

Enhancing Student Engagement and Active Learning through Just-in-Time Teaching and the use of PowerPoint

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This instructional article is about an innovative teaching approach for enhancing student engagement and active learning in higher education through a combination of just-in-time teaching and the use of PowerPoint technology. The central component of this approach was students' pre-lecture preparation of a short PowerPoint presentation in which they answered a few general conceptual questions about the coming lecture topic. The power of PowerPoint, it is argued, is about structuring student thought and student engagement before and during lectures, as well as giving students more power to be involved to shape content and interactivity of university lectures. The article concludes with some valuable lessons and pointers for course instructors across disciplines about the pedagogy and use of PowerPoint as an instructional method for enhancing student engagement and active learning.

This instructional article describes an innovative approach for encouraging student engagement and active learning in undergraduate courses in higher education through the use of PowerPoint, a relatively "old" and widely used technology in teaching and learning in higher and other forms of education. As much research has shown, the role of technologies, in particular in blended and online forms of teaching and learning, is critical for student engagement and active learning in today's higher education learning environments (Dunn, 2011; Garrison & Kanuka, 2004; Oblinger & Oblinger, 2005). With new technologies such as social media, blogs, wikis and e-portfolios (Wankel & Blessinger, 2012a, 2012b), there are a myriad of different ways to motivate and help students to engage with their peers, their teachers and the course material. The "Net Geners [Generation]" of students want from learning technology and technology-enhanced learning that it is flexible in delivery, relevant to the course work and learning objectives, and interactive (McNeely, 2005, para 4.7, 4.9).

The technology enhanced teaching and learning approach outlined here was borne from the knowledge and experience as a university educator that 1) student want interactivity and active learning, and (2) that learning is shifting from teacher to more student-centered approaches, which means a shift in pedagogies to constructivist teaching practices. In this context, I was wondering how I could use PowerPoint, a technology, which is familiar to both teachers and students and even expected by students for lecture presentations, to promote student engagement with course content and make lectures more interesting, student-centered and interactive. The idea behind this approach was to enhance student engagement with course material before, during and after the lecture through PowerPoint rather than presenting in lectures my own PowerPoint slideshow about the topic and providing the students with a copy afterwards or

beforehand on the University's learning management system (LMS). In other words, PowerPoint was used not to enhance the lecture presentation but to enhance student engagement in preparation for the lecture and for interactive lecture activities. As McNeely (2005, para 4.9) rightly states, any "faculty member who uses PowerPoint in a lecture [just for the presentation] is not using technology interactively."

This article will begin with the theoretical background and pedagogical principles about student engagement, active learning and just-in-time teaching (JiTT), which forms the basis of the teaching approach using PowerPoint, described here. After that, the article will outline the method and the findings of this instructional method, which can be used by teachers/instructors in any discipline in the higher education sector. The article concludes with some valuable lessons and further points for using this instructional method for teachers/instructors.

Theoretical Background: Student Engagement and Active Learning

Student engagement has emerged as one of the principal cornerstones and objectives of teaching and learning in the higher education systems around the world (Shaun & Quaye, 2009). The concern with student engagement in higher education is nothing new as "university educators have always had a core interest in understanding and managing students' engagement in effective learning" (Radloff & Coates, 2009, p. 9). But with globalization, increasing internationalization of curricula and more student-centered and constructivist educational pedagogies, the focus is more than ever on understanding and improving student engagement and, with it, the student experience and student outcomes. As the Australian Council for Educational Research (ACER, 2012) noted in a recent media release, "student engagement is key to staying

competitive" in an increasingly global market of higher education where raising educational quality is the central determinant for universities succeed in that market. In this context, student engagement and educational quality become increasingly linked (Coates, 2008, p. 34).

The growing focus on student engagement can also be seen in efforts to measure student engagement at universities so that student engagement and, with it, student experience and student learning outcomes can be improved. The National Survey of Student Engagement (NSSE) is conducted annually in the USA since 2000, and it has been a leading example for other countries' efforts in this field. The Australasian Survey of Student Engagement (AUSSE) is run every year by the Australian Council for Education Research (ACER), an independent not-for-profit organisation, since 2007. These surveys try to incorporate various dimensions of student engagement. The AUSSE measures six areas of Australian university education: 1.) Academic challenge, 2.) Active learning, 3.) Student and staff interactions, 4.) Enriching educational experiences, 5.) Supportive learning environment and 6.) Work integrated learning (Radloff & Coates, 2009).

These different dimensions of student engagement highlight the complexity of improving student engagement and for defining student engagement in a comprehensive way. The Australasian Student Engagement Report 2008 defines student engagement as "students' involvement with activities and conditions likely to generate high-quality learning" (Coates, 2008, p. 1). Astin (1984, p. 297) defined student engagement as "the amount of physical and psychological energy that the student devotes to the academic experience." These definitions put the onus of engagement on the student and not the educational institutions to be involved with the "activities and conditions" at their higher education institutions, leaving out all other dimensions and the fact that learning to a large degree takes place outside structured learning and classrooms. In contrast, Kuh's (2009, p. 683) definition of student engagement tries to combine the individual and institutional factors of student engagement: "student engagement represents the time and effort students devote to activities that are empirically linked to desired outcomes of college *and* what institutions do to induce students to participate in these activities." It is clear that there is "compelling" evidence that enriching the experiences and academic challenges for students is the most successful strategy for engaging them (Zepke & Leach 2010, p. 171).

I do not intend to go into the debates about the responsibilities of students and universities for effective, equitable and inclusive student engagement. My position is that it is ultimately the responsibility of universities and lecturers/course coordinators to provide

stimulating and engaging learning environments for students. Other work about student engagement also takes this position (e.g. Harper & Quaye, 2009; Smith, Sheppard, Johnson, & Johnson, 2005). What is clear, however, is that in the context of globalization and internationalization of education, mentioned earlier, the institutions themselves have to play a greater role than previously for providing the right learning environment for student engagement. Times have changed from when students had to adjust to the learning environment provided; in the globalized world of education the learning environment has to adjust to the diversity of students and their needs to acquire a wide range of skills (Harper & Quaye, 2009). In this more complex and globalized world of higher education in the 21st century, the goals of student engagement have evolved from prevention of student dropout, which is still an important criterion for engaging students, to achieving better learning outcomes and academic success, improving the student experience and creating lifelong learning attitudes and skills (Christenson, Reschly, & Wylie, 2012). Student engagement and active learning are increasingly seen as a prerequisite for effective and meaningful learning and achieving many academic and other outcomes, such as better critical thinking skills, openness to diversity, and growth in leadership and other job related skills (Miller et al., 2011; Smith, Sheppard, Johnson, & Johnson, 2005).

Student engagement and active learning are closely linked. The benchmarks for the Australian and US National Survey of Student Engagement, as stated above, hence include active learning as an important instrument and dimension of student engagement. Active learning can be defined as "the extent to which students are involved in experiences that involve actively constructing new knowledge and understanding. Engaging students in these forms of learning is at the heart of effective educational practice" (Radloff & Coates, 2009, p. 17). The following section will further explore the pedagogical principles, which have informed my approach of using PowerPoint for the promotion of student engagement and active learning.

Pedagogical Foundations: Just-in-time Teaching (JiTT) and PowerPoint Pedagogy

Lectures remain the dominant form of teaching at universities. Because of their long tradition and entrenched position in academia, their ease and efficiency of presentation, and institutional inertia and personal habits, lectures are "likely to remain a major part of traditional Higher Education for the foreseeable future, regardless of the arguments against them" (Huxham, 2005, p. 18). However, the traditional, didactic, teacher-centered lectures are increasingly

challenged by student demands for more engaging, interesting and interactive lectures. Keeping up lecture attendance at universities, despite research showing overall a positive correlation between lecture attendance and academic performance (Clark, Gill, Walker, & Whittle, 2011; Huxham, 2005), is a growing challenge for universities and lecturers. With lecture recordings provided in learning management systems (LMS), more and more online or blended learning (combination of online and face-to-face teaching and learning) options in courses, and student being subject to other pressures, such as work commitments, they make increasingly more deliberate decisions about the value of attending lectures (Billings-Gagliardi & Mazor, 2007; Clark, Gill, Walker, & Whittle, 2011). In my own experience, lecture attendance has dropped in my courses over the last few years, which is due—as reflected in formal student evaluations at the end of my courses—not because of the quality or content of the lectures or the style of my lecturing, but because of more intense study workload and outside study requirements such as paid work and/or family demands. The answer to reverse low lecture attendance, it seems to me, is not to replace lectures with online lectures or other online activities, but rather to use a blended learning approach which makes the face-to-face time more interesting, engaging and valuable for students. In general, students will make an effort to go to lectures as long as they can see the benefits for their own learning.

One approach of making lectures more engaging and interesting and giving students more involvement with lecture and lecture content is Just-in-Time Teaching (JiTT), developed by Novak and Gavrin (Gavrin, 2006; Novak, Patterson, Gavrin, & Christian, 1999; Novak, 2011). It is an approach that “encourages students to be well prepared for class” and promotes active learning during class time (Gavrin, 2006, p. 9). Although the implementation of JiTT pedagogy varies from discipline to discipline and the individual teaching approaches of instructors, it follows certain steps to make lectures more interactive and relevant to students’ knowledge and to achieve active learning by students (Simkins & Maier, 2010). The pedagogical strategy of JiTT is based on feedback loops between teaching and learning and between outside classroom and face-to-face classroom activities (Novak, 2011, p. 65). Students prepare for class through web-based “warm up” exercises, which then affect the content and interaction during class time. Warm-up preparatory work can be designed differently by the lecturers, comprising, for example, reading of provided text, short essays, quizzes or review of videos, but generally “asks students to answer several open-ended, conceptual questions about the material that the instructor will discuss in class” (Garvin, 2006, p. 9).

Students are expected to develop answers to the question by themselves. It is a key feature of JiTT that

students “read and consider new ideas before coming to class. As a result, they are far better prepared” (Garvin, 2006, p. 11). The work or assignment is submitted prior to the face-to-face delivery of the lecture. The JiTT classroom or lecture is linked to the preparatory work by the students, as the lecturer views the exercises or assignments (e.g. a pre-class quiz) and adjusts the lecture content and activities accordingly by using the pre-class student material for discussion or short in class exercises, and by concentrating on identified misconceptions or gaps in knowledge. The warm-up exercises provide insights to what students understand or not, where there are misunderstandings, and with what they are struggling.

In the lecture, the students will most likely be exposed to PowerPoint as this technology is ubiquitous as an instrument for lecture presentations. Because of its pervasiveness and importance in higher and other forms of education, PowerPoint pedagogy has been subject of much research (Adams, 2006; Brock & Joglekar, 2011; Clark, 2008; Konukman, Rabinowitz, Kernodle, & McKethan, 2010). Others before me have asked the question about what the power of PowerPoint really is (Craig & Amernic, 2006; Rose, 2004)? Is there any power to the points made in PowerPoint; is PowerPoint leading to “death” by bullet/powerpoints; or is it an “evil” instrument that stifles effective and engaging teaching and learning (Tufte, 2003)?

Like all learning technologies, PowerPoint has advantages and disadvantages and is not by itself a good or bad thing (Weimer, 2012). There is inconsistent evidence that PowerPoint significantly improves student learning and results in better grades (Craig & Amneric, 2006, p. 150; Hill, Arford, Lubitow, & Smollin, 2012, p. 243). However, it remains the preferred method of lecture presentations for students (Amare, 2006; Clark, 2008; Hill, Arford, Lubitow, & Smollin, 2012), and students believe that PowerPoint facilitates their own learning and better retention (Apperson, Laws, & Scerpansky, 2008). Students’ perception of the utility of PowerPoint for learning, however, is much lower than that of teachers (James, Burke, & Hutchins, 2006). Students see the benefits of PowerPoint for content comprehension and exam preparation (Hill, Arford, Lubitow, & Smollin, 2012). Teachers like it for the ease to present material and the structure it provides to their presentation, but many are ambivalent about it as it has advantages as well as many disadvantages (Brock & Joglekar, 2011; Hill, Arford, Lubitow, & Smollin, 2012).

Critics of PowerPoint (Adams, 2006; Fendrich, 2010; Simons, 2004; Tufte, 2003) view it as an impediment for promoting interactive lectures and student engagement with each other and the material. PowerPoint, they argue, reduces creativity and spontaneity in classrooms, making students more

passive spectators than participants; encourages linear thinking with little room for flexibility and improvisation by lecturers for exploring other material than the ones set out in the PowerPoint presentation; promotes oversimplification and generalization and homogenizes knowledge rather than stimulating critical explorations of concepts and their relationships. The reliance on PowerPoint, these critics argue, facilitates a one-directional, presenter-centred classroom with a passive audience with more emphasis on entertainment than education. Many of these criticisms are valid and have stimulated research and educational change to improve PowerPoint pedagogy. Research has shown that it depends ultimately on the lecturer/presenter and her/his teaching pedagogies and presentation skills whether these negative points of PowerPoint play out in the learning environment or not. The critical issue is not whether instructors use PowerPoint or not, but *how* they use it and how they encourage active learning in the classroom (Cherney, 2011; Gier & Kreiner, 2009). As Clark (2008, p. 43) argues, "the greatest variable rests with the teacher, who can use the technology in pedagogically exciting ways, even in a lecture."

In my courses I use PowerPoint for delivering my lectures because it helps me to structure content and presentation. For me, the way to achieve interactive lectures is not to get rid of PowerPoint, but rather to use it more effectively for student engagement and active learning. Similarly to Clark (2008, p. 40), who was wondering how PowerPoint can be "used effectively to support a more constructivist pedagogy," I was asking myself how I can use PowerPoint, a technology which students are familiar with, to encourage more active learning and student engagement with the content material? I guess I am one of the lecturers who is heeding the call by others to avoid the "tyranny of PowerPoint" by experimenting "with different possibilities and [try to] discover new potentials" (Gabriel, 2008, p. 271) and working with "PowerPoint's potential to improve teaching and promote learning" (Weimer, 2012).

My concern was not to make my PowerPoint presentation and lecture more stimulating, interesting and engaging, or more "populist," as Schrad (2010) suggests, through the incorporation of images, audio and video clips, pop culture references, websites and humor. I have done that with my PowerPoint presentations, but from my experience it does not, as claimed by Schrad (2010), lead to increased lecture attendance and student learning. I am also concerned with maintaining the traditional, one-way, teacher-dominated, non-interactive lecture, even if the lecture is made more "populist" by making PowerPoint more interesting, as well as more useful for more engaged

learning with the lecture through complementary handouts or content-specific questions (Konukman, Rabinowitz, Kernodle, & McKethan, 2010).

In contrast to these approaches, I wanted to encourage student engagement with the content material through the use of PowerPoint as a learning tool *before* and not just during the lecture. Linking JiTT pedagogy with the 'old' technology of PowerPoint seemed to me an exciting idea, which stimulated the teaching method outlined in this article.

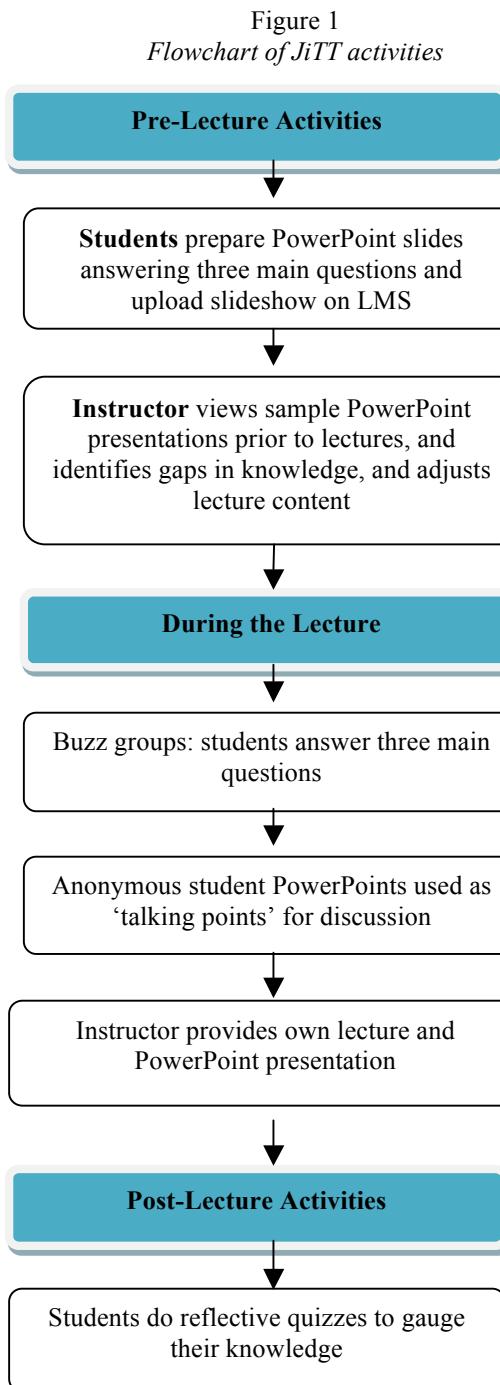
Teaching Method: JiTT and PowerPoint

The innovative teaching method of using PowerPoint for enhancing student engagement, and active learning was used in an undergraduate course at university level in Australia. The course is convened by the author and consists of two lectures (50 minutes long) and one 50 minute tutorial each week for a 12-week-long semester. Lecture attendance is not compulsory and not monitored, and all lectures are audio/video recorded and provided after the lecture on the University's learning management system (LMS) for the course. This new teaching approach was done in 2012 with 94 students enrolled in the course.

Students were provided on the LMS with a lecture module for each lecture which contained: 1) Lecture objectives; 2) the empty template for the PowerPoint slideshow which contained three general or conceptual questions about the upcoming lecture; 3) helpful material relevant to the topic, e.g., policy briefs, short videos (maximum 10 minutes of length), short excerpts of readings (1-3 pages long), and links to web-based material; and 4) a link to the journal page of the LMS where students individually submitted their PowerPoint slideshow (this journal is private and can only be viewed by the course convenor/lecturer).

The various steps of this JiTT approach using PowerPoint are illustrated in Figure 1:

1. Pre-lecture "warm up" exercise:
 - 1.1. Students had to prepare a short PowerPoint slideshow (they were provided with 3 slides with 3 questions which they had answer in their own words with the help material in the lecture module). Students had to do *one* of the two lectures of each week during the semester. The class was divided into two groups with different responsibilities for covering the two lectures per week. Students submitted their slideshow into an individual journal up to 2 hours before the lecture



- 1.2. I viewed a sample of student slideshows before the lecture in order to adjust lecture content according to common misconceptions and/or gaps in knowledge detected from the student slides. I collected some student slides for anonymous presentation at the up-coming lecture.
2. During the lecture:
 - 2.1 At the beginning of each lecture, there were short “buzz groups” of three students to collaboratively work out short answers to the questions for the lecture (about 10 minutes).
 - 2.2 Anonymous student lecture slides and quotes were used as “hangers” or “talking points” for discussion in the lecture. When I selected student PowerPoint slides, I tried to include work from all students during the semester (without revealing the student’s identity) and always made positive comments about the work.
 - 2.3 For the remaining part of the lecture (about 25 minutes), I presented my own PowerPoint about the lecture topic, summing up main points and relating it back to the group discussion that just happened in the lecture.
3. Post-lecture reflective quizzes:
 - 3.1. Students had to do a short reflective quiz (about 10 questions) about the content of both lectures of the week at the end of the week. These were multiple choice or short answer questions. The quizzes were part of the overall assessment.
 - 3.2. I provided my own PowerPoint slideshow and also the audio/video recording for each lecture *after* the lecture on the LMS so that students can use it for the preparation of the weekly reflective quizzes.

The post-lecture/end of week reflective quiz was a different approach to the usual JiTT cycle, which often has a pre-lecture test (e.g. a quiz) to gauge student knowledge before the lecture. I wanted students to use the lecture modules and the PowerPoint as a preparation for the lecture and then after the lecture do a reflective quiz so that they could test and reflect their new knowledge.

At the end of the course, a survey of students was conducted in order to gather the student experience with this approach of using PowerPoint as part of a JiTT teaching and learning cycle.

The Power of PowerPoint: Findings and Implications for Teaching

The survey with 54 responses from 94 students revealed an overall high satisfaction rate with the JiTT activity and formative assessment of pre-lecture PowerPoint preparation. The majority (67.3%) either strongly (25.5%) or agreed (41.8%) that the pre-lecture PowerPoint presentation was helpful for their understanding of the lecture content, and 60% thought it was overall a valuable and effective learning activity. This is not as high as reported by Gavrin in his JiTT classes (80% replied “yes” to the question whether JiTT exercises help to be well prepared for the lecture (Novak, 2011, p. 71) but was a good result for this approach to JiTT through the use of PowerPoint. The quizzes were the most popular aspect of the blended learning approach and JiTT strategy in the course. 79.6% of surveyed students either “strongly agreed” (22.2%) or “agreed” (57.4%) that the quizzes on the LMS were most valuable for student learning, followed with 64.8% by the lecture learning modules (22.2% and 42.6% respectively). The survey also showed that most students (66.6%) used the lecture modules on a regular basis and that 63% of students thought that the lecture modules were “very helpful for their understanding of the upcoming lecture content” (strongly agreed: 20.4%; agreed: 42.6%).

Here are some typical comments of students who found the JiTT assignment of a PowerPoint presentation in conjunction with the use of material in the lecture module helpful:

Pre-lecture PowerPoint preparation helped me a lot to study the content of this course.

The pre-lecture preparation was the best aspect of the LMS Portfolio as it meant I was already thinking about the topics before the lectures and the tutorials, which helped my understanding and connection with the topics better.

I did find the process very useful and valuable for my learning. I found lectures more engaging after I had had exposure to some of the material already, and I greatly enjoyed reading and watching the material provided in the preparation modules.

I found the pre-lecture preparation modules to be surprisingly useful and it was good to have videos as well as readings to make the content more engaging.

The lecture modules were great.

Some comments reflected the students' concern that the exercise, although helpful for their learning, was "difficult and time consuming," which is the same response Gavrin and Novak, the inventors of JiTT, found in student responses (Novak, 2011). A minority (22.3%) either disagreed or strongly disagreed that the exercise was of help for their understanding of course and lecture content and felt that it was "a waste of time" and "pointless" and "taking up too much time." Such views could be contributed to a lack of confidence and a strong affiliation with the traditional lecture style and the belief that lecturers not students should have the responsibility to prepare and present lectures:

The lecture preparation was the least effective element for my learning. I found it difficult to produce information on a topic which I did not yet understand.

I prefer lectures to be in normal lecture format; I want to hear from the lecturer (with a large knowledge base) rather than student contributions.

Personally I found the pre-lecture preparation daunting and not very useful as many weeks I had no previous knowledge on the topics and I would have preferred to listen and learn about these topics in a lecture setting.

One of the underlying principles of JiTT exercises or "warm ups" is that learning is a process and that students engage with the material based on their current knowledge and re-examine and reconstruct their own knowledge in the process (Novak & Patterson, 2010). But, as the comments above show, many students are pushed outside their comfort zone with that approach and resist self-motivated and self-centered learning and independent knowledge construction. There is, of course, increasing pressure on students with deadlines and commitments in many courses so that tasks outside the normal teaching and learning schedule, like this JiTT activity, are not welcomed by some students.

Surprisingly, what did not work well was the use of students' PowerPoint slides at the beginning of the lecture. Only 36.3% of students either strongly agree or just agreed that the inclusion of student PowerPoints at the beginning of the face-to-face lecture was valuable for their learning, with the majority (41.8%) seeing it as invaluable. Students in the survey commented that other approaches used, e.g., short buzz-groups of two or three students discussing the questions in the lecture, were more effective for their learning. The time taken up for using student PowerPoint slides as examples at the beginning of the lecture is better used for buzz groups where the questions can be further discussed.

The combination of pre-lecture PowerPoint preparation by students with the help of lecture modules and then interactive lectures has been positively received by the students and seen as positive for their learning. This supports other findings about the use of PowerPoint and lectures (e.g. Lancaster University, 2012) which states: "Students' perceptions of how much they are learning, how effective and confident they are as learners, and the clarity/comprehensiveness of their notes, were all seen by students as being greater when PowerPoint was used." Instructors who are interested in using this teaching approach should be aware about some of the limitations. There is considerable time involved to set up the lecture module and PowerPoint slides for each lecture. It is important to provide open ended questions which encourage critical thinking of the students (Brown & Keeley, 2012; Rose, 2004). Another limitation is the fact that without compulsory attendance at lectures, which is against the policy of the University where the innovative teaching method was applied and against my own teaching philosophy, the crucial link in the JiTT learning loop—the lecture—can be undermined by non-attendance of students. Students might not attend the upcoming lecture after they had done the pre-lecture preparation. One student referred to this in her/his comment in the survey, "I felt that when students did the preparation they were less likely to attend the lecture, as they felt they had already researched the content." The fact that the course has no end-of-semester exam does not help as this usually stimulates lecture attendance. As a student said in a comment, "There was little incentive to attend lectures as the material was not directly examined due to the requirements for the course." So other instructors are encouraged to stimulate lecture attendance by such assessment strategies as a reflective journal of course content and end- or middle-of-the-year exams.

It could be seen as a major shortcoming of the JiTT pedagogical strategy that it relies on lecture attendance for its outside-inside classroom loop of learning but lecture attendance is not necessarily stimulated or ensured by the JiTT activity. It is not a given that "students respond to the warm-up questions and go to class with genuine interest and desire to learn the answers" (Novak, 2011, p. 64). The "interest and desire to learn" needs to be stimulated by how the JiTT exercises are designed and implemented. For instance, if students perceive the online assignment as an additional task which is not used and discussed in the classroom, they will resist the JiTT activities and hence will not benefit from them (Camp, Middendorf, & Sullivan, 2010). The link between pre-lecture activities and lecture attendance, somehow treated as a given in JiTT literature, demands urgent research.

Despite those limitations, the JiTT pedagogy in this pilot study can be rated as a success. It helped me as lecturer to gauge current student knowledge on the topics and adjust my lectures accordingly. On many occasions I could reverse common misconceptions in the class. For example, it became clear from the student PowerPoint that there was a misunderstanding about corporate governance for sustainability and corporate social responsibility, crucial for understanding the role of the private sector in sustainable development, which I could dispel during the lecture.

Conclusion

The main conclusion from this study is that students value student engagement and active learning. This is in line with other research that has shown that an active learning activity during a traditional face-to-face lecture is highly valued by students (Cavanagh, 2011; Huxham, 2005). JiTT pedagogy has an advantage here as it includes student engagement and active learning not just in the lecture, but *before* each classroom/lecture. PowerPoint pedagogy, as described in this article, as part of JiTT activities was successful for student *engagement* with the content/lecture material. It was about student engagement *through* PowerPoint in contrast to making an engaging PowerPoint presentation and seeing “the PowerPoint presentation as engagement” (Mahin, 2004, p. 221). Since JiTT is flexible and adaptable to a wide variety of disciplines in higher education (Simkins & Maier, 2010), this instructional approach of JiTT based on PowerPoint has validity and use for instructors and courses in other disciplines.

The PowerPoint-based JiTT approach in this pilot study can be varied and in some ways improved for teaching and learning in higher education. For instance, students suggested in the survey that a link to the online discussion board should be added so that students can follow up and discuss what is still unclear about the topic *after* the JiTT exercise and lecture. Another possible approach would be to make the PowerPoint presentation a group-based exercise and thus enhance more peer-assisted learning in the preparation of the PowerPoint. As it was, the lecture modules and PowerPoint questions for the slides done by the students were developed by the lecturer, but this could be handed over to students such that they find the relevant material to make a PowerPoint and develop their own questions which are answered as a peer-assisted group learning exercise. The use of technology only works if students can see the benefits for their own learning and time management and do not feel that their time is wasted; otherwise they resent it and disengage from the learning process.

PowerPoint, as the study has shown, can be an effective educational tool for deeper student

engagement and active learning in higher education if lecturers use it not just as a presentation tool during the lectures, but also as a learning tool before and after lectures. Of the use of PowerPoint has clear advantages: it is familiar to students, and its simplicity and brevity allows students to present their knowledge in short, clearly laid out and structured form. The use of PowerPoint in JiTT activities, most importantly, is about giving power to students to be involved and shape lecture content and interactivity according to their knowledge and needs. Students, in other words, become empowered as active agents of their own learning. Student engagement and active learning does not have to die with the use of PowerPoint—the famous “death through PowerPoint” phrase associated with traditional, non-interactive lecture presentations—but can rather be enhanced through the use of PowerPoint as an instructional tool for pre-lecture just-in-time learning activities.

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