on three stages of the engineering design process. For example, in Phase 1 (Forming the Problem Statement) of the design process, students were required to write a problem statement for their group design project and bring it to a tutorial for discussion with their project team. The team then had to reach consensus on a single shared problem statement. Each student then reflected on the phase 1 experience and wrote a reflection. Assessment of reflective writing was conducted by reciprocal peer review using an online Calibrated Peer Review System (CPR™) developed by Chapman (2001). The learning activity process for phase 1 of the engineering design process is presented in Appendix A and peer review assessment instructions are presented in Appendix B.

Reflective writing has been described as a representation of the reflective process and it is argued that practising this representation can result in greater understanding for the writer (Moon, 2004). According to Moon (2004), there are levels of reflection moving from pure description or retelling of an experience to a "profound form of reflection" (p. 96). The literature on reflective writing provides advice on assignment design, implementation and assessment (for example see Brookfield, 1995; King, 2002; Moon, 2004; Granville & Dison, 2005; Brockbank & McGill, 2007). These resources aim to facilitate the process of reflection and promote the notion of depth in students' reflective writing. However descriptors for assessing learning via reflective writing generally contain broad qualitative learning outcomes,

for example; “higher levels of reflection are more articulated, elaborated and creative – they go beyond the task itself to the wider implications of the work at hand” (Granville & Dison, 2005, p. 101). Other literature (King, 2002; Moon, 2004) describes higher level reflective writing as containing evidence of standing back and moving on. According to Moon, deep reflection contains:

> … recognition that the frame of reference with which an event is viewed can change; recognition of multiple perspectives and differing views of personal behaviour; a recognition of the interaction between prior experience and thought and current behaviour; recognition of the role of emotion in thoughts and behaviours; and, a recognition that learning is gained from experience … (p. 216)

From a deep reflection it should be clear that the writer has a “critical awareness of the processes of mental functioning”, that the writer is “self questioning” and that “learning points are noted” (Moon, 2004, p. 216).

The above descriptors serve to focus our analysis of reflective writing by first year engineering students. This paper presents an analysis of a specific set of linguistic features in first year engineering student reflective writing tasks. The findings presented in this paper are part of an ongoing collaborative study between an engineering lecturer and a learning advisor. Our premise is that analysing the similarities and differences in students’ reflective writing (post assessment) may reveal what counts as evidence of learning about design. Identifying linguistic features in reflective writing that may indicate depth of understanding is the prime concern in our collaborative research.

2. Method

Systemic Functional Linguistics (SFL) is a social semiotic model for describing and interpreting how language is used and how language is structured for use (Eggins, 1994; NSW Department of School Education 1996; Halliday & Matthiessen, 2004). SFL studies can be used to understand how the ideas contained in a text are realized in a particular context. Language (particularly the clause) is a resource for making and communicating a message (Halliday & Matthiessen, 2004). While individual words and phrases contain a “meaning”, their appearance in a clause does not constitute a complete idea or a “message”. The message is partially dependent on how the components of a clause; that is, participants, processes and things, are interconnected and the stance that the writer takes. In this study therefore, the authors focused firstly, on connective resources which express temporal and causal relationships as these would be necessary to help the writer explain what happened and why, and secondly on appraisal resources as these would be necessary to help the writer evaluate behaviour/performance and mental processing. The authors predicted that the reflective writing would contain text types such as descriptions, explanations, and claims about an experience of the phase 1 engineering design process and so initially focussed on linguistic features that may be typical of these text types.

A sample set of 20 reflective writing entries for Phase 1 of the engineering design process, that had been peer reviewed and graded, were selected for initial analysis and coding. Texts were downloaded from the CPR site and placed in two word files (Poor LP1[1] and Good LP1). Some of the poor texts were either not reflective texts because students had misunderstood the task, or contained too many ambiguous meanings, due to poor expression or a lack of proofreading, so these text were deleted from the sample.

Student identifying information was removed to preserve anonymity and template headings and task instructions were removed as they were not part of the reflective writing. The files were then uploaded into the Concordance 3.2 program (Watt, 2004) for initial frequency analysis of words, tokens and sentences. The 20 texts included one set of 10 texts that received a fail or a

[1] LP1 = Learning Phase One

very low pass (912 words[2], 5244 tokens (total word count), 242 sentences), and one set of 10 texts that received a high distinction (1201 words, 6445 tokens (total word count), 292 sentences). There was no significant difference between the two corpora for total words, total tokens, sentence length or number of sentences.

Identifying linguistic features of interest was conducted primarily by hand coding (within a SFL framework) and by Concordance 3.2. As individual words and phrases within each clause can realize different functions (depending on the context of a clause or sentence or even across multiple clauses/sentences), the concordance statistics could not be solely relied upon to reveal similarities and differences; for example, the word "to" has over 23 "meanings" and students often used "to" as a reduced form of "in order to". To ensure correct coding of the students' reflective writing, manual coding was conducted at least four times.

2.1. Temporal and causal resources

Temporal and causal vocabulary/lexis is an important linguistic resource for explaining a sequence of events and their outcomes. As the writing task required students to reflect on the team's completion of stage 1 design (using the Problem Statement Restatement Technique), the use of temporal/sequential and causal/consequential vocabulary/lexis was expected. Along with the categories in Table 1, a general definition from a SFL framework was used for identifying when writers were explaining phase 1 of the design process in their learning portfolios,

> … explanations which are concerned with explaining how or why one sequence of events occurs (sequential and causal explanations) and then with explanations which are concerned with multiple factors or consequences (factorial and consequential explanations). (NSW Department of School Education, 1996, p. 46)

Table 1. Connective type and functional category.

Connective type	Functional category	Student example
Temporal		
	Temporal conjunctions	**Then**, we decided a [sic] initial group problem statement.
		After that, we followed the statement-restatement technique from the textbook to refine our initial statement…
	Time as participant*	**The next step** I believe is to allocate responsibility to different members of the group in the next meeting.
	Time as process*	None found in corpora
		breakfast **precedes** lunch**
		dinner **follows** lunch **
	Circumstance of place	**From** what I have experienced in the course so far, …
	Circumstance of means	Once the main design has been decided **by** all the group members, …

[2] The terms "word" and "token" are used according to Watt's (2004) Concordance text analysis software. Word is the occurrence of a word; while token is the frequency a specific word is used; e.g. "the" (word), "292" (token) means that the word "the" was used 292 times.

Table 1 cont'd

Connective type	Functional category	Student example
Causal		
	Causal conjunctions	The work in team, from my point of view, is usually more complex than working alone **because** there are new parameters to consider,
	Cause as participant* (consequential)	… (with) **the help of my group and our common efforts** in brainstorming, many ideas have emerged.
	Cause as process*	…which might **cause** the misunderstanding of designing project …
	Cause as possible / predicted (consequential)	Constraints will slow us down **if** we do not identify them early and that **will** cause delay in our production of the device.
	Circumstance of cause	…every member of the group thinks differently **because of** the background and the difference of the life experience that we had.

* Indicative of more sophisticated writing.

** Example not from student writing in the corpora.

2.2. Appraisal resources

When a writer takes a stance or attitude about something, the linguistic resources used belong to an SFL system known as appraisal (Martin & White, 2005). Expressing judgements about performance and outcomes would require the writer to use elements of the appraisal system.

Appraisal can be realised in nearly any word form (noun, verb, adverb, adjective, connective, etc.). Appraisal is a discourse semantic resource containing three multilayered and intersecting domains of Attitude, Engagement and Gradation. It functions within the Interpersonal Mood system in SFL. Attitude is concerned with feelings that are categorised as **affect, judgment** or **appreciation**. Engagement is concerned with **projection, modality, polarity, concession and comment adverbials**, all which source "attitudes and the play of voices around opinions in the discourse" (Martin & White, 2005, p. 35). Gradation is concerned with up-scaling or down-scaling the Interpersonal Mood system, "whereby feelings are amplified and categories blurred" (Martin & White, 2005, p. 35).

This paper focuses on the Attitude domains of **affect**, **judgment** and **appreciation** and the Engagement domain of **polarity**. Resources for communicating emotional reactions; such as joy, shock, happiness, etc, are categorised as **affect**. Resources for assessing behaviour based on normative or agreed principles are categorised as **judgment**. Resources for assessing the value of something are categorised as **appreciation**. Table 2 shows examples of appraisal in the reflective writing corpora. The Attitude resources identified (at the level of the clause) in the two corpora were then categorised as positive or negative **polarity**. Other features of Engagement and Gradation are beyond the scope of this paper.

Some sentences expressed all Attribute domains; for example,

> It **seemed like** the questions **become harder** after the discussion [AFFECT], **but** we **learned a lot** from the discussion [APPRECIATION], and the team discussion is the **most effectively [sic] way** to solve problems [JUDGMENT].

Table 2. Appraisal examples from students' reflective writing about phase 1 engineering design process. (Adapted from Martin & White, 2005).

Attitude Domain	Student examples
Affect (emotions/ reacting to behaviour/ text/ process/ phenomena)	Actually I **don't like** our final statement **at all**.
	I would **like** to see things on different perspectives
	I did **not want** to **fall behind** them.
Judgement (of behaviour/ by ethics)	... there are several of us **not prepared** resulting in **very little or no** ideas.
	In fact I just work on a **wrong** problem for this first phase!
Appreciation (aesthetics or value in text/ process/ phenomena)	Therefore, it **allows** me to have a **very prepared** mindset.
	In short, it's **hard to decide** which one is the **most important.**

One of the learning outcomes for graduate engineers is an understanding of the complexities of the design process, which is partially realised by the ability to recognize weaknesses, limitations and problems. Appraisal resources which express a negative stance would likely be used to identify and discuss problems arising from the learning activity, teamwork, and the writer's understanding. Appraisal resources which express a positive stance would likely be used to identify a successful learning activity. Hence, clauses that expressed negative or positive appraisal were identified and coded for polarity as well as appraisal type. Frequency was noted at the level of the clause (see Figures 3 and 4). While Martin and White's appraisal system is multilayered, the three domains of Attitude (i.e**. affect, judgment**, and **appreciation**) were deemed sufficient for initial analysis of the reflective writing. Deeper analysis of appraisal in reflective writing will be considered in future studies.

3. Results

The frequency of temporal and causal resources as well as appraisal resources were identified in the 20 reflective writing texts and are presented in Figure 1 (11,689 tokens). From the sample of 10 good [HD] and 10 poor [FL/P] Phase 1 reflective writing entries, it appears that the HD texts used slightly more temporal vocabulary/lexis and significantly more causal and appraisal resources. The HD texts contained more explanation and evaluation about the phase 1 engineering design process.

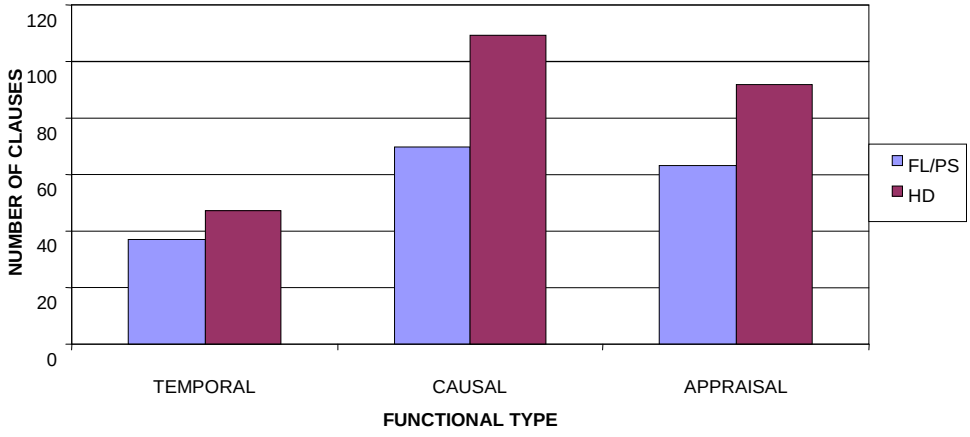

Figure 1. Temporal, causal and appraisal resources in poor (FL/PS) and good (HD) reflective writing.

To date we have also coded all reflective writing (69,541 tokens) for engineering design phase 1 by grade and then for frequency (percentage) of causal vocabulary/lexis only. Figure 2 shows that use of causal words in phase 1 reflective writing has a general upward trend from fail to credit, then a slower upward trend from credit to distinction, but surprisingly, a much higher (almost double) use of causality at high distinction. Further investigation is required before the findings of the analysis can be confirmed and interpreted.

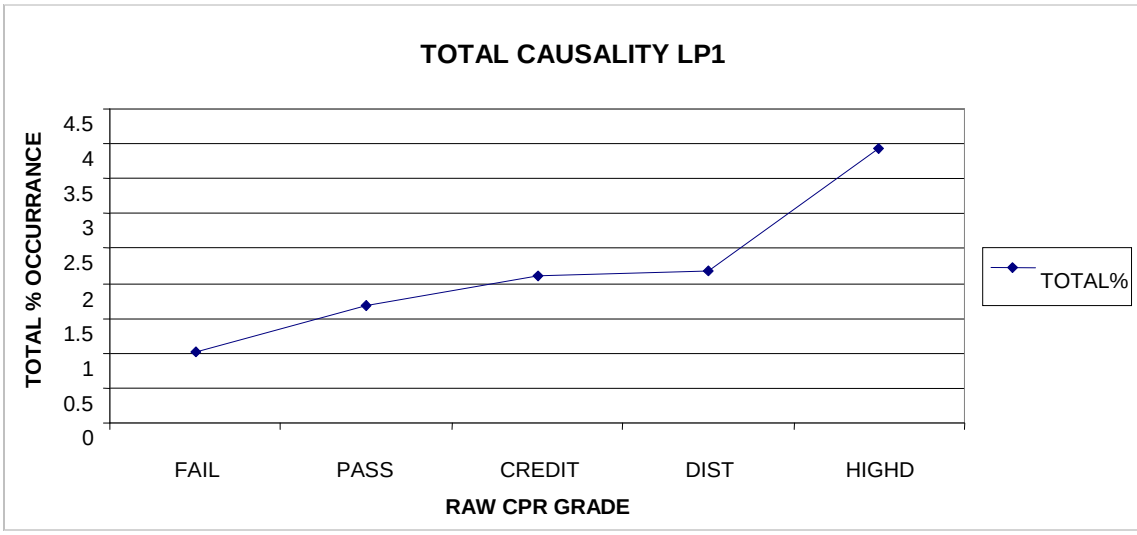

Figure 2. Percentage of causal words by grade: design phase 1 reflective writing.

Next we discuss in more detail the use of temporal, causal and appraisal resources in some reflective writing samples taken from the corpora.

3.1. Explaining what happened and why

Students were instructed to, "… include how your team went about this process ...". An explanation of an experience was required. Table 3 shows two extracts from two learning portfolio entries, one graded "HD" and one "FL/P". From Table 3 it can be seen that extract A mainly uses temporal vocabulary/lexis which results in a simple retelling of an experience; how a group went about phase 1. Reflective writing that predominantly uses temporal connectives just describing a sequence of events would be considered a low learning outcome (Moon, 2004, pp. 96-102).

Table 3. Example explanations.

Extract A [FL/P]	Extract B [HD]
Firstly, we showed each other of our original problem statements. **Then**, compare with the differences between the original problem statements, and find the same goals mentioned in our statements. **After that**, we try to find the most important goals in the statements and discuss about these. **Then**, we decided a initial group problem statement. **After that**, we followed the statement-restatement technique from the textbook ***to refine*** our initial statement and got the final one.	**At the first meeting**, we all had diverse propositions on the statement of the problem design. ***So*** we all had to think together, and mix all of our ideas ***to*** generate a real problem statement that would really mean something. In addition, our tutor gave us some good advices on how to define it correctly. ***After that,*** we have been able to write the first problem statement of the group: "Design and manufacture a simple and innovative device that will move a maximinly heavy payload, to a final elevated point in the quickest time possible". **At the end of the tutorial**, every members of the group were satisfied by the work done, but we knew that there were still some problems remaining in our statement. ***That is why*** the statement/restatement process has been very useful at that stage. Explications (in the lecture courses) on how to use this technic also helped us a lot. We have tried to simplify our problem statement ***because*** it was too narrow…And each member of the group understood progressively a bit more on this process, while solutions were found. **Few days latter**, we have finally defined by an effective statement/ restatement process, our problem statement for the design of the device …

Notes: Temporal words in bold; causal/consequential words in bold italics (original spelling and grammar retained).

3.2. Evaluating what happened

In the task instructions, students were required to explain, "… how effectively the statement/restatement technique helped the team members to develop their ideas". Drawing on Appraisal Theory (Martin & White, 2005) enabled identification of when writers were evaluating a process, their performance, or their team's performance. As the appraisal system is complex and multilayered, we limited the initial analysis to appraisal resources of **Affect, Judgment** and **Appreciation** that expressed a positive or negative attitude (Figure 3).

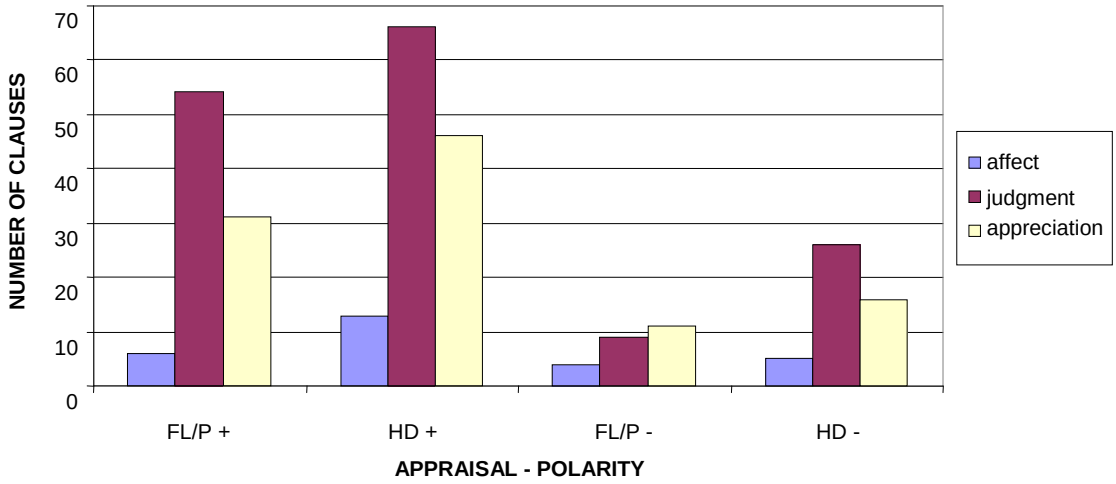

Figure 3. Appraisal resources by type and polarity (+ signifies positive polarity, - signifies negative polarity).

Figure 3 shows the number of clauses that use appraisal resources to express a positive or negative attitude. Overall the reflections of phase 1 are more positive (73%) than negative about the learning experience. The least used appraisal resource was **Affect** (9.7% overall). **Appreciation** (35.9% overall) was the second most common appraisal resource used. **Judgment** of behaviour (self and others) was the most frequent (53.6% overall) choice in all but one category (FL/P negative).

HD reflective writing accounted for 61% of appraisal identified in both corpora (Figure 4). In terms of polarity the greatest differences are observed in clauses which expressed appraisal with negative polarity. HD reflective writing was twice as likely to use negative polarity (particularly for judgment) than FL/P reflective writing (Figure 4). The low frequency in FL/P texts of negative judgment may be due to personal, social or cultural beliefs about expressing a negative judgment on the performance of one self and one's team members; especially when you know your reflections will be peer reviewed, but this perception needs further investigation.

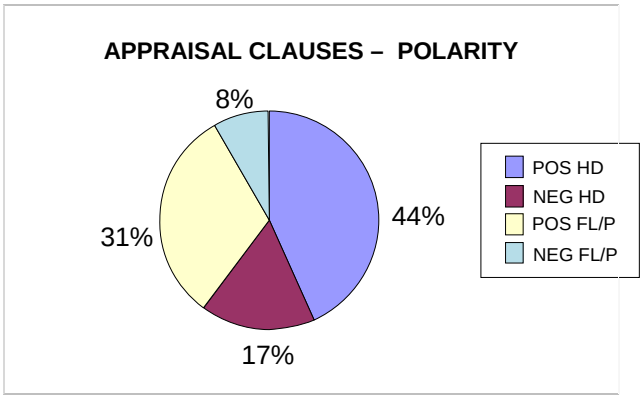

Figure 4. Appraisal in clauses by polarity.

Some example extracts below show how students evaluated their experience of phase 1 engineering design process. Table 5 contains two extracts (unaltered) that contain appraisal, both positive and negative. Differences are observed in choice of words. Text C, uses general words such as “more problems”, “become harder”, and “learned a lot” to describe problems and challenges. On the other hand, text D includes more precise words for problems and challenges such as, “simply incorrect”, “too vague”, “ill-conceived” and “does not constrain”. As a learning outcome for the engineering design process, these more precise appraisal resources are also considered indicative of students beginning to use domain specific language.

Table 5. Example appraisal.

Extract C [FL/P]	Extract D [HD]
Our problem statement is to Design, build and test a device that can transfer a payload. The device should utilise an innovative and simple design and abides by constraints such as dimensions and time. To what I thought that our real problem is to design and construct the device which can move the cube to the higher platform. But it was **not that easy [negative judgment]** like that. When we was discussing, we found **more problems [negative appreciation]** that such like, the weight of the payload, the time taken during the task, the device must be simple, and the maximum weight the device can hold. It **seemed** like the questions **become harder [negative affect]** after the discussion, but we learned **a lot [positive appreciation]** from the discussion, and ***the team discussion is the most effectively way to solve problems [positive judgment]*** next time when we meet together we will talk about how to solve these problems.	My original statement was “To design and build a payload delivery system that will transport a load to a distance of 1500mm and a height of 700mm within certain specifications”. ***I understand that the process of developing a problem statement is iterative.*** The problem statement is the **most critical [positive appreciation]** step in an engineering process**.** An initial problem statement may be found to be **simply incorrect**, **too vague** or **ill-conceived [negative appreciation]**. Several reformulations of the problem statement are required to make it more accustomed to the situation and its limitations. That is the **breakthrough [positive appreciation]**step towards the final solution. I developed my problem statement in such a way that it will solve the problem **specifically** yet **allows** a **broad avenue** of solutions **[positive judgment].** My problem statement **does not constrain** the design **too much [positive appreciation]** but it will have to adhere with the specifications that were listed in the project brief.

Notes: Bold = appraisal; Bold italics = explicit learning statement.

The analysis also revealed that the HD texts were more likely than the FL/P texts to express a negative judgment (Figure 4). Two further extracts that received a high distinction grade are presented (unaltered) in Table 6.

Table 6. Appraisal in HD texts – negative polarity.

Extract E [HD]	Extract F [HD]
The first thing I can say about my original problem statement is that it contains **too many** details. This is something that most of the my group members agreed on during our first meeting. **This large number** of constraints **will distract** the reader from the real problem and **limit his innovativeness**. My statement is also **not succinct**, which will **cause more distraction** from the real problem.	In developing my problem statement I included the main problem that needs to be solved, **but** I also included some **unnecessary** constraints and measurements. I think **this lead to** the **long and complicated** statement.

Extract E and F demonstrate awareness of a Phase 1 key concept, the impact of constraints on design, and this is considered a higher learning outcome. By identifying constraints as important for defining the problem, the students have shown basic comprehension. In addition, by elaborating on this to include the "cause-effect" either in terms of the benefits (positive attitude) of "establishing a solution space" or the disadvantages (negative attitude) of "solving the wrong problem", means they have shown a higher understanding of the concept. The extracts interweave causality (factorial and consequential) and appraisal, showing that multiple resource systems are at play in the reflective writing.

3.3. Towards deep reflection?

Finally, students were asked to reflect on what they had learned about teamwork and the design process. According to Moon (2004, pp. 95-102), in order to show deep reflection, writers need to explain a sense of change in perception and a clear statement of what was learnt; a type of reflection on reflection (Brockbank & McGill, 2007, pp. 196-200).

The FL/P reflective writing often listed general learning outcomes such as, "I should be a good listener", and "I need to communicate well". While the writers show an awareness of requirements and obligations underpinning teamwork, little or no elaboration was provided to enable an assessment of depth of learning. For example, what does the writer mean by "a good listener", how did the writer come to this realisation, and how has the writer's thinking changed? Some HD reflective writing, on the other hand, attempted to explain how perceptions changed as a result of the phase 1 activity. For example:

> … During the problem statement phase of the design project, **my ideas about the project changed substantially**. My initial ideas about the project were all concentrated around one specific idea, and **no matter what** other ideas were given out I still stuck firmly to my original plans. **This changed dramatically** once I entered the problem statement phase of the design project. My original problem statement did shows [sic] a contrast the[sic] to final problem statement that our group decided upon after the statement/re-statement phase. **This shows that** my ideas significantly changed from a single aspect situation, to a "think outside the square" method of thought … [author's highlights]
>
> … Through the creation of this definition, **I learned that teamwork can immensely change my perspective upon any given situation,** even though I might think I have the one and only solution. **This taught me** to let other people judge my work and analyse other people work, as two heads are better than one, and six heads are better than two … [author's highlights]

The above extracts could be considered to demonstrate a significant level of deep reflection as the writers have noted learning points and described a change in thinking and behaviour.

Overall, a broad analysis of good and poor reflective writing appears to show that the "good" texts were providing linguistically richer descriptions and explanations of an experience, which resulted in more frequent and more explicit statements about design complexity, the challenges faced in the engineering design process, and changes in perception.

4. Conclusions

Language is a complex multilayered system where, depending on the context and the register, words and combinations of words have multiple meanings and connotations. This makes initial coding of connectives (Flowerdew, 1998) and appraisal (Martin & White, 2005) challenging. While concordance software can isolate words or phrases of interest, manual reading and hand coding is still needed to check the writer's meaning at the level of the clause. Nevertheless, identification of connectives as well as appraisal resources in students' reflective writing has revealed to some extent how the texts are communicating meaning. The linguistic features or "rhetorical effects" (Martin & White, 2005, p. 94) noted in this paper may be useful for identifying the depth of learning in reflective writing.

Given that the frequency of the target linguistic features appears to match assessment grades, then this correlation could be viewed as more than coincidental and is worthy of further investigation. In order to further develop a representative set of linguistic features which may be used for modelling and assessing reflective writing in engineering design, future analysis will be conducted on causal, temporal and appraisal features in the reflective writing of all three phases of the engineering design process, These features may also be correlated to levels of reflection and learning, which could then be mapped onto learning taxonomies such as Bloom's taxonomy, the SOLO taxonomy, or Sim and Duffy's (2004) model of learning in design.

Acknowledgements

We'd like to thank Dr. L. Ravelli and Dr. I. Skinner for their discussions and advice on matters linguistic and the engineering design process. We also thank Ms. R. Goldsmith, Ms. H. Farrell, the JALL reviewers and JALL editors for feedback on many drafts.

Appendix A. Learning activities for phase 1 design process

1. Student obtains selected readings and project brief from Vista facilitated learning pages.
2. Student prepares an individual problem statement and submits online.
3. Student attends lecture on problem definition.
4. Student participates with team members to create an agreed problem definition.
5. Student logs onto CPR – completes calibration phase to weight peer assessment.
6. Student prepares and uploads individual reflective writing task.
7. Student completes assessment of 3 peer scripts – uses rubric + own feedback.
8. Student completes self-assessment.
9. Marks awarded by deviation outside of average marks received by their peers.

Appendix B. Phase 1 reflective writing peer assessment criteria (from Reidsema, 2008)

Different types of questions are used. You may be asked to give a Yes/No response, and to add a comment. You may be asked if there were None, Some or Many examples of a particular characteristic in the text. Another question type asks you to respond with an A, B, or C. For any question that requires an A, B, or C response, use the following criteria.

A. Clear understanding and application. The student has clearly understood the issues and techniques and has effectively applied then to the task.
B. Reasonable understanding and application. The student has thought about some of the issues and techniques and shows evidence of a reasonable level of understanding and application.
C. Limited understanding and application. The student appears to have a limited understanding of issues and design techniques and does not describe a clear process of application of techniques to the task.

1. Does the student clearly show a good understanding of the statement/restatement technique by explaining how the technique was used to generate a problem statement?

□ Yes □ No

2. Does the student include a description of the group application of the four parts of the statement/restatement technique? These are: varying the emphasis on certain words or phrases, substituting explicit definitions for key words, changing positive terms to negatives and vice versa, and replacing persuasive an/or implied words and investigating the underlying reasoning and expressing words in graphical or mathematical formats:

□ None □ Some (1 or 2) □ Many (more than 2)

3. How clearly does this student demonstrate an understanding of the problem statement process and the statement/restatement technique as applied by the student and the group?

□ A □ B □ C

4. Does the student appear to have learned how to contribute to the team process and how to help the team to be effective?

□ A □ B □ C

5. How would you rate this text?

□ 10 Highest ... □ 1 Lowest

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