SELF-PACED LECTURES

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ABSTRACT
There are, in general, two main modes of course content delivery: internal face-to-face lectures and external self-paced study. In the former the lecturer generally takes students through the relevant material by writing points on a whiteboard or on transparencies or, most commonly, by talking to various points on a PowerPoint presentation. In the latter mode the student reads the various materials outlined in the study guide at a pace and place which suits them. In this paper we describe a trial of some software, known as Macromedia Breeze, that allows students to listen to a lecture, following the presentation on the PowerPoint slides, but which also allows the student to start, stop, revisit and resume the lecture when and from where they prefer via the WWW. The results show that students preferred the higher degree of control and increased level of engagement afforded by the Breeze environment.

KEY WORDS
Online Learning, Computing Education

1. Introduction

There are, in general, two main modes of course content delivery: internal face-to-face lectures and external self-paced study. In the former the lecturer generally takes students through the relevant material by writing points on a whiteboard or on transparencies or, most commonly, by talking to various points on a Powerpoint presentation. In the latter mode the student reads the various materials outlined in the study guide at a pace and place which suits them.

In this paper we describe a trial of some Macromedia software, known as Breeze, that allows students to listen to a lecture, following the presentation on the Powerpoint slides, but which also allows the student to start, stop, revisit and resume the lecture when and where they prefer. In a face-to-face lecture the closest the student gets to this level of control is to interrupt the lecturer and ask a question. In the case of online material for self-study, there is less of a sense of collaboration with the lecturer.

In the following section we introduce the trials we conducted. In Section 3 we provide the results. Discussion is given in Section 4. Related research and concluding remarks can be found in Section 5.

2. The Breeze Lecture Trials

The Division of ICS Breeze Trial was conducted during week 10 of Semester 1, 2004. Students from an Object Oriented Programming Unit were asked to participate in an experiment involving an online presentation and collaboration tool called Macromedia Breeze. The *presentation* and *collaboration* components of the software were tested separately. This paper reports on results for the presentation component that was used to deliver week 10 coursework.

2.1 Online Presentation Unit

The Breeze Presentation software facilitates the delivery of online audio-PowerPoint style modules. To test the relative merits of this media as compared to the standard website paradigm of flat text and images, two modules were created that contained identical information. The first was a regular website for the topic of Version Control and Design Patterns and the second was a Breeze online audio-PowerPoint style presentation as shown in Figures 1 and 2 below, respectively.

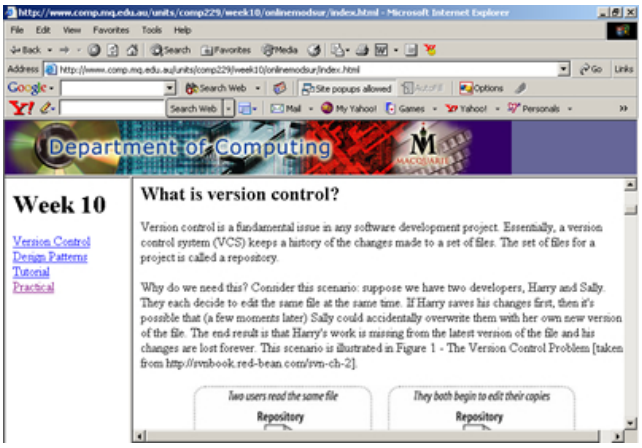

Figure 1. Standard Online Website

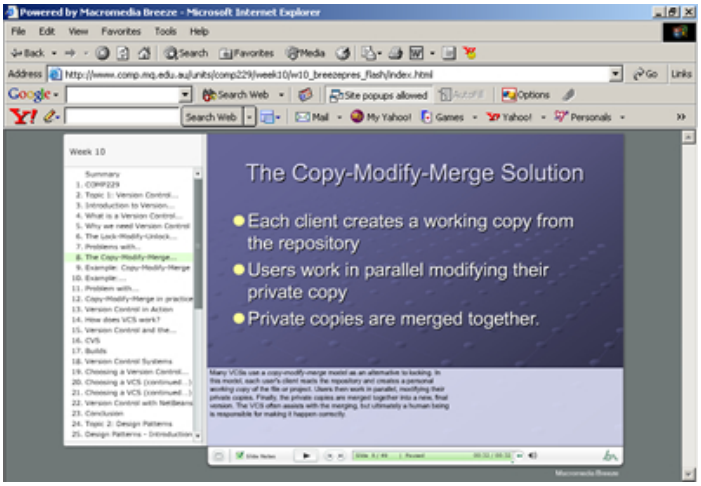

Figure 2. Breeze Online Website.

The audio transcript for the Breeze presentation was exactly the same as the text in the "Standard" online module. The text contained in the slides of the Breeze presentation highlighted important points for each sub-topic being discussed.

The 195 students in the course were randomly split into two groups. Of those, 141 consented to participate in the online module experiment, 28 did not consent and 25 had not logged on to complete their week 10 coursework. From those 142 students who consented to participate in the experiment, 67 responded to the survey questions (35 of which had been allocated to the Breeze module and 32 to the Standard module).

We present a summary of the responses to the online module survey questions next.

3. Results

The survey included 8 questions. Each question is presented in sequential order with a summary of the data. Discussion is provided in a separate and subsequent section. Questions 1 to 5a used a seven-point likert scale with values ranging from Very Poor(0) – Poor(1) – Moderately Poor(2) – Neutral(3) – Moderately Good(4) – Good(5) – Very Good(6). For each of these quantitatively answered questions we present a column graph comparing the results for Breeze and for the standard control group. A table accompanies each graph with the averages and standard deviations.

Question 1: How would you rate the module you just learnt in terms of its ability to hold your attention?

Table 1. Ability to hold attention (*No significant difference between groups (t = 1.72, df = 65, p = 0.090).*

Group	Total	Average	St Dev
Breeze	35	4.600	1.090
Standard	32	4.063	1.458
Total	**67**	**4.343**	**1.297**

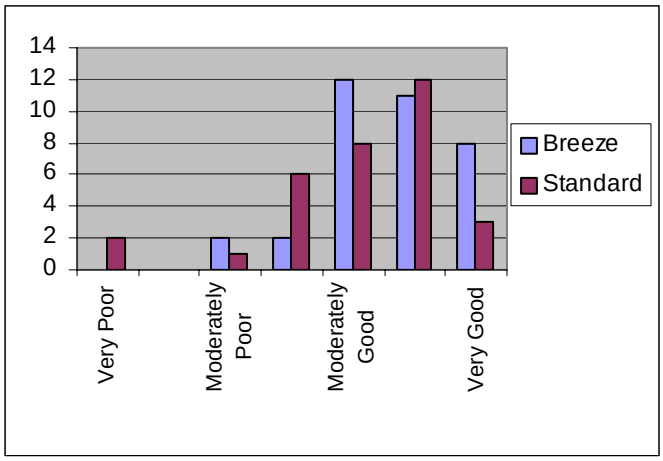

Figure 3. Ability to hold attention

Question 2: How would you rate the interest level of the content within this presentation?

Table 2: Interest level of content *(No significant difference between groups (t = 1.65, df = 65, p = 0.105)*

Group	Total	Average	St Dev
Breeze	35	4.457	1.094
Standard	32	3.969	1.332
Total	**67**	**4.224**	**1.229**

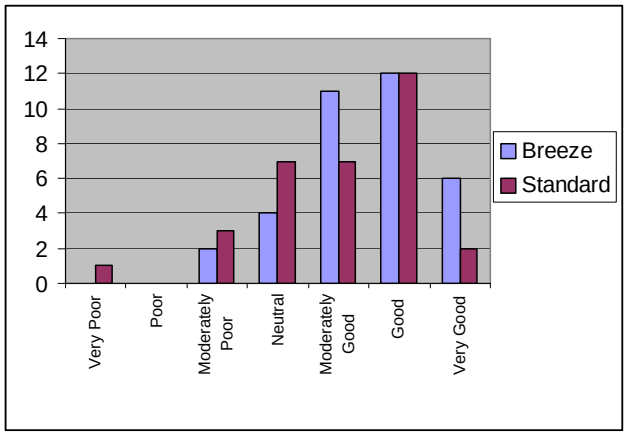

Figure 4. Interest level of content

Question 3: How would you rate the media used to provide this presentation?

Table 3: Media Rating *(Significant difference between groups (t = 4.00, df = 65, p <0.001))*

Group	Total	Average	St Dev
Breeze	35	4.943	0.998
Standard	32	3.844	1.247
Total	**67**	**4.418**	**1.245**

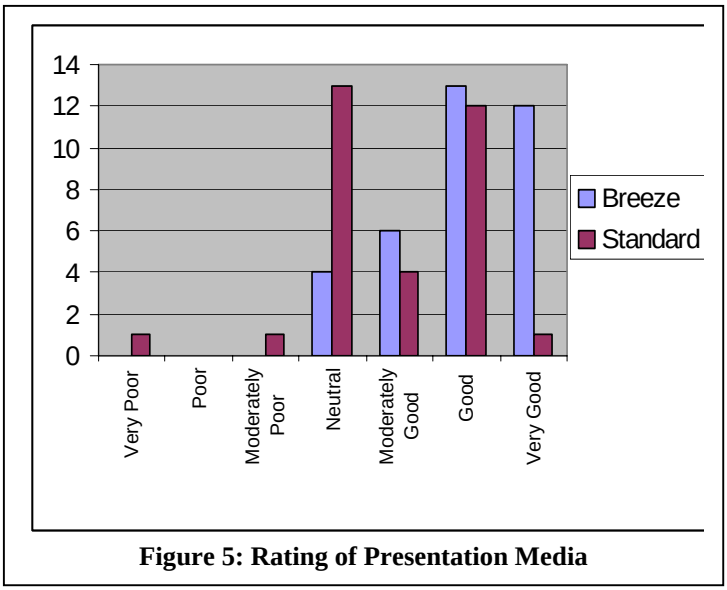

Figure 5: Rating of Presentation Media

Question 4: Approximately how many minutes did you spend working through the online module? *(Don't include time spent reading other resources such as your text book or external websites.)*

Table 4: Number of minutes working on the module (*Highly sig. difference between groups (t = 4.69, df = 65, p <0.001))*

Mins spent	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	150	155	160
Breeze	0	0	0	1	0	1	1	4	6	4	0	6	1	3	0	1	0	4	0	1	0	0	0	0	1	0	1
Standard	0	1	4	1	0	11	1	1	5	0	0	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

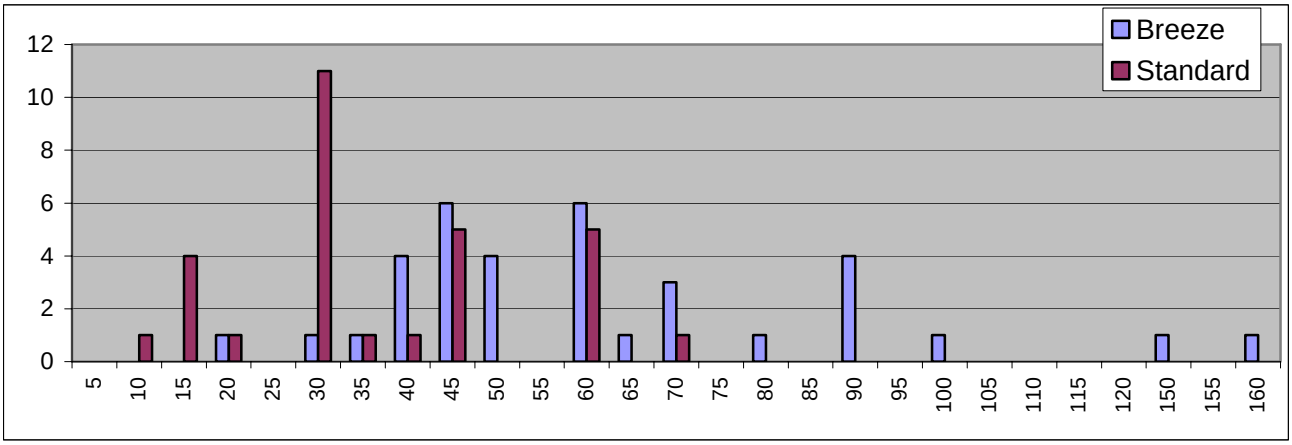

Figure 6: Module duration NB: the outliers at 150 and 160 have been placed in non-linear positions on the scale

Question 5a: What media would you have preferred for this module?

Table 5: Preferred Media

	Powerpoint/Audio	Flat Text	Grand Total
Breeze	33	2	35
Standard	18	13	31
Grand Total	51	15	66

For the Breeze group there was a highly significant difference between the number of students who favoured PowerPoint/Audio versus Flat Text (Binomial Distribution two tailed test, p-value<0.001) whereas there was no significant difference for the Standard group (Binomial Distribution two tailed test, p-value = 0.282). For the two groups there was a highly significant difference between the number of students who favoured PowerPoint/Audio versus Flat Text (Binomial Distribution two tailed test, p-value<0.001).

Question 5b: How come?

When the open-ended responses to this question were classified into different response types the main reasons quoted for preferring an Audio-visual PowerPoint style presentation were "more captivating" (15), "interactivity" (8), "more sensory input" (7), ability to "stop/start/replay" (4), easier to understand (4). The 15 people who sited flat text as their preferred option cited "self-paced" (4), "printability" (3), "simple navigation" (2) and "fewer distractions" as their main reasons.

Some interesting/representative comments for preferring an Audio-visual PowerPoint style presentation include:

> "Because inherently we pay to go to uni to listen to an experienced' person tell us things we can't read on a piece of paper.... Higher understanding as it were." *(Reported by a student in the Standard group)*

> "I think more interactivity and synthesising different formats (graphics, audio, visual etc) is better achieved through these rather than what seems static html source file. The combination of these medias blending means more effort required (consciously or subconscious) or captured from us and sure more senses involved." *(Reported by a student in the Standard group)*

> "online lecture is real benefit for those who are not English background student. for me, if I don't understand some of the information, I can simply hear the slides again.. it is really good, and I learn what is VCS now!" *(Reported by a student in the Breeze group)*

> "both should be better, hence after an audio was heard an option to read the explanation to absorb it better" *(Reported by a student in the Breeze group)*

And this comment by a student who preferred flat text:

> "I don't really want things jumping around, I prefer to just read information, and leave it up to the text to hold my attention. If it's bland, I will finish reading it regardless of the shiny toys filling the window" *(Reported by a student in the Standard group)*

Question 5c: How would you rate your English language ability?

Table 6: Student's English Ability *No significant difference between groups (t = 0.47, df = 65, p = 0.639)*

Group	Total	Average	St Dev
Breeze	35	4.829	1.294
Standard	32	5.063	1.162
Total	67	4.94	1.229

Question 6: What were the best features of the module you just completed?

Students from the Breeze group cited "ability to stop/start/rewind" (11), "audio" (8), "ease of comprehension" (5) and "embedded hyperlinks" (4) as the main advantages of the module. Two interesting comments include:

> "Audio. It keeps me watching and at least listening to explanation therefore it makes it more formal and it keeps me in focus to watch as opposed to pure text where I'd tend to go and see other website."

> "lecturer isn't on the spot.... wont go off on some tangent to further explain some poorly presented previously made point because if it doesn't sound good on tape they can change it. Make it clear and concise "

On the other hand students from the Standard group cited "diagrams and examples" (8), "anywhere/anytime access" (6) and "casual/clear style of content" (5) as the main advantages of the module. A specific example is provided below:

> "I can learn at my own pace and have a good reference for the material in case I wish to revise it later. The main thing I have against lectures is that sometimes its hard to concentrate on what's being said while taking notes for later use at the same time; however here I don't need to take notes so I can concentrate on the material."

Question 7: What suggestions could you make to improve the module you just completed?

Students from the Breeze group sited technical considerations as the main disadvantage of the module: "not printable" (7) "not downloadable" (5) and "problems with audio" (3). Two interesting comments were:

> "Maybe if someone had questions regarding the lecture, there could be an online chat function where you can talk to the lecturer in real time (maybe in a chat room) and ask a question and receive an answer quickly."

> "every 10 or so slides have multiple choice questions regarding the information in the previous slides"

Students from the Standard group had more issues with the formatting and content; "poor colour/formatting" (5), "unclear content" (3) and "not print-friendly" (3) were three main concerns.

Question 8: Please provide any other comments.

Students from the Breeze group volunteered 8 positive comments and 5 negative comments between them in response to this question. Two examples include:

> "I am using a 56k dialup connection and the downloading of each slide was fast with only a few delays for buffering to occur. Maximum wait was only 15 seconds"

> "headsets were available to day students, but not evening students."

Students from the Standard group offered 3 positive comments and 6 negative comments about their online module. Two examples were:

> "good to have online stuff for learning, but face-to-face still the first choice (if the lecturer is good =).)"

> "what's the use of being an internal student if I'm going to be treated as if I were external. Tell the lecturers to do their jobs and lecture."

4. Discussion Of The Results

While there was no significant difference between the Breeze group and the Standard group in terms of the "ability to hold your attention" or "interest level of content" ratings, both average scores were higher for the Breeze group.

The (highly) significant difference lied in the student's rating of the media; the average "quality of media" rating provided by the Breeze group was "Good" (second highest possible rating out of 7 choices) versus "Moderately Good" (third highest rating) for the Standard group. Perhaps students in this day and age expect a certain quality of delivery more than they perceive that there are overwhelming educational advantages to different media. This has implications for competition amongst educational service providers.

There was a highly significant difference between the average amount of time spent on the unit by the Breeze group ($\overline{x}$ = 63 minutes) versus the Standard group ($\overline{x}$ = 35 minutes). This could be interpreted in two ways: firstly that the Breeze module is a slower way to learn, or secondly that the Breeze module did hold people's attention for longer. Further research (such as an in class test) is required to determine whether there are educational gains provided by the Breeze module. The threat of an assessment task may actually have caused the Standard group to spend longer working on the module. Given the nature of an Audio/PowerPoint style lecture it would seem more difficult for students to speed up the presentation beyond its standard playtime of 40 minutes.

An interesting aspect of the time spent completing the module is that the Breeze students actually recorded a much higher standard deviation of time spent on the module (s = 30 minutes) than the Standard group (s = 17 minutes). One may have otherwise suspected that the fixed play time of the Breeze module would have reduced the variability of time spent, but obviously many students made considerable use of the playback feature.

Question 5a indicates that people who saw the Breeze module overwhelmingly preferred the media to the normal flat text paradigm. Interestingly the Standard group who had not seen the Audio/PowerPoint style presentation didn't significantly favour the medium. This speaks well for the Breeze environment. In Question 5b the extra ability for this type of media to hold student attention was made apparent, with "more captivating" being nearly twice as popular a reason for preferring audio-PowerPoint style modules than any other.

Question 6 indicated that there was no significant difference between the two groups' perception of their English Language ability. Regression analysis was performed to determine whether or not there was any correlation between English Language ability self-rating and ratings for questions 1, 2 or 3 (ability of module to hold attention, interest level of the content and the quality of the content, respectively) for either the Breeze group or the Standard group. No significant correlation existed. That is to say, this question in itself provided no support for the proposition that students who were less confident about their English language ability preferred one form or another.

Students felt that Audio-PowerPoint style presentations had educational advantages (captivity, interactivity, more sensory input for improved comprehension) as well as technical advantages (playback, audio, and embedded hyperlinks). Flat Text was seen to have advantages of easier printability and navigation. Interestingly few students mentioned the fact that it was potentially faster to process a Flat Text module.

The final question (Question 10) in the survey reinforced the impression that students generally favoured an Audio-PowerPoint style presentation over a standard web module with the Breeze group providing more positive final comments while the Standard group provided more negative final comments. The negative comments provided by the Breeze group were mainly technical (inability to print, poor quality audio, availability of hardware/software) and are foresee-ably surmountable whereas the criticisms of the Flat Text form were generally educational.

5. Concluding Remarks

Presenting lecture material online is not novel. Since the development of the internet, educational institutions have been quick to take advantage of this form of delivery. For example, [1] combined the use of hypertext, multimedia, audio, still pictures, video, graphics and animations to create an interactive multimedia textbook for an introductory computer science course. Beyond textbooks, multimedia has been employed to convey specific computing ideas such as algorithm design and efficiency [2] and object oriented concepts [3].

However, as Brown and Lu [4] point out, "online teaching material that is attractive and usable is not sufficient". In the end there must be improved learning outcomes. We note that it had been our intention to test the learning outcomes via a quiz at the end, but we ran out of time for this in addition to gaining Ethics approval and developing and delivering the Breeze module by the allocated week in the course. Future studies will ensure this step is not missed. Brown and Lu [4] combined principles from the fields of learning theory and usability

engineering to develop a Learner-Centred design process. We recommend such an approach ourselves and many of the principles Brown and Lu [4] advocate were applied in the design of our flat text and Breeze modules. However, our work differs in that our focus was on alternative delivery of lectures rather than tutorials.

Closer to our study is the work of Kurtz, Parks and Nicholson [5] who developed a virtual classroom environment using a hyperlinked textbook and online collaborative laboratory experiences. They employed the Macromedia Web Design Studio that allowed students to jump around and pop up additional material as they worked through the textbook. Our approach was somewhat different. We still had a paper-based textbook that was referred to and expected to be read before, during (as indicated in the presentation) or after the online lecture. We believe most people still prefer hard copies for reading extended amounts of text. We used a newer Macromedia product to provide a more lecture style situation with a spoken voice, with the typical and unavoidable waffle edited out, and a summary to focus on visually in the form of PowerPoint slides. In this way, we believe that the Breeze environment afforded a good match between the medium and the learner, the context and the task, which are critical factors affecting the effectiveness of a medium [6].

Kurtz, Parks and Nicholson [5] note that the retention and completion rates for online courses are 10-20% lower than in traditional in-person courses. We believe that the use of a media like Breeze may be more engaging and encourage students to complete the modules. Our results showing that students consistently spent longer and a similar length of time on the Breeze module supports this conjecture. Further our results show that Students in this study opted in favour of Breeze style Audio-PowerPoint presentations as opposed to standard flat text web modules for online content delivery.

6. Acknowledgements

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7. References

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