

## **e-Review Program: An alternative online interaction for a first-year unit of Engineering Mechanics using a virtual classroom**

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### **KEYWORDS**

Virtual classroom, e-review, graphics tablet, online interaction

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**Abstract** For large first-year units such as Engineering Mechanics 100, a lack of close interactive consultations between individual students and lecturers, and opportunities for weekly topic reviews precludes the enhancement of effective learning outcomes. Such drawbacks can lead to students' disengagement that ultimately results in their academic underperformance. This e-Review project investigated the effective use of an alternative flexible learning method in which the interactive online teaching tool *Elluminate Live* was combined with a visual-aid graphics tablet to conduct the weekly e-Review sessions and revisions of past-semester examination questions. As opposed to the conventional in-class review in unit teaching, the difference of the e-Review program lies in its convenient electronic access to unit revision activities through the monitoring of lecturers (as moderators) in a virtual classroom. It is shown that the use of *Elluminate Live* offers supplementary academic support that is beneficial to students through more direct feedback than can be achieved in a real class. Students also recognise the higher utility of e-Review materials that allow for subsequent viewing of recorded e-Review sessions.

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### **Background**

Engineering Mechanics 100 (EM100) is a core unit in the Engineering Foundation Year (EFY) program at Curtin University. The unit is taken by a large cohort of students, totalling over 300 at the Bentley campus, and some 180 at the Miri campus (East Malaysia) in each semester. There are three major unit assessment components including laboratory practical tests (30% weighting), in-class quizzes (20% weighting) and a final examination (50% weighting). Large-class lectures, a high student-to-staff ratio, and limited opportunities for individual interactions and feedback from lecturers inevitably impede the goal of effective teaching and learning outcomes. Additionally, time constraints, coupled with the need to cover an extensive range of mechanics topics, mean that students are not exposed to sufficient review of, or reflection upon, the lecture materials and topic revisions to meet their individual learning-development goals. The typical feedback mechanism by which students can be appraised of their progress is

through the in-class quizzes that are normally conducted for 10-15 minutes in their weekly tutorial classes with small study groups (typically 25 students). However, according to Curtin eVALUate (the student online learning feedback system) results (EM100 eVALUate USR, Semester 1, 2011 & EM100 eVALUate USR, Semester 2, 2011), EFY students reported that insufficient time was spent on completing the in-class quizzes. Additionally, late attendance due to a class swap from other campus venues and absences owing to sickness or family issues can also adversely impact on the self-evaluation of students' study progress though mark allowance is granted for legitimate absences in a student's overall assessment mark.

In order to remove all of the aforementioned barriers to effective learning encountered by EFY students, a supplementary virtual classroom for EM100 was set up with the aids of Elluminate *Live*, an online education tool, and a graphics tablet for the 2011 e-Scholar program. As participants in this e-Review project, EFY students enrolled at Bentley and Miri campuses in Semesters 1 and 2, 2011 were encouraged to use this sophisticated facility for the four-week Dynamics module (teaching weeks 7-10). Dynamics is the second section of EM100 in addition to Statics and Fluid Mechanics being the first and third teaching modules. The development of e-Review sessions was structured as a 'practice' or 'trial-run'. Accordingly, it was not made compulsory and students' participation did not attract any unit assessment marks. After the four-week trial period, an online survey of students' experience and views on the e-Review program was conducted via SurveyMonkey in which students' voluntary participation entered them into a prize draw.

## **Rationale**

The use of Elluminate *Live* to establish a virtual classroom is a potentially valuable addition to unit delivery in that it allows for peer-to-peer interactions and live consultations with lecturers that are likely to enhance personal motivation and self-development of students, and their flexible learning options unconstrained by the physical and timetabling obstacles to which traditional learning approaches are subject. More specifically, it was anticipated that the e-Review program would permit the step-by-step demonstration of unsolved worked examples, reviews of previous week's topics and entire module revision. There are missing components in large-lecture classes due to time constraints; neither can such components be covered adequately in the weekly quizzes that test basic Dynamics concepts. Ultimately, the successful conduct of this project would significantly enhance and encourage multi-faceted learning and mixed educational approaches in alignment with Curtin's blended and flexible learning developments.

## **Literature review**

Distance e-learning and online education have become a new delivery mode at tertiary educational level enabled by the advancement of current information technologies. To meet recent educational challenges encountered such as classes with large student

numbers, growing curriculum content (as knowledge and techniques inexorably advance), and limited face-to-face consultation time with lecturers, the introduction and use of functional e-learning platforms and tools are essential to achieve reciprocal benefits for students and lecturers.

Garcia et al. (2007) summarised the range of existing commercial platforms and tools for synchronous distance e-learning. Amongst all of these, Elluminate *Live* academic edition emerges as a very powerful and popular package in multi-media, many-to-many, collaborative, online education. Murphy and Ciszewska-Carr (2007) highlighted the needs to enhance student-student interactions using the two-way audio and direct messaging in Elluminate *Live*. By analysing the teaching strategy using both Elluminate *Live* and HorizonLive, Barron et al. (2005) found that 83.3% of students almost always felt more connected to others in their class and 75% felt almost always more connected to instructors. On the instructor side, their satisfaction rate with teaching with technology, in particular their experience with using Elluminate *Live*, was also quite high (60% for 'very satisfied' and 40% for 'satisfied'). Crofton et al. (2007) gave general guidelines on implementing Elluminate *Live* and tablet PC to deliver a hybrid course in the University of Kentucky-Paducah's Extended Campus Engineering Program. As a joint engineering program between the University of Kentucky and Murray State University, its virtual-class application facilitated lecture delivery via Elluminate *Live* and offered an alternative to commuting between different campuses required by the traditional teaching mode. The experience of a non-traditional student, attending lectures in mechanical and electrical engineering from work or home, has been compared with those of a traditional student attending on-campus lectures to assess whether Elluminate *Live* can serve as a substitute means of lecture delivery. The results suggested that Elluminate *Live* is an extremely effective resource as a supplementary tool to lectures, but could not completely replace the traditional dynamics of lectures. Fuller (2009) focused on student engagement in large classes using Elluminate *Live* in order to facilitate the provision of real-time interaction, collaboration and group meetings. A core subject within the Bachelor of Business at the Queensland University of Technology (QUT) with an average enrolment of one thousand students per semester in 2008 and 2009 used Elluminate *Live*. The survey was conducted based on sampling data of 75 students who participated in the *I have used Elluminate Live survey* and 108 students who participated in the *I have not used Elluminate Live survey*. Elluminate *Live* was found to be a more flexible means of accessing academic support with more than 90% student agreement. In this study participants also found Elluminate *Live* to be an overall satisfactory teaching tool with 96% student agreement, which helped 'more than expected' to improve student learning in the subject (80% student agreement).

### **Research objectives**

The purpose of this project was to evaluate the feasibility and usefulness of integrating Elluminate *Live* in combination with a graphics tablet as an online learning tool for the Dynamics module in EM 100. The detailed objectives of this project were to:

- Assess interactive/collaborative learning and usefulness levels of Elluminate *Live*;
- Determine the impact of an e-Review program on students' learning experience and outcomes in the Dynamics module; and
- Evaluate the online learning flexibility and helpfulness of recorded e-Review sessions.

## Project set-up and methodology

### Elluminate *Live* platform

Elluminate *Live* is one of the most readily used virtual-classroom software packages because the online teaching and learning environment requires just an internet connection and computer speakers (for receivers) as basic settings. From the moderator's point of view, it is a cross- platform web-based technology enabling the use of peripherals including a webcam, a microphone and a graphics tablet. The basic idea is to transfer face-to-face sessions from a physical environment to an online virtual educational environment for relatively small study groups as opposed to real large classes so that collaborative communication can be more efficiently established, thereby facilitating an enhanced student learning experience. A typical Elluminate *Live* interface is depicted in Figure 1, which shows four main built-in windows. The functionality of the Elluminate *Live* interface as used in the e-Review project is described as follows:

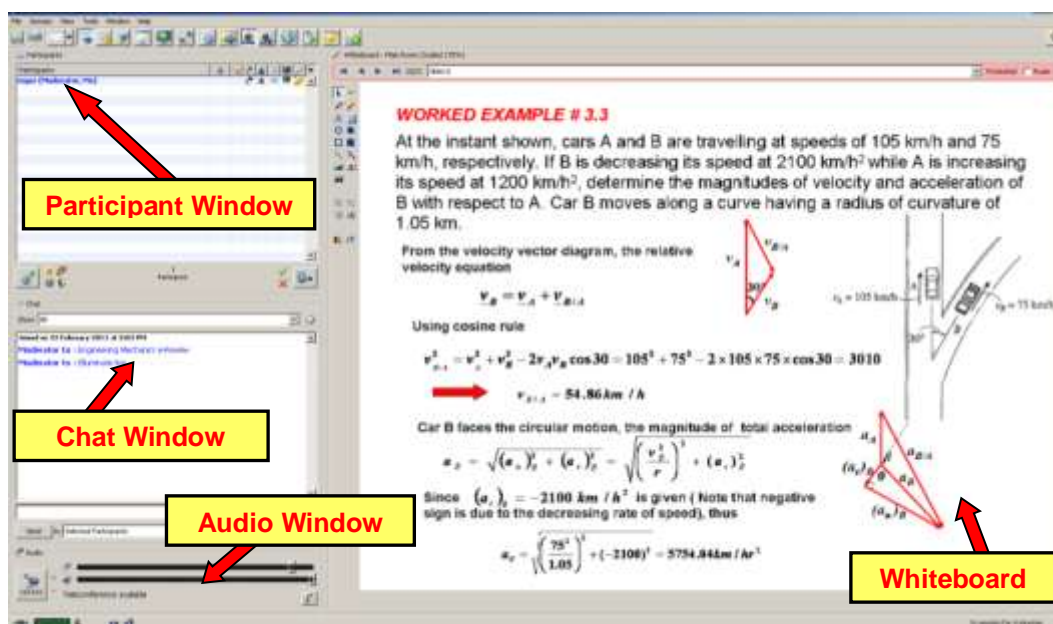


Figure 1: Four built-in window features on Elluminate *Live*

- **Participant window:** This window provides a list of all participants and moderators in the online session and indicates their current activities ranging from audio speaking, sending chat messages, entering texts for close-captioning, using the whiteboard drawing tools, graphing calculator, application sharing, video webcam and file loading features.

- **Chat window:** This window enables sending and receiving text messages directed to one participant only, selected participants, moderators and/or all participants. Messages could be filtered, time-stamped, printed and saved to track session communications.
- **Audio window:** This window is used for participants and moderators to converse with each other. Normally a microphone with built-in speakers or headset and a computer sound card are required.
- **White board:** This window is used to load PowerPoint presentations which can be annotated by moderators and/or students. In addition, moderators can draw figures/diagrams and write annotations on the white board with or without the use of a graphics tablet (Elluminate Live V 10 Moderator's Accessibility Guide, 2010).

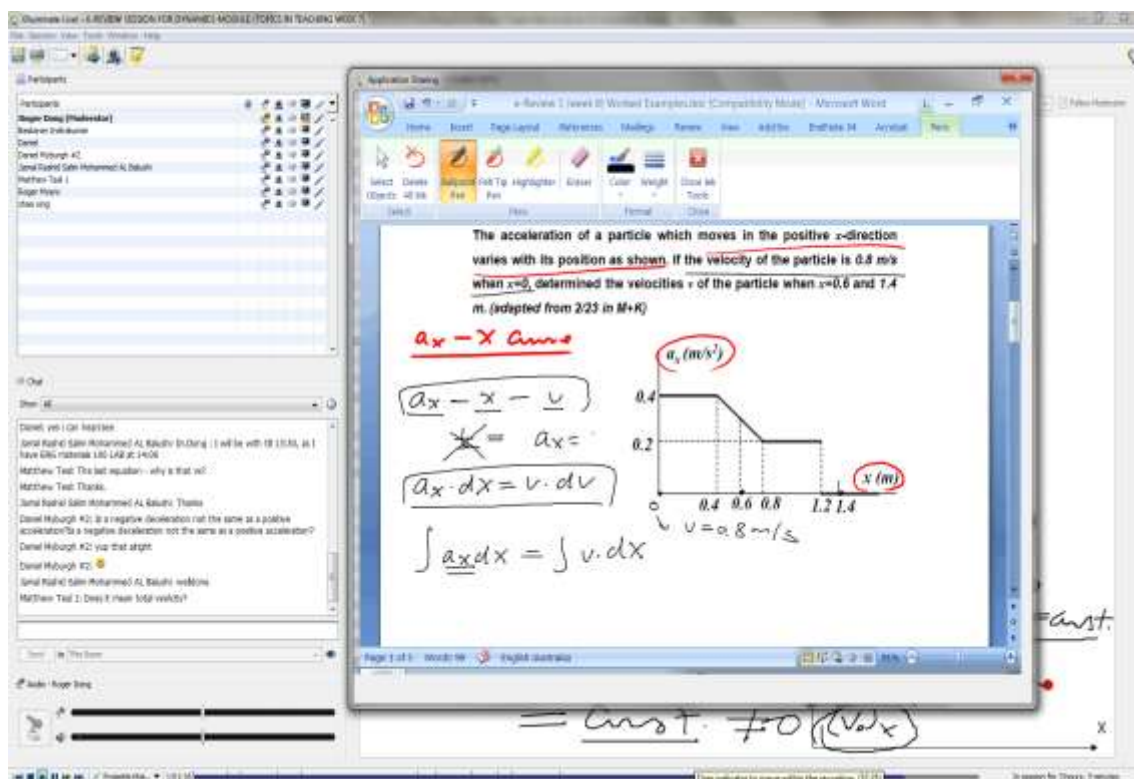


Figure 2: Application sharing an MS Word document on Elluminate Live

Other important features supported by Elluminate Live are a webcam function for moderators and participants to view one another during the initial introduction and question time as well as to display the contents in a pre-loaded MS Word, MS Excel or MS PowerPoint file during application sharing. The application-sharing feature was particularly important for demonstrating the Dynamics worked examples in a MS Word document with the utilisation of a graphics tablet, as is illustrated in a typical example in Figure 2. Furthermore, index recording and playback functions were enabled to help students unable to attend certain e-Review sessions to view recorded live sessions as many times as they wish.

Since Elluminate *Live* is integrated with Blackboard, the online learning management system at Curtin University, scheduling and set-up of the e-Review program was very simple as it is embedded within the unit's Blackboard site. Students were informed of the pre-arranged timetable of e-Review sessions in each semester via a Blackboard announcement. The direct link to each session was supplied to students as an alternative entry into sessions, if they experienced problems with logging into Blackboard. Firefox was the recommended web browser for reliable interface access owing to an integrated Java program used when running Elluminate *Live*.

### ***Graphics tablet***

A WACOM graphics tablet DTF-720 with a 17 inch LCD interactive pen display screen was employed to further enhance the e-Review program. A cordless and battery-free stylus pen with the support of WACOM Pen Tablet Driver was also applied to make annotations, draw diagrams and figures, and demonstrate worked calculations on the white board and in shared MS Word documents, respectively.

### ***Online questionnaires using SurveyMonkey***

A wide range of survey questions to assess the effective use of Elluminate *Live*, the impact of e-Review on learning outcomes, and the flexibility of e-learning as compared to traditional learning approaches were set up using SurveyMonkey, an online survey tool for creating, collecting and analysing data ([www.surveymonkey.com](http://www.surveymonkey.com)). The SurveyMonkey interface used in the e-Review project is shown in Figure 3. Ethical approval for the online survey was granted by the Curtin University Human Research Ethics Committee for Semesters 1 and 2 2011. All students ( $n = 431$  in Semester 1, 2011 and  $n = 516$  in Semester 2, 2011 at both Bentley and Miri campuses) were invited through a Blackboard announcement to complete this survey with a prize draw. However, only 3.5% ( $n = 15$ ) in Semester 1, 2011 and 5.4% ( $n = 28$ ) in Semester 2, 2011 responded. Considering the small group size (normally less than 20 students for the interactive communication) for the Elluminate *Live* sessions, it was still deemed worthwhile to perform an explicit statistical analysis of the survey data in this proof-of-concept study. Such analysis combined the data obtained from both semesters and mainly targeted EM100 students who either participated in e-Review program or viewed the recorded e-Review sessions.

Curtin University Exit this survey

e-Review Program Survey for Engineering Mechanics 100

20%

Thank you for taking the time to complete this survey on the e-Review program in the Dynamics module of Engineering Mechanics 100 by the School of Civil and Mechanical Engineering of Curtin University. Your feedbacks and comments are very important to us and will assist us in improving this teaching unit in the future.

The purpose of this survey is to investigate whether the e-review program using the virtual classroom via Elluminate Live has improved your blended learning experiences (motivation, engagement and understanding) in the dynamics module of Engineering Mechanics 100.

This survey should take less than 10 minutes to complete. Your answers will be completely anonymous and by filling out our survey you will be entered into a draw for a \$50 iTunes card. All results from this survey are confidential and will only be used for research purposes.

If you have any questions please contact Dr. Yu (Roger) Dong, Unit Coordinator for Engineering Mechanics 100 on (08) 9265 9055 or by email Y.Dong@curtin.edu.au

1. Please select your age range:

Under 21

21-30

31-40

41+

2. Do you agree or disagree with the following statement:

"The unit review of Engineering Mechanics 100 (including the past exam questions) by lecturers is important."

Strongly agree

Agree

Disagree

Strongly Disagree

Not applicable

3. Did you participate in the e-Review program for the Dynamics module of Engineering Mechanics 100?

Yes

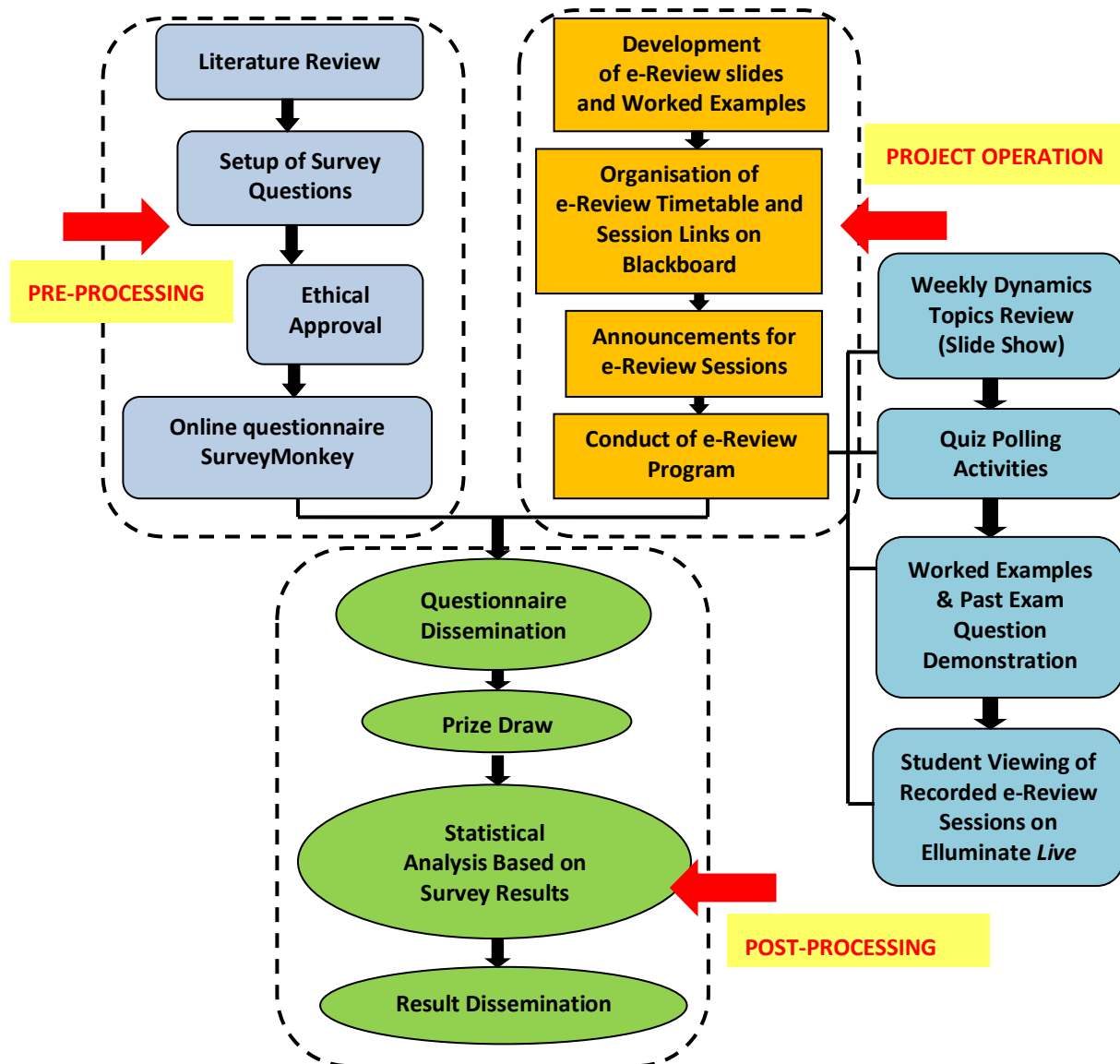
No

Figure 3: Online survey questionnaire using SurveyMonkey

## Project methodology

The e-Review program was conducted in two consecutive semesters in the 2011 academic year from April 20 to May 25 for Semester 1 and from September 7 to October 19 for Semester 2, utilising a project methodology that comprised the distinct phases of pre-processing, project operation and post-processing as detailed in Figure 4.

In the pre-processing step, an initial literature review relating to online learning via Elluminate *Live* was undertaken to inform the investigation, followed by the set-up of survey questions and document preparation for ethical approval, and completed by the establishment of the online questionnaire using the SurveyMonkey system. The questionnaire was designed to include 20 different types of questions ('single/multi-choice', 'level-ranking' and 'directly answered') with a main focus on the user-friendliness of Elluminate *Live*, enhancement of effective learning as a result of specific features on Elluminate *Live*, students' experience, and suggestions about the e-Review program. Students were advised that the anonymous survey would take approximately 10 minutes to complete. The first step was mainly completed by the project investigators prior to semester commencement.



**Figure 4:** Flowchart of project methodology

In the second step of the project, e-Review PowerPoint slides, simple quiz questions and worked examples associated with their detailed solutions were developed. Thereafter, the timetable (mainly scheduled in students' common free time from 12:30-1:30 pm on Wednesdays) and hyperlinks of e-Review sessions were set up using the Elluminate *Live* tab on Blackboard. These were further publicised via unit announcements on Blackboard and concurrently through email communication using students' accounts linked within Blackboard. The core component of the project's operation was the actual conduct of the e-Review program scheduled on a weekly basis from the Dynamics-module lecturer's office. This weekly component comprised the following activities:

- e-Review of previous week's Dynamics topics (including fundamental Dynamics concepts, theory and important formulae or equations) using PowerPoint slides;



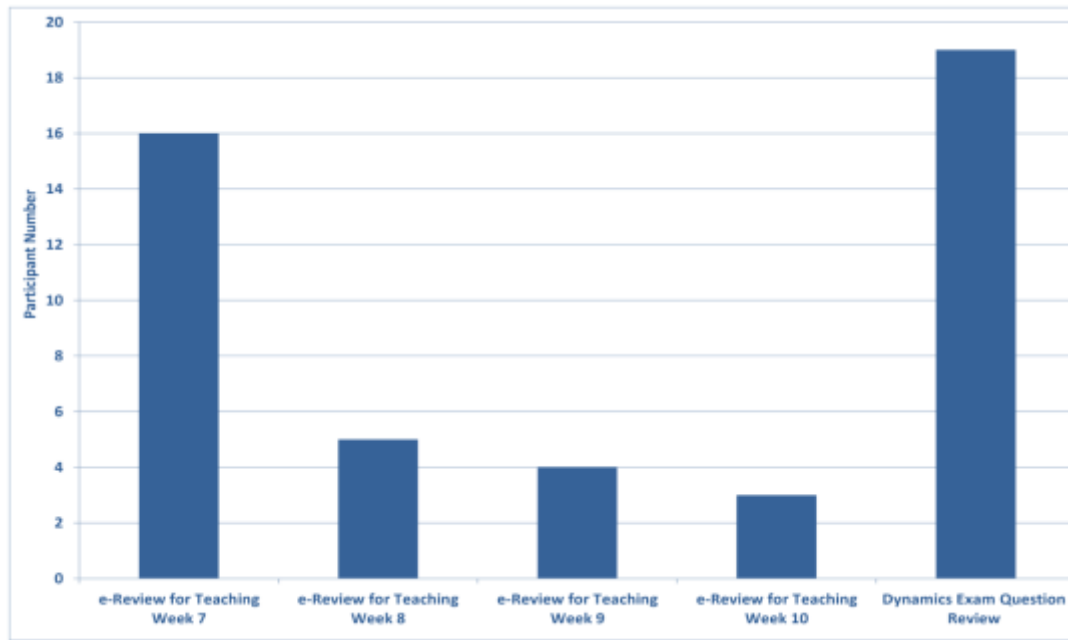
- Student polling activities using simple quizzes in either ‘Yes’ or ‘No’ or multi-choice format that permit students to self-monitor their study progress and understanding;
- Demonstration of fully worked examples (not shown in large-lecture classes) and past- semester examination questions (during study weeks) by using a graphics tablet in a live broadcast via the application-sharing feature on Elluminate *Live*;
- Invitation to individual students to raise questions or post live queries on the ‘chat window’ during/after e-Review and example work-out time, to get immediate clarifications and advice from the lecturer (in the role of ‘moderator’ on Elluminate *Live*); and
- Student viewing of playback videos of recorded e-Review sessions.

In the post-processing step, a Blackboard announcement was made inviting all EM100 students to use the hyperlink to access the e-Review online questionnaire on SurveyMonkey. Those who completed the survey were offered entry into a prize draw of an iTunes \$50 card. Statistical results were automatically generated in SurveyMonkey and replotted using MS Excel spreadsheets prior to their analysis and dissemination.

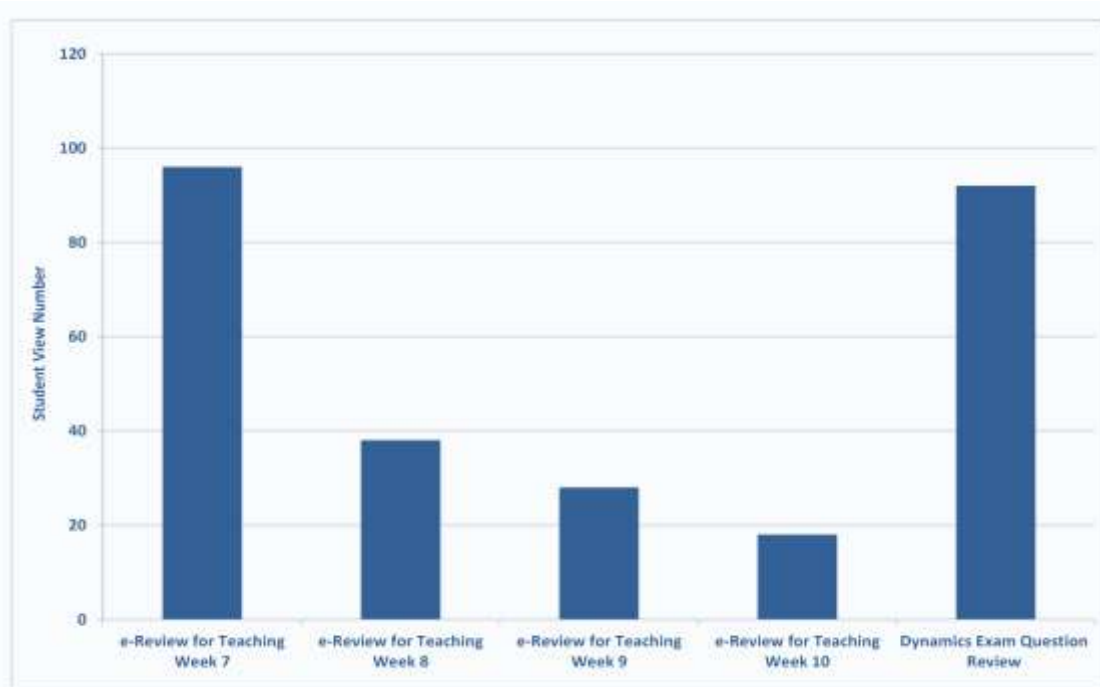
## **Results and discussion**

### *Participant number vs. view number*

Participant number in the e-Review program is an important factor for gauging the value perceived by students of using Elluminate *Live* as a live educational consultation tool. As observed from Figure 5, the overall participation was quite low being less than five students for teaching weeks 8-10. Nonetheless, relatively high numbers (about 16 and 19, respectively) were detected in the first e-Review session for teaching week 7 and Dynamics examination-question review at the end of semesters. For the former, the high numbers could be attributed to initial interest and the curiosity of students to try out a new and flexible online learning system. The latter peak in participant number may be due to an examination-focused student mindset towards the end of semesters when working on unit revision to prepare for the final examination. Students tended to lose interest or might have been distracted by other unit activities or part-time work during the second, third and fourth e-Review sessions as evidenced by a relatively small participant number. Overall, it appears that the students had greater enthusiasm and self-motivation in their initial attempts but then failed to maintain steady learning habits.



**Figure 5:** Participant number in e-Review program



**Figure 6:** Student view numbers in e-Review program

Like the iLecture system deployed at Curtin University, the view number after recording the e-Review sessions is equally important since this factor can reflect indirect student participation in the program, especially for those who were unavailable during the live consultation sessions held at the same time every week. The counting of view numbers is based on two major criteria comprising the elimination of students with “uninitialised” status (i.e. ‘login fails’) for Elluminate *Live* access and number adjustment for those with multiple login accesses over short periods of time (i.e. treated as one login only) in order

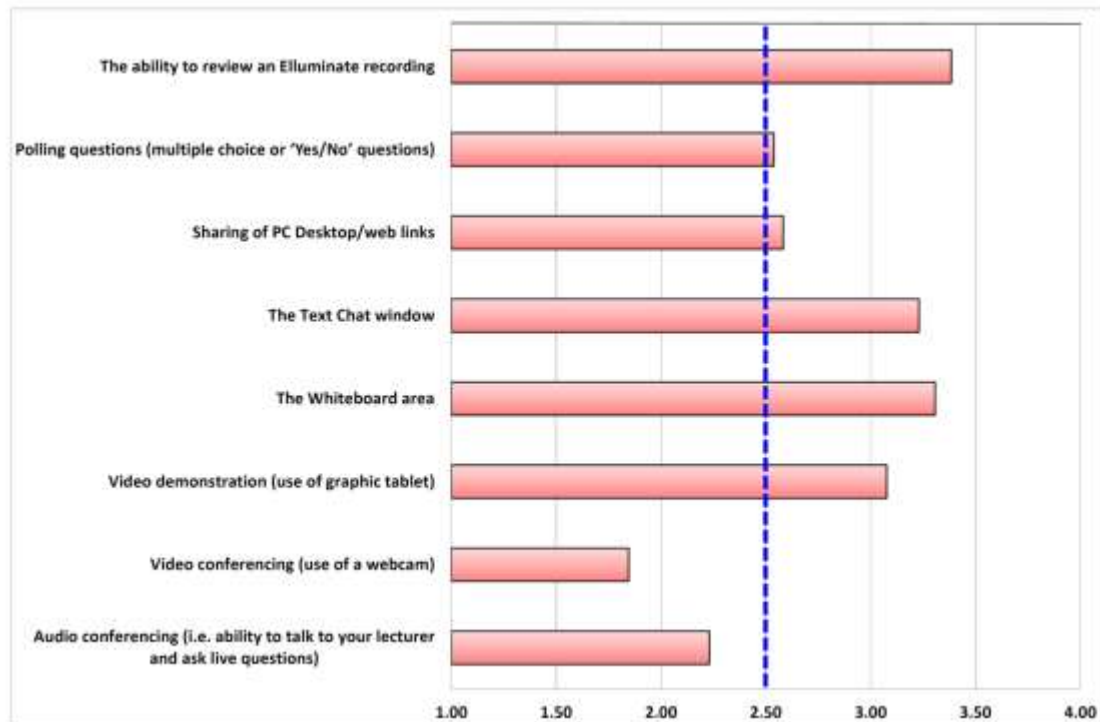
to obtain accurate data for interpretation. As a whole, the view numbers shown in Figure 6 are far higher than the participation numbers seen in Figure 5. This implies that students preferred to view playback e-Review sessions rather than participate at designated time slots. More expectedly, significantly higher numbers of 96 and 92 are seen for the first e-Review session and Dynamics examination-question review, respectively, which resembles the live-participation trend of Figure 5. Additionally, the total view numbers for both semesters monotonically decreased from 38 to 18 between the second and fourth e-review sessions. As a result, viewing the e-Review sessions to play back the recorded lecture sessions, has made a more predominant impact on the attraction of students' study interest.

### ***Survey results***

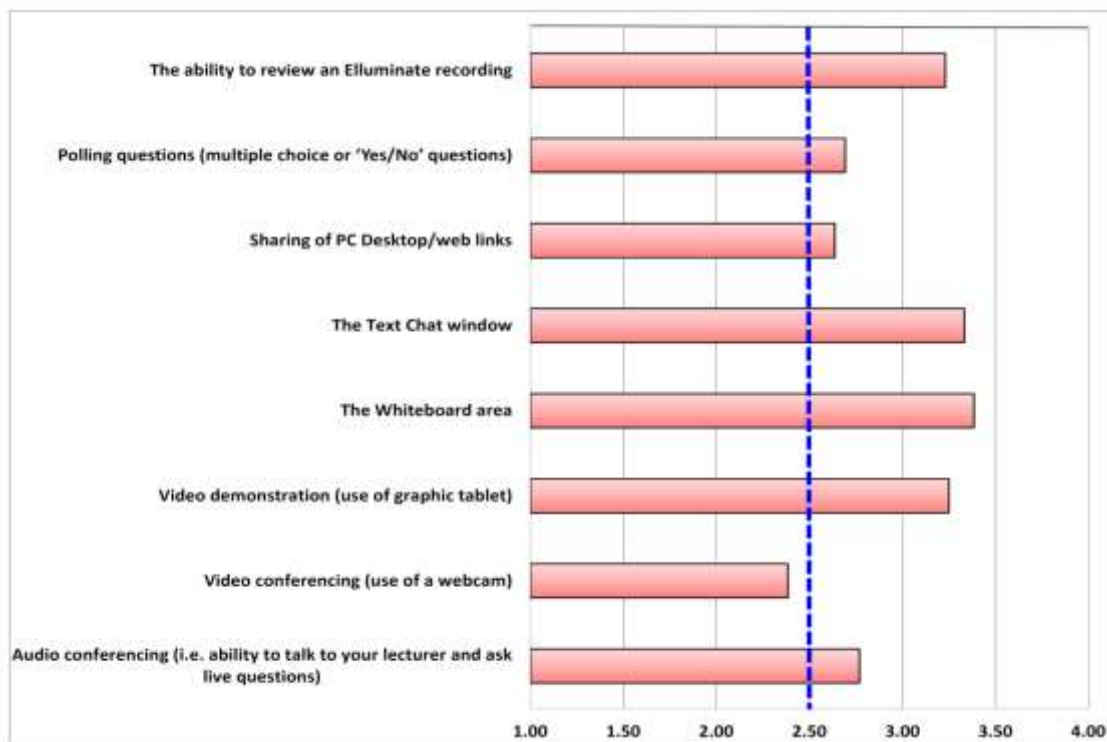
Of the overall survey responses on the SurveyMonkey system, over 86% of the 22 students for both semesters (including 'agree' and 'strongly agree') realised the importance of unit review in EM100. This was the factor that had motivated the introduction of present e-Review program as compensation for the lack of in-class reviews of the Dynamics module owing to time constraints imposed by the need to cover a wide range of topics. This finding confirms that students are still very keen on a 'closed loop' teaching strategy of 'lecture delivery-to-lecture review'.

In terms of learning flexibility, students tended to participate in the e-Review sessions in multi-locations at both university and home (none in the workplace). The predominance of participation from home is clearly evident with 62.5% of 16 students as opposed to 37.5% in the university. This might suggest that students are more keen to be engaged with Elluminate *Live* outside their scheduled lectures and tutorials since additional comfort and convenience could be offered at home. The other point worth noting is that Elluminate *Live* enables those students absent from lectures and tutorials due to family or medical matters to access the live consultations and view the recorded e-Review sessions as attending students. This advantage is unique to online learning with more study freedom and flexibility relative to traditional learning in which attending lectures or tutorials is the only means to attain first-hand information on unit contents and participate in learning activities.

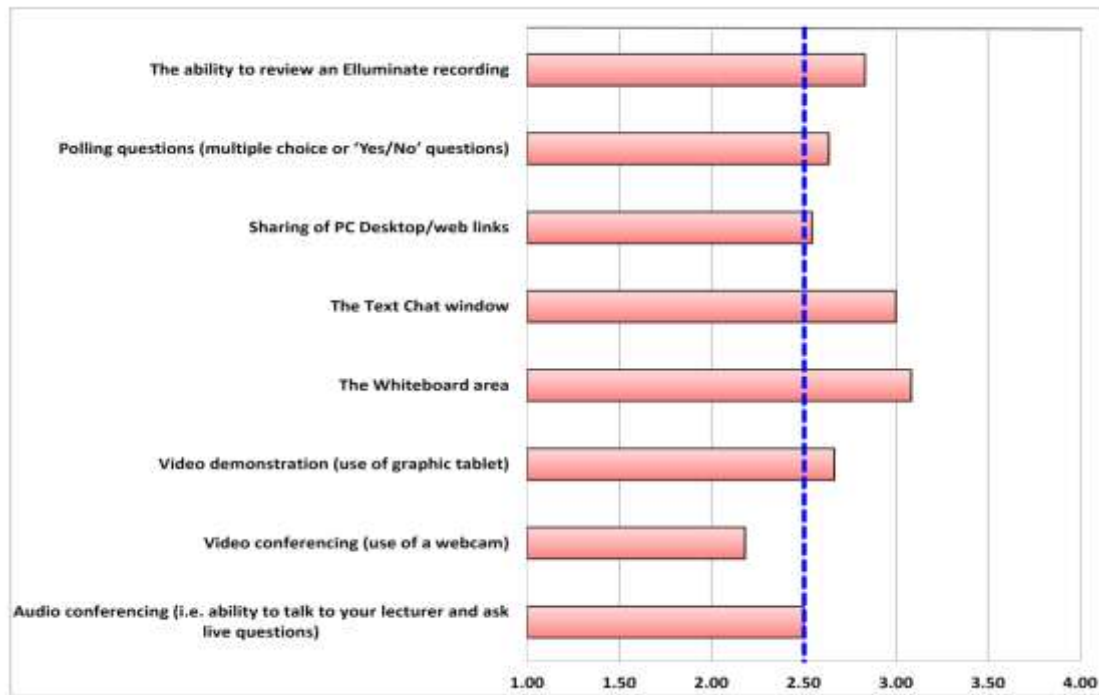
The effectiveness of Elluminate *Live* features on the three enhanced learning aspects including 'interactive learning', 'collaborative learning' and 'a sense of learning community' were investigated with the results shown in Figures 7-9. Given that the scale threshold of 2.5 between agreement and disagreement levels for the positive feature impacts, 'the ability to review an Elluminate recording', 'text chat window', 'white board area' and 'video demonstration (use of graphics tablet)' were ranked as the four most favoured features. In particular, 'video demonstration (use of graphics tablet)' is found to have great potential as an effective visual aid, better facilitating both interactive and collaborative learning.



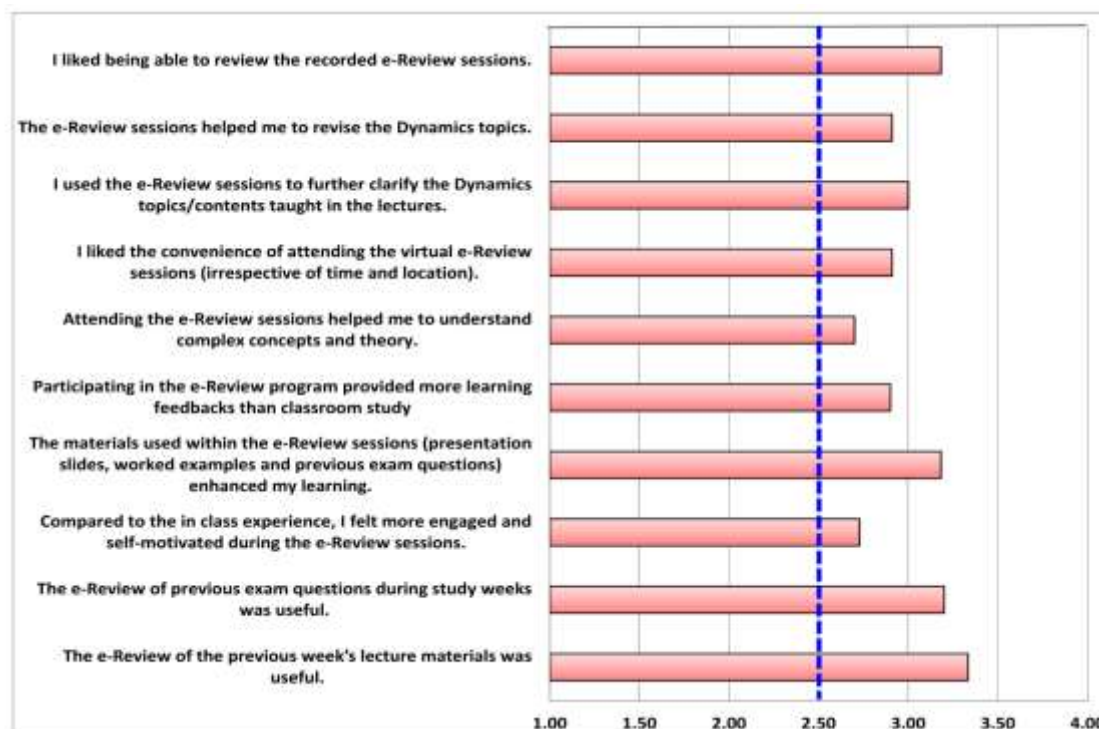
**Figure 7:** Average agreement levels of interactive learning using Elluminate *Live* features in e-Review program (total response numbers n=13 for both Semesters 1 and 2, 2011 and 1=Low to 4=High for the agreement level). The dashed line represents the scale threshold of 2.5 between the agreement and disagreement levels.



**Figure 8:** Average agreement levels of collaborative learning using Elluminate *Live* features in e-Review program (total response numbers n=13 for both Semesters 1 and 2 2011 and 1=Low to 4=High for the agreement level). The dashed line represents the scale threshold of 2.5 between the agreement and disagreement levels.



**Figure 9:** Average agreement levels of a sense of learning community using Elluminate *Live* features in e-Review program (total response numbers n=12 for both Semesters 1 and 2 2011 and 1=Low to 4=High for the agreement level). The dashed line represents the scale threshold of 2.5 between the agreement and disagreement levels.



**Figure 10:** Average agreement levels of student learning experience in e-Review program (total response numbers n= 12 for both Semesters 1 and 2, 2011 and 1=Strongly disagree, 2=Disagree, 3=Agree and 4=Strongly agree). The dashed line represents the scale threshold of 2.5 between the agreement and disagreement levels.

Student learning experiences in the e-Review program are reported in Figure 10 with the same threshold level of 2.5. The opportunity to view the recorded e-Review sessions, enhanced e-Review learning materials and the usefulness of both previous weeks' lecture materials and past semester examination questions are the most noteworthy aspects of program participation. Since the virtual class is a relatively new concept to most of EFY students as compared to the traditional real-lecture teaching, it may take quite some time for students to become comfortable with this online teaching and learning approach, especially for those who instinctively prefer the face-to-face interactions and in-person feedback.

### ***Typical student testimony***

Further qualitative insights of student perceptions of Elluminate *Live* as a pedagogical tool are presented here. These comprise typical student comments gathered from various sources obtained through Curtin eVALUate reports (note that USR=Unit Survey Report and TER=Teacher Evaluate Report) and online survey questionnaires:

#### **Usefulness of the e-Review program**

*“e-quizz, e-review and lab are excellent.”* (EM100 eVALUate USR, Semester 1, 2011)

*“The live e-review sessions were really helpful. Great way to sum up certain concepts and apply them to questions.”* (EM100 eVALUate USR, Semester 1, 2011)

*“e-Review sessions are very useful!”* (EM100 eVALUate TER for Yu Dong, Semester 2, 2011)

*“The examples and Elluminate are very useful.”* (EM100 eVALUate TER for Yu Dong, Semester 2, 2011)

*“Elluminate has been a very useful tool this Semester....”* (EM100 eVALUate TER for Yu Dong, Semester 2, 2011)

*“e-Review was extremely helpful and the delivery pace was far better than in the lectures.”* (Online survey questionnaire report via SurveyMonkey, Semester 2, 2011)

These comments endorsed the implementation of Elluminate *Live* in the e-Review program as a helpful online-assistive educational tool to recap fundamental Dynamics concepts and apply them to the worked examples. The better delivery pace in the e-Review sessions is also acknowledged by students as a welcome balance to the pace of the lectures.

#### **Expansion of the e-Review program to other modules**

*“I found the e-Review aspect extremely helpful. I think it should be done in Statics and Fluid Mechanics as well.”* (EM100 eVALUate USR, Semester 2, 2011)

*“The most helpful part so far was the Dynamics module only. The questions done during the lectures and the Elluminate are very helpful. Would really be useful for Statics as well.”* (EM100 eVALUate USR, Semester 2, 2011)

*“If at all possible, please introduce the e-Review sessions for Statics and Fluids!”* (EM100 eVALUate USR, Semester 2, 2011)

*“Please add e-Review to Statics as well if possible.”* (EM100 eVALUate TER for Yu Dong, Semester 2, 2011)

*“Please extend it to the whole unit-there may not be time to review Fluid Mechanics but the option to review Statics would have been very helpful.”* (e-Review online survey questionnaire report via SurveyMonkey, Semester 2, 2011)

In addition to the students’ positive feedback on the e-Review program for the Dynamics module, students suggested (in the above comments) the expansion of the e-Review program to include the Statics and Fluid Mechanics modules. This point reveals that students have recognised the important role that an e-Review program can play as a supplementary study activity that could benefit all of the taught components in Engineering Mechanics 100.

## **Conclusions**

This chapter has reported on the applicability and potential of Elluminate *Live* for conducting an e-Review program in the Dynamics module of Engineering Mechanics 100, a large-class first-year unit taken by all Engineering students. The statistical data on what was voluntary participation and subsequent viewing of recorded sessions suggest that those students who participated tended to favour the use of the recorded e-Review session over personal participation in the live consultation. Higher participation and viewing number were noted for the first e-Review session probably due to student curiosity about a new teaching and learning technique, and for the last sessions where past-semester examination question reviews were conducted, reflecting students’ assessment-oriented outlook. It was also shown that the Elluminate *Live* platform could contribute to increased flexibility in the learning environment because students predominantly chose to participate or view the e-Review sessions at home.

With respect to the capability of Elluminate features, ‘the ability to review an Elluminate recording’, ‘text chat window’, ‘white board area’ and “video demonstration (use of graphics tablet)” were ranked very highly by students in terms of ‘interactive learning’, ‘collaborative learning’ and ‘a sense of learning community’. This demonstrates that students who participated in this study endorsed the use of Elluminate *Live* as an interactive virtual classroom and appreciated the alternative approach that supplemented the traditional learning approaches. The positive learning experiences of students with Elluminate *Live* are also noted as evidenced by their commendations on the recorded e-Review sessions and usefulness of e-Review materials.

However, there are also limitations to the robustness of these findings owing to the low number of participants as seen by the small sizes of student groups in the live e-Review sessions and those who chose to respond to the online survey. Accordingly, the results discussed herein should not be generalised but are better treated as a typical case study. Higher sampling data numbers have to be obtained and analysed in order to build confidence in the interpretation of the results presented here.

From student testimony, the expansion of the e-Review program to the Statics and Fluid Mechanics modules is recommended to yield a review mechanism for the complete unit that would benefit student-attainment of the unit's overall learning outcomes. To encourage student participation in such a teaching modality, it may be necessary to introduce this e-Review program as a formal unit activity, perhaps attracting participation marks, and an integrated mechanism for providing practical feedback and valuable advice to students; a similar strategy has been found necessary to ensure traditional tutorial attendance in the unit. An extension of present work is a follow-up of participating students to find out why they used the e-Review program and how their assessment marks were influenced as a result of the e-Review participation.

## Acknowledgements

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