

Student Choice and Higher-Order Thinking: Using a Novel Flexible Assessment Regime Combined With Critical Thinking Activities to Encourage the Development of Higher Order Thinking

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Flexibility in assessment is usually achieved by giving students choice over the assessment weighting, type or format, the timing, the criteria, or the overall assessment result. This study, however, demonstrates the development of a flexible assessment regime where students were given the choice to invest in within-semester tasks designed to encourage the development of higher order thinking skills. This was accomplished by incorporating two compulsory summative assessments and two optional tasks focused on the process of learning. Students could choose whether to invest extra time to complete all four tasks, or to concentrate their effort only on the compulsory assessments. Evaluation of the flexible assessment regime was conducted using a survey incorporating quantitative and qualitative questions. The data showed that students came to value the flexible assessment regime by the end of the semester. Qualitative responses indicated students thought they had developed their higher order thinking skills, but were unaware of how these skills were of benefit in their disciplinary context. A follow-up interview study was conducted to further understand students' responses. These discussions indicated that students thought the assessment options allowed them to scaffold their learning throughout the semester, reduced overall student stress, and encouraged the development of higher order thinking skills. This study therefore demonstrates that flexibility in assessment allows students to take a proactive role in their learning. When combined with activities designed to develop critical thinking, this assessment strategy can be effective in developing higher order thinking skills.

Educators need to prepare students to become professionals in their chosen field of study by teaching both academic content and transferable skills (such as critical and analytical thinking, academic writing and research skills, as well as organizational and time management skills). Approaches to improve tertiary curricula often focus on improving the workplace transferability of the content being studied or on addressing the assessment and feedback strategies (Bradley, Noonan, Nugent, & Scales, 2008). However, universities are still heavily reliant on the use of more traditional forms of assessment such as essays, tests, and exams. In a continually changing graduate environment, teaching staff need to develop innovative assessment regimes that shift priorities from formulaic approaches of content learning to tasks that focus on the *process* of learning. Additionally, it is increasingly important to develop assessment tasks that both encourage students to develop transferable skills and allow them to see the practical application of these skills gained throughout their studies.

Student engagement is considered central to effective educational practice in higher education (Biggs, 2012; Devlin & Samarawickrema, 2010). One of the most important elements of student engagement is participation in learning. Institutions have made considerable progress in seeking ways of engaging students by improving universities' approaches to teaching and learning. These alternative approaches include blended learning, peer and social learning, problem-based learning, experiential learning, and learning through self-discovery. Strategies for improving engagement with assessment tasks at a tertiary level

usually focus on improving the authenticity of the assessment tasks. This is done by ensuring constructive alignment of the tasks to the course and unit objectives, graduate attributes, and learning experiences (as first described by Biggs, 1996), leading to alternative assessment types that are more authentic to students' future workplaces. Examples of authentic assessment tasks include internship projects, alternatives to written assessments (such as class mini-conferences and podcasts), simulations, and problem-based tasks. A previous study has for example shown that incorporating constructively aligned skills development in a problem-based assessment task resulted in improved overall authenticity and increased problem-solving skills development (Pretorius, Bailey, & Miles, 2013). Additionally, this approach allowed students to better see the transferability of the skills they learned for their future career (Pretorius et al., 2013). Designing assessment tasks that focus on the process of learning and foster students' higher order thinking skills by promoting critical thinking, reasoning, reflection, and metacognition require further innovation.

Metacognition is often defined as "thinking about thinking" (Livingstone, 2003, p. 2). However, a more comprehensive definition is necessary due to metacognition's relationship with self-regulated learning. Self-regulated learning involves students setting goals and working to monitor, regulate, and control their own learning, motivation, and behavior in order to achieve these goals (Pintrich, 2004; Wolters & Taylor, 2012). This comprises the use of several strategies that are considered metacognitive, including self-monitoring, questioning, reflection, and

self-assessment (Gourgey, 1998). For the purposes of this paper we have defined metacognition as the students' ability to engage and monitor the cognitive processes involved in their learning. Similarly, various definitions of critical thinking have been proposed depending on the researcher's theoretical perspective. We consider critical thinking to involve the ability to engage a range of cognitive skills such as interpretation, evaluation, analysis, and synthesis in order to solve problems and draw conclusions (Alghafri & Ismail, 2014; Dixon, Prater, & Vine, 2004; Kurfiss, 1988). In this paper we define reflection as the students' ability to analyze and evaluate their learning experiences and actions in order to foster self-discovery and growth. Since reflection incorporates elements of analysis and evaluation, it is considered to be a higher order thinking skill (Pretorius & Ford, 2016).

Flexible Assessment

One area of assessment that has received less attention is how students can be more actively involved in the assessment process itself. It has been suggested that students' higher order thinking can be improved through assessments that allow increased learner flexibility and control during the assessment process (Irwin & Hepplestone, 2012). There are several terms for these approaches in the literature, including flexible assessment, student choice, and selected assessment. In order to provide some clarity to the meaning of flexible assessment practices, Rumsey (1994, p. 20) suggests that "assessment practices are flexible if they can accommodate the scope of knowledge and skills encompassed by the assessment criteria, the variations in context in which assessment may be conducted, and the range of needs and personal situations of potential candidates."

Studies describing different approaches to implementing flexible assessment in practice show that such assessments can incorporate student choice or autonomy in assessment weighting, type or format (Irwin & Hepplestone, 2012; Varsavsky & Rayner, 2012), timing (McCurdy, 2000), as well as the assessment criteria or the overall assessment result (Francis, 2008). Literature also suggests that students appreciate being given autonomy or empowerment in the assessment process and that they are generally highly receptive to flexible assessment (Cook, 2001; Francis, 2008). By offering students some form of choice they become active participants in the assessment process, taking responsibility for their own learning. Allowing students a degree of flexibility also appears to positively impact upon their attitude and motivation toward the task (Pacharn, Bay, & Felton, 2013). Flexibility in assessment has also been suggested to reduce student stress (Cook, 2001).

In this paper we aim to investigate whether flexibility in assessment can be achieved by allowing students the opportunity to invest in optional tasks. We also aim to investigate how this flexible assessment approach affects students' approaches to study. This study demonstrates that flexibility in assessment allows students to take a proactive role in their learning. When combined with activities designed to develop critical thinking, this assessment strategy can be effective in developing higher order thinking skills.

Methods

Learning Context

The flexible assessment regime described below was applied to a large second-year undergraduate subject focused on management accounting. This subject is a core component of the accounting major and is required for membership to professional accreditation bodies. Topics covered in this unit include costs and cost behavior, product costing, cost allocation, cost-volume-profit analysis, and the use of cost information for management decisions. This unit is delivered twice a year, and enrollment numbers per semester vary between 200 and 350 students, including students from culturally and linguistically diverse backgrounds. We applied the flexible assessment regime with three different cohorts of students with a combined enrollment of 895 students. The subject design and instructor for each iteration of the unit were the same, allowing for the grouping of all three cohorts for data analysis.

Flexible Assessment Design

The flexible assessment regime in our unit was comprised of four assessment tasks. Two assessment tasks were compulsory for all students and were focused on the final product of the students' learning. These compulsory tasks were familiar to students and similar in design to their other subjects. The first compulsory task required students to submit a short written response to a set question on three separate occasions during the semester (weeks 4, 7 and 10). These summative coursework tasks were designed to measure the students' understanding of a particular concept discussed during the preceding three weeks. The second compulsory assessment required students to complete a three-hour closed-book examination at the end of the semester.

The other two assessment tasks were voluntary and focused on the process rather than the final product of learning. These process-focused assessment tasks were designed to foster higher order thinking and assist students in their learning throughout the semester. The first voluntary assessment task required students to

Table 1
Assessment Weighting Depending on Student Choice.

Assessment task	Choice 1 <i>Completion of all four assessment tasks</i>	Choice 2 <i>Completion of only the two compulsory assessment tasks</i>
Coursework tasks (compulsory)	15%	20%
Exam (compulsory)	60%	80%
Pre-lecture quiz questions (optional)	10%	Not applicable
Critical thinking questions (optional)	15%	Not applicable

answer a series of short pre-lecture quiz questions each week. Students were also required to attend the lectures as part of their assessment, so their student numbers were recorded at the start of each session. The second optional activity was specifically aimed at developing students' critical thinking skills. For this task, students were required to generate a series of "critical thinking questions" related to an identified discussion topic prior to attending a tutorial. During the tutorial students worked together in groups to find answers to these student-generated questions. Student questions were also assessed by the tutors, and answers were discussed during the seminars. This assessment task aimed to foster critical thinking by encouraging students to reflect on their learning needs prior to class, question their existing knowledge, and identify gaps in their understanding. Additionally, this approach is likely to encourage self-directed learning, as students take control of their own learning during class time. All students participated in the teacher-facilitated tutorial discussions about the student-generated questions and possible answers. Consequently, this was also a time for shared learning, encouragement of critical thinking, and development of metacognitive skills such as questioning and problem-solving.

Rather than exercise tight control over students by requiring everyone to complete all assessment tasks, our assessment regime gave students autonomy to choose to invest in the optional tasks. Students were therefore given the opportunity to take control of their learning trajectory throughout the semester by choosing which tasks they would complete. The students who completed all four assessments were not disadvantaged in terms of their final mark, as their overall grade depended either on just the two compulsory tasks or on all four assessments, whichever was higher. Consequently, the optional assessment activities would only contribute to the final result if their effect was to increase a student's overall mark. The assessment grading was designed in this way so that students were not deterred from choosing to attempt the process-focused assessment tasks. Students who chose to

complete only the compulsory assessment tasks were also not disadvantaged because of their choice, as their final grade only depended on their work in the two summative tasks. However, these students may not have developed the same higher order thinking skills as those who completed all four tasks, as they did not devote time to generate critical thinking questions. This means they were likely to have reflected on their learning needs to a lesser extent than those students who elected to complete the additional assessments. It should be noted though that critical thinking development may still have occurred during shared learning in class time, as all students were involved with answering the student-generated questions.

Depending on a student's choice and the semester in which they completed the unit, assessment tasks were weighted differently. If students chose to complete all four assessments (Choice 1), and if the effect of the optional assessments was to increase the overall grade for the student, the assessments were weighted as shown in Table 1. If students chose to only complete the compulsory tasks (Choice 2), or if the effect of the optional assessment tasks were not beneficial to the student grade, the exam was weighted at 80% and the coursework tasks at 20% (see Table 1). It is important to note that the assessment weighting described in Table 1 was the preferred model for this assessment regime. In the first iteration of the new assessment regime, however, the exam weighting had to comply with what was presented to students in the previous year's unit handbook. Consequently, in the first and second semesters that this new assessment regime was implemented, the coursework tasks were weighted at 40% and the exam at 60% for Choice 2. The preferred weighting model was implemented on the third occasion after the unit handbook was amended.

While students were not required to inform staff of their choice, it is possible to gauge choice by examining the percentage of students whose unit score was based on two assessments as compared with all four assessments. Based on this information, there was no difference in the number of students who participated in the voluntary assessments

for either weighting model, so we do not feel that the change in weighting altered the students' choice. Consequently, we combined the data from these two weighting models for further statistical analyses.

Research Design

The design, data collection, and analysis procedures described in this study were approved by the University's Human Research Ethics Committee. All participants provided informed consent, and all data were de-identified before analysis. This study describes an evaluation of the flexible assessment approach using a mixed-method quantitative and qualitative research design. Quantitative data were obtained using an anonymous online survey created using Google Forms[®]. The full survey can be found in the Appendix. A total of 252 completed surveys were collected across the three semesters. All questions in the survey were optional, so each question has a different response rate, as indicated in the results section of this study. Results were similar from each of the teaching semesters, so results have been combined for the purposes of data analysis. All results were analyzed using Microsoft[®] Office Excel[®] 2010.

In addition to the quantitative data, qualitative data were obtained through an open-ended question at the end of the survey which asked students to identify possible improvements in the flexible assessment regime design or the unit more generally. A total of 90 responses were received, and responses were similar for each cohort of students. Flyvbjerg (2011) highlights that a combination of quantitative and qualitative methodologies allows the researcher to investigate a phenomenon in both depth and breadth. This question was therefore included to examine students' experiences in the unit, as responses can be considered as a reflection of the students' overall impression of the unit. We applied a thematic analysis approach to assess the responses to this question, incorporating steps designed to enhance the credibility of the study. The theme analysis was conducted by a researcher not involved in the assessment design or teaching of the unit. All responses were read in order to gain a general understanding of the main concepts identified by each student. Each response was then organized into a theme cluster, which can be considered as expressing the latent content of each student's responses (Graneheim & Lundman, 2004). Agreement among co-researchers was sought, and quotes from the responses are included to enhance the credibility of the research findings. In total, three themes were identified: flexible assessment structure, incorporation of higher order thinking skills, and technical issues associated with the unit.

After data analysis we were interested in further examining the responses from the survey respondents using an in-depth interview approach. However, as the surveys were conducted at the end of each teaching semester and data analysis was not done until the next year, longer-term

follow-up of students was problematic. It was therefore not possible to conduct large-scale in-depth qualitative interviews about the students' survey responses, as many students would have either already graduated or were no longer contactable. However, five participants were identified that were still available for follow-up discussions. While five participants represents only a small percentage of the overall cohort, discussions with these students could still prove useful to provide some context for the survey responses. As such, we decided to conduct informal discussions with these students using a semi-structured interview approach to allow students to independently identify topics for further discussion. These discussions can be considered as small case studies aiming to gain a deeper understanding of the students' experiences in relation to the flexible assessment regime. Flyvbjerg (2011) notes that case studies can add more detail, richness, and completeness regarding the understanding of a phenomenon under investigation, providing the researcher with deeper insight. While the data from these case studies cannot be extended to the whole cohort, we believe the data still provide a valuable insight into the students' experiences, so excerpts from the students' responses have been included in this study. Participants were both male and female, represented domestic and international students, and had received a range of grades for the unit. Interviews were conducted by a staff representative who was not involved in the teaching and grading of the unit. Students were not provided with any incentives for participating in the study. We applied the same thematic analysis approach as described above to assess the content of the case study interviews, incorporating appropriate steps to insure credibility of the study. In total, three key themes were identified from the student interviews: changes in study approach and scaffolded learning, usefulness and limitations of the assessment regime, and the development of higher order thinking skills.

Results

Students' Participation in the Flexible Assessment Regime

Completion of all four assessment tasks (Choice 1) was the preferred regime choice for students. In total, 66.4% (594 students) chose to complete both the compulsory and voluntary assessment tasks. Another 31.4% (281 students) chose to complete only the compulsory assessment tasks (Choice 2). The choice of twenty of the students (2.2%) was unclear, as these students did not complete the compulsory final exam.

Students' Understanding of the Flexibility in the Assessment Regime

Prior to assessing the effects of the flexible assessment regime on students' grades and approaches to study, it was

necessary to establish students' overall understanding of the flexible nature of the assessment regime. Survey responses indicated that 89.0% of the students were aware of the flexible nature of the assessment model (Table 2). It was also of interest to determine when students felt they had clearly understood the nature of the assessment regime. The majority of survey respondents (59.1%) reported that they clearly understood the flexibility of the assessment regime by the third week of the semester (Table 2). A further 21.6% of respondents indicated that they understood the assessment regime by the middle of the semester (Table 2). Only five students reported that they had never clearly understood the assessment regime (Table 2).

Students' Receptiveness to the Flexible Assessment Regime

As this was the first unit in the students' overall course that incorporated flexible assessment, we were interested in determining whether students approved of the flexible assessment regime in the unit. Survey responses showed that 67.5% of respondents identified the flexible assessment regime as a "very good" or "good" idea by the end of the semester (Table 3).

Data from the qualitative survey responses indicated that students were generally receptive to the idea of flexible assessment ("flexible coursework is reasonable and helpful to most student[s]"; "the regime is fine"; "no improvements need to be made"). However, students also felt that the weighting of the exam in Choice 2 (see Table 1) was too high ("the percentage on [the] exam can be lower"), which decreased the likelihood that students would choose that option ("yes it was flexible, but in what way is it fair if

one of the options was that the exam is worth 80%?").

All five case study interviewees thought that the flexible assessment regime was "really helpful" and "interesting". Students felt that the flexible nature of the assessment regime gave them "more freedom" as they had "more than one option." Two students also commented that the flexible nature of the assessment reduced student stress during the semester and exam time.

In the end-of-semester survey several students commented on technical difficulties associated with the flexible assessment regime. In particular, students did not like attendance checking ("do not have attendance for the lecture"; "no compulsory seminar attendance"). One of the case study interview participants also commented that technology difficulties and attendance checking throughout the semester negatively impacted upon their experience. Several of the case study interviewees also commented that the unit was "difficult" and that the amount of content covered during the semester was "a bit of overload." One student also discussed the extra pressures placed upon students from international backgrounds, particularly in relation to study costs ("But I need to pass. It's very expensive to fail the unit.") and language barriers ("Most people spend like an hour? I spend two hours because I have language barriers.").

Effect of the Flexible Assessment Regime on Student Grades

The average grade for students who completed all four assessment tasks was 63.4% (n=594). Students who completed only the two compulsory tasks had an average grade of 51.4% (n=281). This represents a 12% difference in mark between Choice 1 and Choice 2. Survey respondents were asked to self-report their final

Table 2
Students' Understanding of the Flexible Assessment Regime.

Survey question	Response	Number of responses	Percentage
Were you aware that the coursework assessment regime was flexible?	Yes	211	89.0%
	No	26	11.0%
Approximately when during the semester did you first clearly understand what flexible coursework assessment meant?	At the Start of the Semester	101	59.1%
	About Halfway Through the Semester	37	21.6%
	Towards the End of the Semester	28	16.4%
	Never	5	2.9%

Table 3
Students' Receptiveness to the Flexible Assessment Regime.

Survey question	Response	Number of responses	Percentage
Now thinking back over the semester, to what extent do you approve of the idea of a coursework assessment regime being flexible?	I now think the idea was a very good one	46	22.7%
	I now think the idea was a good one	91	44.8%
	I now think the idea was unimportant and pointless	39	19.2%
	I now think the idea did not make sense	15	7.4%
	I now think the idea was a very bad one	12	5.9%

Table 4
Grade Distribution of Survey Respondents and the Overall Student Cohort.

Grade	Survey respondents	Overall cohort
High Distinction (80-100%)	12.6%	7.4%
Distinction (70-79%)	19.1%	16.3%
Credit (60-69%)	27.6%	30.3%
Pass (50-59%)	22.0%	24.6%
Did not pass (below 50%)	12.6%	21.4%
Prefer not to say	6.1%	Not applicable

grade. Overall, students' results approximated a normal distribution (see Table 4). The grade distribution of survey respondents can be considered representative of the overall grade distribution for the whole cohort of students (Table 4).

It was also interesting to see whether students felt that their final grade represented their understanding of the unit content. The responses to this question were approximately equally distributed between yes and no (52.2% and 47.8% respectively). We also examined the students' perceptions of the effect of the flexible assessment regime on their final grades. Approximately half of the students (49.5%) responded that the flexible assessment regime did not affect the final result they had achieved. This may reflect that students were not aware that the critical thinking exercises were designed to prepare them for the summative assessment tasks. A total of 26.9% of respondents felt it contributed positively to their results (see Table 5). Interestingly, 23.6% of students indicated that the flexible assessment regime negatively impacted their final result (Table 5) despite the fact that the assessment regime was designed so that participation in the voluntary assessment tasks would not negatively affect the overall grade the student received.

It was not possible to determine the mark students would have achieved if they had opted to complete all four tasks rather than just the two compulsory tasks.

However, in order to determine whether the voluntary tasks positively affected students' final grades, we compared the grades for students' who had completed all four tasks. This allowed us to determine whether the students' grades would have been higher if they had just completed the compulsory tasks, or whether the inclusion of the compulsory tasks positively influenced the overall unit grade. In the full cohort of students, the voluntary tasks contributed positively on 65.0% of students' grades. As mentioned earlier, in those cases where the voluntary tasks did not contribute positively, the overall grade the student received was determined by only using the grades for the compulsory tasks.

Impact of the Flexible Assessment Regime on Students' Study Approaches and Learning

It was of particular interest to examine how the flexible assessment regime affected students' approaches to study during the semester, as well as their overall learning in the unit. The end-of-semester survey responses showed that 56.5% of survey respondents felt that the flexible assessment regime had no effect on their overall study approach (Table 6). Approximately equal amounts of respondents decided to place extra emphasis either on the voluntary tasks or the

Table 5
Perceived Effect of the Flexible Assessment Regime on Students' Grades.

Survey question	Response	Number of responses	Percentage
To what extent did the fact that the assessment regime was flexible influence the result you achieved for the unit?	It was the main reason I did as well as I wanted	14	7.7%
	It was a significant reason I did as well as I wanted	35	19.2%
	It had no effect	90	49.5%
	It was a significant reason I did not do as well as I wanted	22	12.1%
	It was the main reason I did not do as well as I wanted	21	11.5%

Table 6
Effect of the Flexible Assessment Regime on Students' Approaches to Study.

Survey question	Response	Number of responses	Percentage
Which of the following best describes the effect that the flexible assessment regime had on your approach to studying the unit?	It made no difference	113	56.5%
	I placed extra emphasis on the voluntary tasks	39	19.5%
	I concentrated on the compulsory coursework tasks	33	16.5%
	None of the above	15	7.5%

compulsory tasks (19.5% and 16.5% respectively, see Table 6).

In the qualitative responses of the end-of-semester survey, only one student noted the reason why they thought the flexible assessment regime did not affect their study approach: "I really think it [had] no effect on me as I am always going to take [the] route that makes the exam weight lower." Four of the case study interview participants said that they had altered their study strategy in response to the flexible assessment regime. In particular, students commented that the assessment tasks throughout the semester required them to continually pay attention to their studies, allowing them to "learn something every week." The interviewees felt that changing their study approach in this way was beneficial as it helped them to scaffold their learning, allowing them to "study little by little" and earn marks "step by step" throughout the semester. One student highlighted that she did not feel the flexible nature of the assessment regime altered her study approach:

Just because it had flexibility I just didn't think, like, OK, I would just like get marks in the exam rather just like you know committing my time for internals. I didn't think like that, I just did my internals at my best and also my exam..."

It is important to note, however, that while this student thought that she did not make a choice, completion of all four assessment tasks does indicate a choice on her part. This student also commented that she thought the flexible assessment regime would be beneficial to other students:

I think like, um, some people prefer doing things like getting more marks and doing things internally, like [throughout] the semester. Those who prefer that would go for like 60% and 40%. Yeah. Those who just [want to], like, score in the exam, they would just go for the 80% and 20% regime.

Impact of the Flexible Assessment Regime on Students' Higher Order Thinking

Irwin and Hepplestone (2012) suggest that students' higher order thinking and reasoning can be improved through flexible assessment. We therefore wanted to see whether our assessment approach evoked the development of such skills. Qualitative responses to the end-of-semester survey were very interesting and indicated that many students were not aware of the overall benefits of higher order thinking and reasoning in learning. Students identified that they had learned

higher order thinking skills: “It forced me to read more and think more.” Also, they noted that generating critical questions helped them develop a deeper understanding: “Every week I will spend an hour to find the correct [questions and answers], since it also [gave] us the little marks on our [final] mark. I’m happy to do so since it is good for my understanding.” However, a large number of responses negatively commented on the critical thinking questions and the metacognitive strategies required in the unit. Several students also commented that it would be better if the teacher provided the answers to the critical thinking questions instead of encouraging the students to discover the answers for themselves. Students thought that “not all [students] have critical thinking ability,” that it is the “lecturer’s job to help [them] understand the content [rather than] to teach [them] how to think,” and that critical thinking was not something that was necessary in accounting or in a second-year subject:

Accounting is not an Arts subject. It should be taught like most other accounting subjects. The critical thinking sought is not something that should be taught in a 2nd year core subject, but perhaps as a 3rd year elective.

To further examine these results, transcripts from the case study interviews were examined. All of the interviewed students commented on the incorporation of critical thinking and metacognition into the curriculum. Students felt the flexible assessment regime taught them to “ask more questions” and to use their “critical thinking side,” allowing them to learn how to apply their knowledge instead of “just memorizing” or “just giving an answer.” Students also commented that this ability to apply critical thinking in their work will be applicable to their future study. Similar to the previous findings, one of the students commented that while higher order thinking is useful, it would have been better to study theory instead of asking and answering the critical thinking questions: “If the tutors can conduct some..., like theoretical, I mean knowledge stuff during the tutorials, like explain more instead of like asking questions cause that’ll be better...” Together, these results suggest that the benefits of higher order thinking skills should be made more explicit to students. Furthermore, it should be made clearer that the critical thinking tasks were designed to help prepare them for the summative tasks throughout the semester.

Discussion and Conclusion

The assessment regime described in this study is likely to be novel. In this study we demonstrate an assessment regime where students make a private conscious choice as to whether they will invest in two

voluntary within-semester assessments. We demonstrate that flexibility in assessment allowed students to take a proactive role in their learning. When combined with activities designed to develop critical thinking, this assessment strategy was effective in developing higher order thinking skills.

The assessment tasks in the unit were divided into product-focused and process-focused activities. The product-focused tasks were compulsory for all students and allowed them to demonstrate the final product of their learning. The process-focused assessment tasks were voluntary and designed to foster higher order thinking as well as assist students in their learning throughout the semester. Students could therefore choose whether or not to invest extra time and resources to complete these voluntary activities. We believe this encouraged the development of self-regulated learning by allowing students to take control of their own learning trajectory. This incorporates strategies that can be considered metacognitive, such as self-monitoring and reflection. Research suggests that self-regulation can improve learning and deepen understanding, as well as increase achievement and problem-solving (Azevedo, Moos, Johnson, & Chauncy, 2010; Plant, Ericsson, Hill, & Asberg, 2005; Pretorius & Ford, 2016; Sandi-Urena, Cooper, & Stevens, 2012; Schraw, Crippen, & Hartley, 2006). Development of critical thinking and metacognitive skills was encouraged for all students during peer-learning in the tutorials. Finally, successful completion of the optional activities required regular reflection on learning in order to generate critical thinking questions prior to class. This was designed to foster the development of analysis and evaluation skills, essential elements of higher order thinking.

Results regarding the benefits of this flexible assessment approach were interesting. Students were aware of the flexibility in the assessment approach (see Table 2) and decided to approach the assessment regime in different ways (see Table 6). Some students stated that they had placed special effort only on completing the compulsory product-focused assessment tasks, while an approximately equal amount said they paid particular attention to the voluntary process-focused tasks. Approximately half of the students stated that the flexible assessment regime did not alter their study approach. After completion of the unit, two-thirds of students reported that they now thought the flexible assessment regime was either a “good” or “very good” idea (Table 3), indicating that students came to discover the benefits of the flexible nature of the assessment regime later in the semester. The students who were interviewed thought the flexibility in the assessment regime was beneficial, as it provided them with more “freedom” and a “second-chance.” They also felt that the process-focused assessment tasks helped them “learn something every

week,” allowing scaffolded learning throughout the semester. This indicates that these students were motivated to continue with the process-focused tasks throughout the semester because of the benefits they discovered for their overall learning.

Students’ end-of-semester survey and interview responses highlighted the development of their higher order thinking skills throughout the semester, most notably critical thinking and metacognition. Data from the end-of-semester survey showed that while students clearly thought they had learned critical thinking and metacognitive strategies, they did not clearly understand the benefits of these skills in relation to their discipline or their overall learning. This indicates that teachers should place more emphasis on explicitly articulating the benefits of higher order thinking in tertiary settings. Interviewees felt that the process-focused assessment tasks helped to develop their “critical thinking side,” taught them “how to think,” and demonstrated to them how to apply their knowledge and “ask more questions.” This may have also arisen from the overall teaching approach of the unit, since application and questioning was promoted throughout the unit. While the interview data cannot be applied to the whole student cohort in this study, it has been previously shown that authentic assessment strategies can be used to promote higher order thinking by emphasizing application of knowledge rather than factual recall (BoarerPitchford, 2014; Darling-Hammond, Aness, & Falk, 1995; Ennis, 1993; Huba & Freed, 2000; Irwin & Hepplestone, 2012; Morris, 2001; Palomba & Banta, 1999; Pretorius et al., 2013). Combined with the data from the end-of-semester survey we therefore believe that flexible assessment can be an effective strategy to develop higher order thinking skills such as critical thinking and metacognition.

Most of the end-of-semester responses and the case study interviews also highlighted limitations of the assessment approach. In particular, students highlighted technical issues, attendance checking, and the impact of the within-semester tasks on overall student workload. While technical issues are not always within the teacher’s control, it is true that use of novel online tools can sometimes cause technical issues for students unfamiliar with the technology. It may be possible in the future to use software that students are more familiar with in order to overcome some of the technical issues. It was also clear from student feedback that attendance checking was not popular. Attendance at lectures are not compulsory in our university, however one of the voluntary assessment tasks required students to attend lectures. Attendance was therefore taken to insure that students received credit for their presence in the lecture. It is currently unclear how this limitation can be overcome. There may, however, be more efficient ways of taking attendance that would be

quicker and less cumbersome for students. It is also important to note that requiring students to attend the lectures would likely have affected performance and skill development, and could also have impacted on students’ decisions on whether or not to participate in the optional activities.

The interviews highlighted that the perceived workload required for this unit was considered high. This is true and is likely explained by the use of teaching methods aimed at achieving higher order thinking. We feel that this prepared the second-year students for the level of study required for their third-year units and also demonstrated the importance of developing effective organizational and time-management strategies. It has been previously shown that students are much more likely to follow a study schedule if the program they are studying is demanding in nature (Ford et al., 2015). It may, however, be possible to streamline some of the within-semester tasks so that they only need to be completed every second week. This would still ensure students are learning content and critical thinking skills throughout the course, but it may reduce the workload placed upon students. A greater focus on organizational and time management skills at the start of the semester may also be of benefit to the students in this cohort.

Limitations of the study should be noted. Firstly, this study represents only one unit in one discipline and can therefore not be considered representative of all tertiary contexts. We do, however, believe that the assessment approach can be applicable across disciplinary contexts, as higher order thinking skills are essential in all fields of study and are considered key employability skills. Secondly, it would have been useful to be able to determine which assessment choice the survey respondents had made, as this would have provided valuable insight into the students’ answers. Due to the anonymity of the survey, however, this was not possible in our study. Thirdly, data from the case study interviews cannot be more broadly applied due to the small self-selected sample size. The data from these interviews do, however, present an insight into the actual learning experiences of the students. Finally, future studies should examine whether students who had completed all four assessments performed better in the final exam of the unit. Our study showed that completion of all four assessments was associated with a higher overall grade. The reasons for this, however, are likely to be multi-factorial, influenced by various confounding factors including student competency and skill development in previous units. If the confounding factors could be controlled in future studies, this would provide further evidence that the process-focused tasks were effective in developing deeper thinking ability in students.

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Appendix

End-of-Semester Quantitative Survey

1. What grade did you achieve in this unit?
 - a) High Distinction
 - b) Distinction
 - c) Credit
 - d) Pass
 - e) Not passed
 - f) I prefer not to say, or I don't know yet because I'm doing the deferred exam

If answer = f, skip to question 3
2. Do you think your grade is a good indicator of your understanding of the unit?
 - a) Yes
 - b) No
3. Were you aware that the coursework assessment regime was flexible?
 - a) Yes
 - b) No

If answer = (b), skip to Q9
4. Which of the following best describes the effect of the coursework assessment regime being flexible had on your approach to studying the unit in the early to middle weeks of the semester?
 - a. It made no difference, I approached Critical Thinking, the first Coursework task, and Lecture Engagement in the same way I would have if the assessment regime was not flexible
 - b. Because the assessment regime was flexible and on the understanding they would improve my performance in the Coursework tasks and the exam, I made a special effort with the Critical Thinking and Lecture Engagement assessments
 - c. Because the assessment regime was flexible, I decided my time would be spent most effectively if I concentrated on the Coursework tasks, and paid less attention to Critical Thinking and Lecture Engagement
 - d. None of the above

If the answer is not (d), skip to Q6, else do Q5
5. Since you answered 'None of the above' to the previous question, would you like to comment on the effect flexibility had on your approach to studying the unit?
6. The coursework assessment regime being flexible means that your unit result was based on the exam (60%) and all 3 assessments (Critical Thinking 15%, Lecture Engagement 10%, and three Coursework Tasks 15%), or the exam (80%) and only the three Coursework Tasks (20%), whichever gave you the higher score. Approximately when, during the semester, did you first clearly understand what flexible coursework assessment meant?
 - a. Never, I did not understand that flexibility meant this
 - b. Early in the semester; between O-Week and Week 3
 - c. Between Week 4 and Week 7
 - d. Between Week 8 and Week 12
 - e. During the exam study period
7. To what extent did the fact the coursework assessment regime was flexible influence the result you achieved for the unit?
 - a. It was the main reason I did not do as well as I wanted
 - b. It was a significant reason I did not do as well as I wanted but not the main reason
 - c. It had no effect
 - d. It was a significant reason I did as well as I wanted but not the main reason
 - e. It was the main reason I did as well as I wanted

8. In theory, the introduction of flexible assessment is believed to encourage students to study more effectively. Now thinking back over the semester, to what extent do you approve of the idea of a coursework assessment regime being flexible?

- a. I now think the idea was a very good one
- b. I now think the idea was a good one
- c. I now think the idea was unimportant and pointless
- d. I now think the idea did not make sense
- e. I now think the idea was a very bad one

Skip to Q10

9. The coursework assessment regime being flexible means that your unit result was based on the exam (60%) and all 3 assessments (Critical Thinking 15%, Lecture Engagement 10%, and three Coursework Tasks 15%), or the exam (80%) and only the three Coursework Tasks (20%), whichever gave you the higher score. In theory, the introduction of flexible assessment is believed to encourage students to study more effectively. Now thinking back over the semester, to what extent do you approve of the idea of a coursework assessment regime being flexible?

- a. I now think the idea was a very good one
- b. I now think the idea was a good one
- c. I now think the idea was unimportant and pointless
- d. I now think the idea did not make sense
- e. I now think the idea was a very bad one

10. What improvements to the flexible coursework regime or the unit generally would have helped you perform better in this unit?

11. How many times have you undertaken this unit?

- a. Once only
- b. Twice
- c. 3 or more times

12. Are you happy to talk about your answers to these questions with a researcher who is not involved in teaching this unit? If so, please provide both your name and email address.