INTERACTIVE MULTIMEDIA LEARNING: STUDENTS' ATTITUDES AND LEARNING IMPACT IN AN ANIMATION COURSE

Belinda Soo-Phing TEOH and Dr.Tse-Kian NEO
Centre for Innovative Education(CINE), Faculty of Creative Multimedia, Multimedia University, Malaysia
tkneo@mmu.edu.my

ABSTRACT
Malaysian classrooms are progressively absorbing interactive multimedia as instructional strategies for teaching and learning. Though, till now, interactive multimedia in a Malaysian classroom is often limiting and is confined to the hybrid use of chalk-and-talk method with multimedia assisted materials, where learning is still largely teacher-oriented. Such progress does not realize the full potential of multimedia learning, thus denying the credibility of student-centred learning strategies. The Web provides a wide network of information and interactive simulations necessary for active and independent learning. Hence, this paper describes the development and implementation of student-centred learning through Web-based domain on students in a Film & Animation course. The aim is to determine students' learning impact and attitudes towards independent learning and self-paced discovery. A set of multimedia tools were employed to create the student–centred learning environment and were designed using Gagne's Nine Events of Instructions which provides a proper theoretical framework of a good instructional lesson plan. The essential features were documented, examined and its impact on the student learning process assessed. Students' attitudes toward this Web learning approach were recorded as positive and promising. The use of multimedia in learning proves to be a feasible and viable alternative to traditional classrooms.

INTRODUCTION

The call for learning diversity is all-embracing as society undergoes constant change in the way of living and communication. Thus, this growing need has heralded change and transformation in the learning and teaching arena to shape learners in this knowledge-based society. "Universities today are in transition. Much of the change we see is driven by economic pressures and demands for graduates who will be able to function in a knowledge society" (Franklin & Peat, 2001). Likewise, in Malaysia, institutes of higher learning are currently moving towards a more multimedia-oriented classroom. Neo & Neo (2004) posit, "There is already a move to create multimedia courseware in educational institutions". Meanwhile, Malaysian government has created the Multimedia Super Corridor or MSC Malaysia to assist companies and higher learning institutions to test the limits of technology and to prepare themselves for the future.

The current mode of learning in Malaysia is structured on traditional chalk-and-talk method. For many students, learning has been dependent on time, place and is fundamentally teacher-oriented. The flexibility of such a learning environment is restricted, and the essence of multimedia learning which anchors on student-centred strategy remains a paradigm untouched. Unfortunately, such quandary is a common phenomenon, "technologies are too often used as substitute teachers that deliver information to learners rather than as learning tools that support the active learning process" (Kiili, 2005). This study aims to infuse interactive multimedia and student-centred learning strategies into the classrooms. By utilizing the common interactive learning approach, specifically the Web-based domain, this paper has adapted Gagne's Nine Events of Instructions as guide for a good lesson design. The replication of Gagne's instructional criteria was imperative to ensure the suitability of the multimedia instructions in our quest to reap effective learning outcomes.

Multimedia and student-centred learning

"One way to bring about a change of emphasis in teaching, from the teacher directed approach to a facilitated approach, is to change the medium of instruction" (Kearsley, 2000). Interactive multimedia offers an alternative medium of instruction to the current learning process. The nature of interactivity and discovery in multimedia learning bears a beneficial boost to the monotony of passive learning. Rather than be bounded by the pace of the teacher, learners are individually paced according to his or her own ability. One way, multimedia can give low ability students extensive learning time before moving forward. Alternatively, high ability students can branch out to random sequencing through the module and not be confined by linearity or a much slower pace. This aspect of multimedia learning supports student-centred strategy whereby learners take responsibility in their own learning process. The liberty to proceed or recede allows self-pacing, an important facet to enable learners to learn according to their individual pace.

Akin to hypermedia, multimedia presents an immeasurable interconnectivity to information in a variety of possible combinations, sequences and mixture of resources which shapes the higher-order thinking in students. "Students learn to sift the relevant from the irrelevant information and can relate new information to real world

situations" (Stoney & Oliver, 1999, p.9). With technology, the process of learning germinates interactive and active responses; students will demonstrate both cognitive and emotional intelligences in accordance to the multimedia stimuli.

Multimedia capable features such as the embellishment of graphics, ability to orchestrate sounds, animate moving pictures and present videos are innovations which can enliven the learning experience. The flexibility of multimedia to replace traditional textual instructions allows a wider range of stimuli, both in the verbal and visual, thus increases the state of student engagement in learning. In other words, multimedia is capable to transmit information through its capacity to make it alive, thus helping students to make real-world visualisations otherwise unseen. Kearsley (2002) confirmed that, "Imagery has been shown to facilitate recall in many studies. Recall or recognition is enhanced by presenting information in both visual and verbal form". Studies also show that students who learn from multimedia have greater self-esteem and motivation, consequently the rate of retention in multimedia learning exceeds that of traditional means. When learners are engaged in learning, the likelihood to retain information and sustain the learning process increases. According to Reeves (1998), "Multimedia can stimulate more than one sense at a time, and in doing so, may be more attention-getting and attention-holding."

Researchers indicated that the key distinction between traditional and multimedia instructional strategy is interaction. Interactive multimedia learning cultivates interaction between the learner and the learning content and the content with the learner. Research suggests that when such learning interaction occurs, a learner's attention and comprehension of the learned subject increases. "Interaction is commonly viewed as stimulus response reinforcement encounters action, an integrated form of between the learner and the instruction" as stated by Stemler (1997). Interactivity makes the learning process responsive and active, governing a learning of participation and doing, not passive watching or merely listening.

METHODOLOGY

The treatment spanned across fourteen weeks. The initial course structure contained weekly lectures, one-on-one tutor discussions and critique sessions. However, to achieve the aims of this research project, the Web-based learning were integrated in as a substitute to the weekly traditional lectures. Although the implementations of treatment were over fourteen weeks, there were significant time periods in between allocated for assessments and independent self-learning in both learning domains. Students were exposed to self-regulated learning with the Web domain otherwise not available in the existing method of learning and teaching. The Web module was implemented following that, where students were briefed and informed that their next lecture will be provided online. They were provided with a Web link which connects them to the Web learning module, teacher's e-mail and chat room access. Given one week time frame, students were instructed to access the lecture module independently, on their own effort, time and location. Apart from the flexibility, they were told to engage in online consultations if deemed fit and that the tutors were available for online discussions via Yahoo! Messenger and electronic mail.

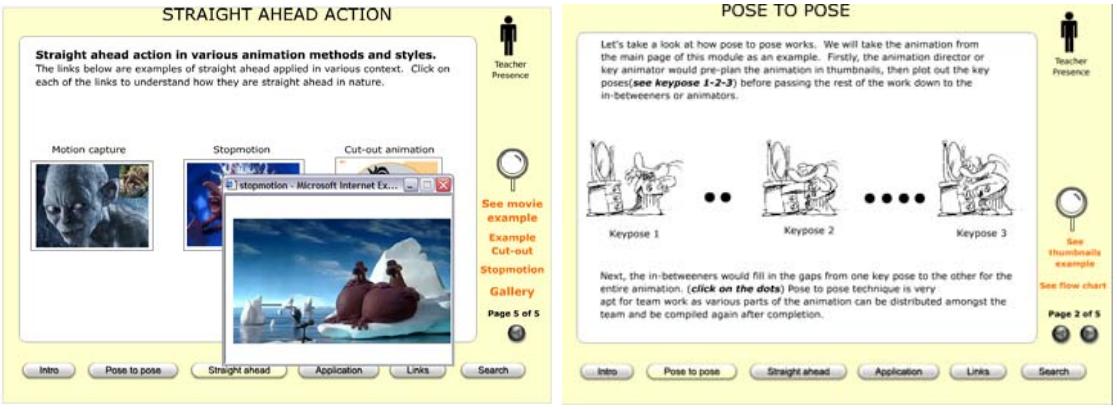
Film and Animation (FA) Design Process I is a class for animation students of Gamma (2^{nd} year students) in the Faculty of Creative Multimedia. In this class, the core curriculum is animation precepts which are called "Principles of Animation." The understanding of animation principles is most elementary to the learning of animation. This syllabus is to assist learners on their first attempt to animate independently. There are twelve precepts to animation principles. Among the twelve, one defining principle of action and movement known as "Straight Ahead & Pose to Pose Action" was selected as the lesson design. The title was produced in each of its own whereby "Straight Ahead & Pose to Pose Action" was structured as Web-based. Twenty six students participated in the study (n=26). All of them were students from the second year Film & Animation course of MMF 2013 whereby the researcher was an academic staff of the said course. The general age range was 19-24 years. These students have pre-requisites in design, multimedia and computer authoring subjects obtained from the first year course programme.

Instructional design of the Web-based learning environment: Gagne's Events

Gagne's theoretical framework was based on the cognitive perspective of learning and emphasized largely on the effectiveness of the instructional design. In his theory, he has correlated the nine events of instruction with the associated internal mental processes and formulated these events as elements of a good lesson which promote effective learning (Gagne, Briggs, & Wagner, 1992). Hence, the development and creation of the Web-based learning environment in this research incorporated with Gagne's 9 Events of Instruction to be considered a good lesson design (Ellington and Earl, 1999). Based on his findings, the multimedia learning environment can be considered as a "good lesson design" should it acquire the nine events and instructions as put forth by his instructional theory.

Event (1):Gain attention

Learning is a process which requires attention. In order for learning to take place, capturing the attention of the students is therefore critical. Gagne proposed that learning material should provoke learners to be inquisitive and motivated. Thus, in the Web module, images, textual information, sound and contrasting colours as background were used to attract learner's attention. Animation was added as part and parcel of the course as well as to stimulate learners' attention (see Figures 1(a) and 1 (b)).

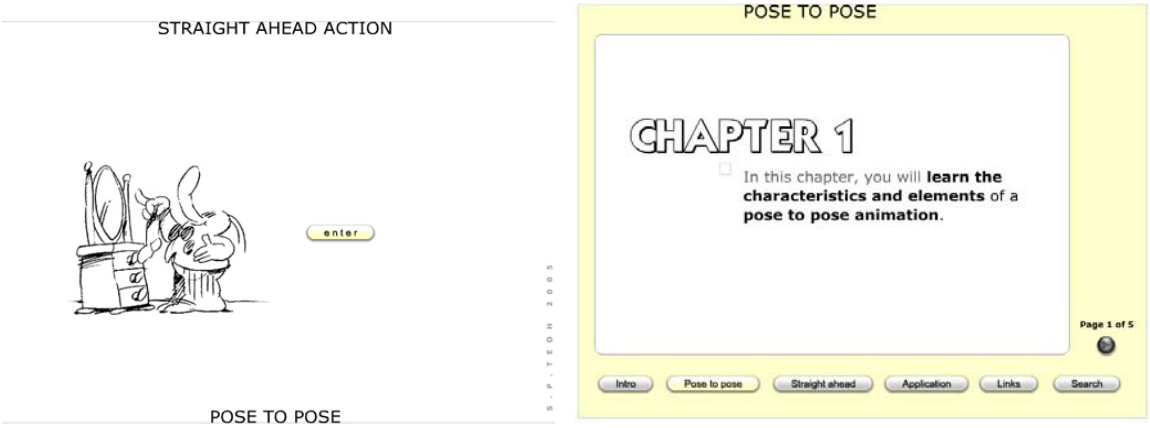


(a) **(b)**

Figure 1 (a) and (b) Multimedia elements were used to gain the students' attention

Event (2): Inform learners of the objectives

Learning objectives should be made clear to the students at the start or early of each given lesson. First, an informed learner will be aware of the gains from which the learning would provide. Second, the objectives would initiate a conscious responsibility towards the learning process; hence this will help assist students to complete the learning programme. As a result, the students were informed of the objectives prior to given the module. The web module contained a page stating and explaining the objectives of the module. The title of the lesson was also stated and provided input to the content that is to be studied, in this case, the topic was "Straight Ahead Action and Pose-to-Pose."(see Figures 2 (a) & (b)) A pre-test was also given to the students prior to using the module.



(a) **(b)**

Figure 2(a) and (b) The title and the objectives of the module

Event (3): Stimulate recall of prerequisite learning

Within this context, prior knowledge and understanding of previously learned concepts are associated to the overall learning experience. The ability to make connections of previous knowledge to newly learned information can facilitate learning development. In order to understand the topics, students had to have prior knowledge in the multimedia and animation in general. In other words, they have to know what multimedia is, what animation is and why it is necessary to understand the topics given in the Web module. In this project, the

students have learnt a few principles of animation prior to taking the web module. The content in the web module is one of the 12th animation principles that they have to learn (see Figure 3).

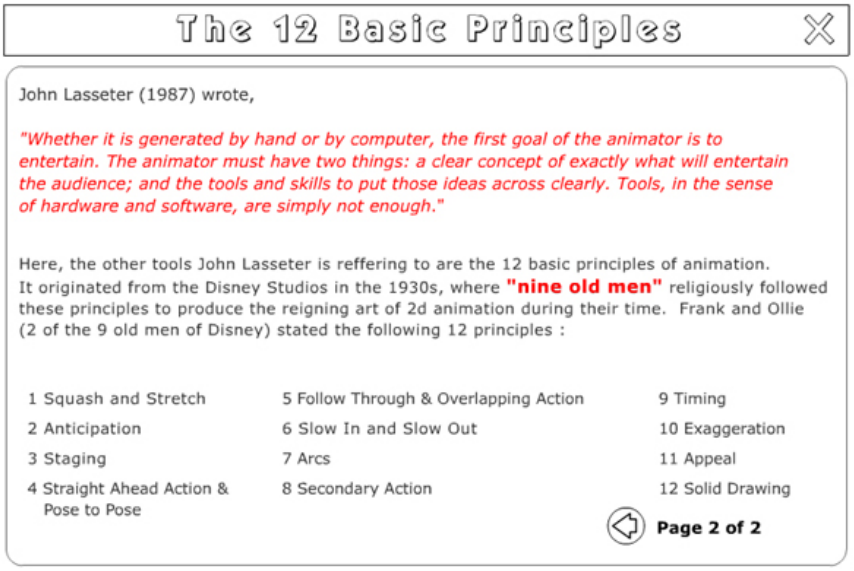
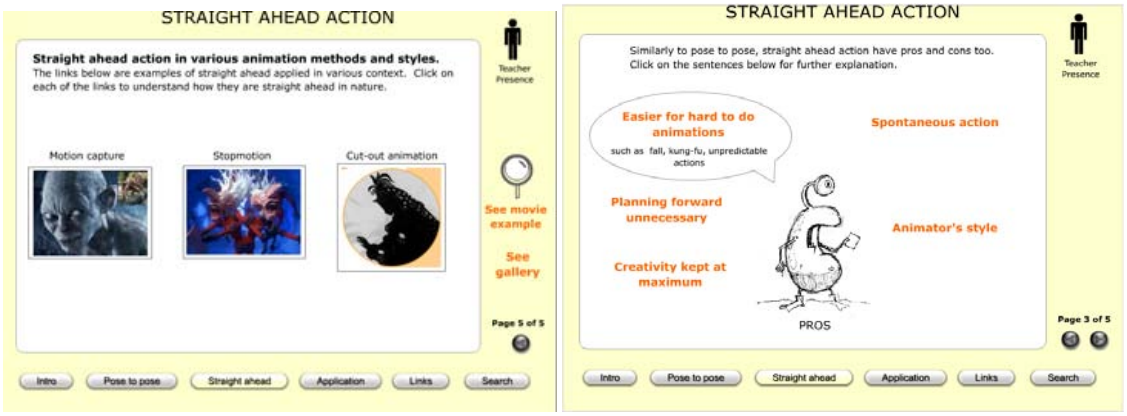


Figure 3The animation principles that the students have to learn

Event (4): Presenting the content

Due to the different learning styles and behaviours, learners have selective perceptions of content based on each individual needs and cognitive awareness. In order to elicit a response from the learner, stimulus in this aspect refers to the presentation or display of the content. Therefore, clear, simple and direct to the point language was used to explain concepts. Images, sound, video and animation elements were used to illustrate ideas, demonstrate and present content. Also contained were navigational tools for the students to explore (see Figures 4(a) & (b)).



(a) **(b)**

Figure 4 (a) and (b) Graphics, Images and navigational tools are provided and presented to the students

Event (5): Providing learning guidance

Providing examples, guided instructions, concepts, analogies, graphical representations and case studies in the learning programme offer additional guidance to assist learning. Within the Web module, learner's activities were built into the module for the students to interact with. Examples using images, video, sound, and animation were also available for the students to use and understand the content being presented. Examples of the principles were demonstrated and sound was made available to the students to further understand the content presented. Navigational tools were provided to the students to explore and they were clearly labelled. Clear instructions were given to the students as well as directions to help students to explore and learn on their own (see Figures 5(a) &(b)).

Event (6): Eliciting the performance

Post-tests were given to the students to assess their understanding and their attitude towards learning on the Web method. Also, through the repetitive exploration of the learner's activity built into the modules, the students will be required to demonstrate their understanding.

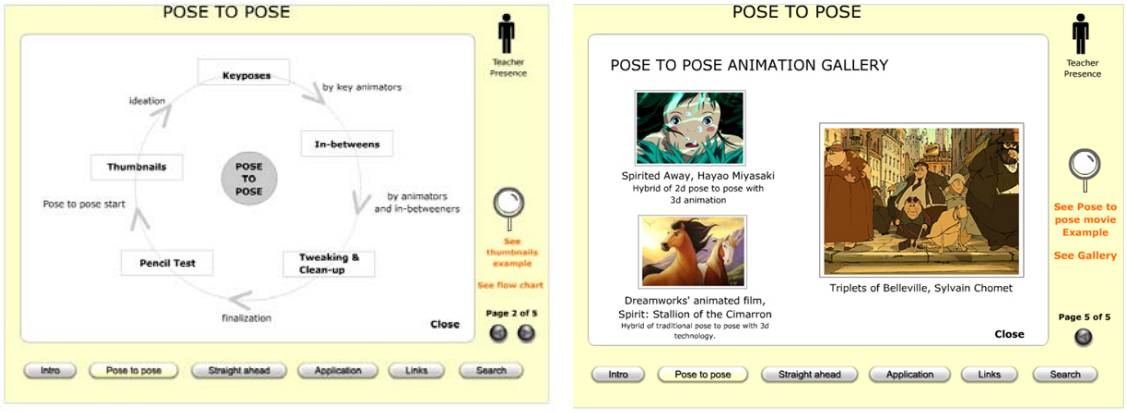


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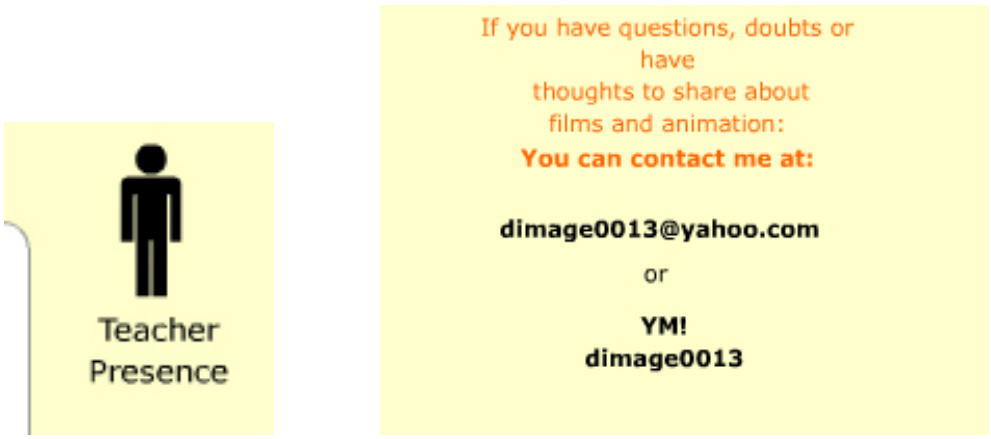
Figure 5 (a) and (b) Examples were provided to enhance their understanding of the content and instructions allowed them to navigate within the module

Event (7): Providing feedback

Providing informative feedback on learner's performance is an important reinforcement process. Students in this learning environment had access to the teacher in person or via email or chat. For the Web, instant messaging feature was added to the module to allow the students to ask the teacher for help or clarification and for teacher to provide feedback to the students. Students could also obtain feedback from one another (see Figures 6(a) & (b)). Instructions on how to use the modules were also included to provide feedback.



(a) **(b)**

Figure 6 (a) and (b) Show the icon that the students can assess the teacher through instant messaging and email for feedback and help.

Event (8): Assessing performance

In order to determine the effectiveness of the learning process, assessment was required to evaluate students' comprehension and knowledge of the learned content. They were also given post-tests to see if they understood the content that was presented to them. Projects required critique sessions to demonstrate students understanding of the animation principles by creating an animation movie reflecting the principles learnt

Event (9): Enhancing retention and transfer

Learning is complete when knowledge can be transferred into a new situation. The need to have varied practice tools and aids can facilitate transfer and enhance retention process (see Figure 7). The students have to apply what they have learnt in the module in doing a final independent project for the Animation course. Students must exhibit the principles learnt to the actions in their animation.

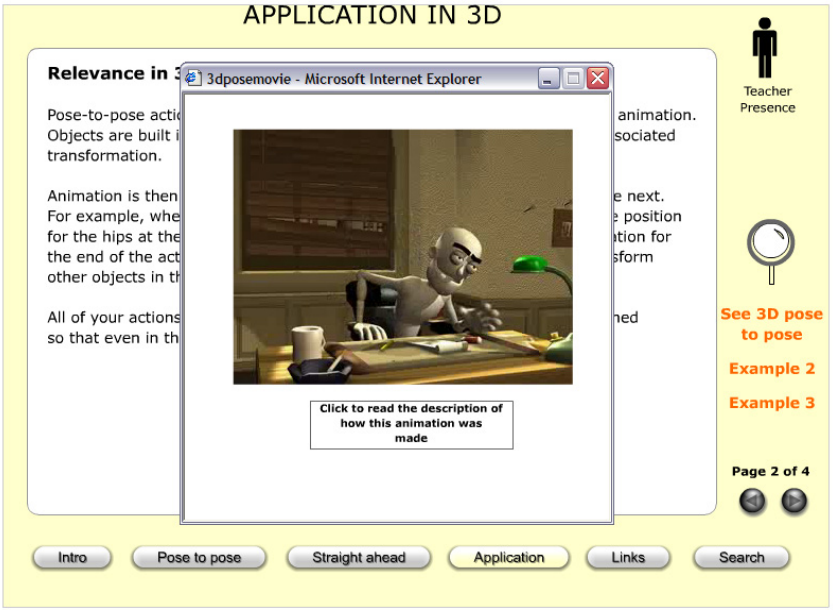


Figure 7 Application on how the principle is applied in 3D form

Surveys and Questionnaires

The Web-based survey yielded twenty one student respondants. Five point likert-type scales and closed-ended questions were used as a tool for survey assessment. The survey was adapted from *CAL Evaluation, Gregor Kennedy, University Of Melbourne (1998).* A set of questions were constructed for Web-based learning environment. This variety inclusive of the open-ended questions enabled students to express their views in fuller statements and at the same time add comments which were not pre-ordained by the researcher. The following are the results of the Likert-scale questionnaire (see Table 1).

The student survey was structured in the following priorities:

1. Learning motivation
2. Content Organisation
3. Navigation and GUI
4. Multimedia and Interactivity
5. Web Features

The table states the mean (m) of result of the statement as well a the percentage of students who agree and strongly agree with the statements (p). The items in the results were divided in the constructs as stated above. As for reliability of the survey, according to Lim, Khine, Hew, Wong, Shanti, and Lim (2003), a reliability of above 0.6 is deemed to have satisfied the reliability of the survey. The reliability of the survey questionnaire or the Cronbach's Alpha was 0.908. Thus, this survey is deemed reliable.

Table 1 The results of the survey given to the students

No.		Mean (m)	% (p)
	MOTIVATION		
1	I find learning interesting and engaging.	4.00	92.3
2	I found the module useful for learning.	4.23	92.3
3	From the start it was clear what I was going to do in the module	4.00	88.4
4	From the start it was clear what the objectives of the module were	4.19	96.2
5	I know better about the subject after using the module.	4.15	92.3
	CONTENT		
6	Generally there was just the right amount of information on each screen.	3.88	80.0
7	Important information or key concepts were easy to identify	4.31	88.5
8	Generally the content was clear and logically organised	4.27	92.3
	NAVIGATION & GUI		
9	I found it easy to locate pieces of information I had previously used.	4.19	96.2
10	I found the interface clear, structured and appealing.	4.23	96.1
11	I always knew where to go next.	4.38	100

12	I found it easy to navigate my way around the module.	4.35	92.3
13	The buttons and links were easy to understand.	4.42	92.3
14	I found it easy to return to the module from an outside link.	3.88	80.8
	MULTIMEDIA & INTERACTIVITY		
15	I found the graphics and multimedia useful in visualising the concepts.	4.35	96.2
16	The module provided responses that were meaningful to me.	3.92	80.7
17	Multimedia increases my motivation to learn.	4.46	100
18	Interactivity helps me learn better.	4.46	96.2
	WEB FEATURES		
19	I found the chat access to my teacher helpful whenever I needed assistance.	4.08	73.1
20	I found the e-mails and chats effective and convenient for teaching.	3.96	69.2
21	The information from outside links reinforced my knowledge of the subject.	4.19	84.6

Student Feedback

In addition, based on the five constructs stated above, interviews were conducted via the chat room, as means to engage in one-on-one dialogue in the least formal flair. This approach was effective as it encouraged students to elaborate their thoughts in the least intimidating manner. Table 2 presents the list of feedback (unedited) the students had written in response to the open-ended questions posed to them.

Table 2 Student feedback of the web-based environment

		WEB
1	**Learning Motivation**	• I can access it wherever I wanted to. • Web method more easier way, able to access anytime, anywhere. • I prefer to use Web method because I am very bad in communication and quite blurry. • I love to get tutorials from the internet. Easy to catch up. • I always browse website for learning tutorials. • I have not used the web much except for referencing and reading of certain topics. • Web method is most of the time behind some monitor. • Not motivated because I am always by my pc so when I come to university and have to sit at a pc again…it sort of bugs me out. • I tried to open it when the connection is bad and it takes a very long time • It is way more interesting than bloody boring power point slides. • It is helpful cause it is boring just hear the lecturer talking in front. • I have more time to read the information. • Yes I enjoy the module because I am not alone anymore with the module. • (Web) It makes the learning process non-linear. • It enhanced my interest factor. • It makes me want to know more.
2	**Content**	• Clear and organised I was able to learn. • Language is simple and easy to understand • Info is clear and easy to understand. • It was presented nicely and really organised. • Yes, it is summarized. The point is already highlighted. • I was able to understand the content because we can see a lot of examples there. • Visuals help me understand more cause I can understand and visualise the related topic. • I have enjoyed the web because it is more fun than reading long notes or going through 5 slides just to explain 1 thing. • Though brief, I found out that whatever topics to be covered are there. • Good enough to remember • Sorted out by points. Therefore easier to find keywords. • Very useful and enough for basic understanding of the subject.
3	**Navigation & GUI**	• The GUI was nice, clean, simple and to the point. • The GUI has clear direction and clear links. • It was clear in its direction and purpose in directing our attention further on

		the module. • The navigation helps me to go back and forth whenever I want. • The web module allows me to learn because I am a slow leaner. So I might take longer time than others to learn something. • Web allows learning in my own pace. Since I am quite lazy, the pace is slower. • It makes learning process non-linear. • Easy to understand and user friendly. • Suitable, no hard to understand icon. • Suitable, easy to see where to go next. • Learning in my own pace.
4	**Multimedia & Interactivity**	• There's not much text to bore me and many visuals to interact with which is fun. • Allows us to learn more and the multimedia element really helps a lot. • Am motivated as my eyes are interacted with something fun. • The interactive features will lock the information that I just read in my mind longer. • The interactive features give a deep image in my mind after study. • Interactive features are useful as it helps me understand the topics. • I can not only see, I can hear and I can feel in a way. • Want to click on it (curiosity) because of the illustrations. • Videos takes long time to load. • I try to open it with the connection and it takes a very long time. Motivation depends on the connection. • The Web module is fun and enjoy the study but the interactive is very heavy to load for those who using low speed internet. • I was able to understand the content because we can see a lot of examples there. • Best features - animated graphics. • The MM elements manage to make me think further ahead than visual. • The Interactive features act as a sidekick wherever you are in trouble. • There are pictures for easy understanding. • It was more interesting to learn where there's interactivity involved. • The Web makes me want to click (on curiosity) because of the illustrations. • MM helps me visualize the content better. • The use of graphics and animation samples really helps. • The external links and animations are helpful.
5	**Web Features (chat access, email and links)**	• The best features of a web module are the external links. The external links and animations are helpful. • Yes I enjoy the Web module because I am not learning alone anymore. • Worst web features-downloading

DISCUSSION

1. Learning Motivation

The students' perceptions on the use of multimedia and interactivity were very positive. Students agreed that learning with interactivity and multimedia was interesting and engaging; at the same time they found this method of learning useful and favourable. The motivation in the Web was high with m=4.00, p=92.3 (see Table 1 line 1). Some of favourable comments were "*Web method more easier way, able to access anytime, anywhere*" and "*It is way more interesting than bloody boring power point slides*" (see Table 2, under Learning Motivation).

While the overall implementation of the Web-based learning garnered positive numbers in learning motivation, there were some reluctance as pointed out in the students' feedback. "*Web method is most of the time behind some monitor"* and "*I tried to open it when the connection is bad and it takes a very long time"* (see Table 2 on Learning Motivation under Web) were some examples.

2. Content Presentation
Screen information was appropriate as the following data suggest; Web m= 3.88, p=80.0 (see Table 1, Line 6). Acquiring preference for conciseness, students noted brevity of content as very influential to their learning; *"It was presented nicely and really organised"*. Another said, *"Language is simple and easy to understand"* (for more student comments on this area see Table 2 under Content).

3. Navigation and GUI
In Table 1 (Line 12, m=4.35, p=92.3), the results show that the students found it easy to navigate in the module which was also supported by their comments such as "*Easy to understand and user friendly"* and "*The GUI has clear direction and clear links*" (see Table 2, under Navigation and GUI).

As a techno-savvy generation, these students suggested that they were comfortable with the characteristics of non-linear learning and are adaptable to more complex structures. Such was reflected in a respondent's feedback, *"it makes the learning process non-linear"* (for more student comments on this area see Table 2 under Navigation & GUI). The students also commented that they enjoying learning at their own pace, especially those who consider themselves slow learners. One student commented "*The navigation helps me to go back and forth whenever I want*" while another stated very clearly "*Learning in my own pace"* (see Table 2 under Navigation & GUI).

There has been confidence in self-paced learning among the respondents. Students have shared fondness for liberty of time and control over their learning tasks and that they are able choose to proceed, pause or retrace anytime they wish or feel ready to. For some, this feature was exceptionally helpful as they do not have to catch up with other students or the lecturer in order to sustain personal learning and understanding. Hence the students' feedbacks include *"Web allows learning in my own pace"* and "*The web module allows me to learn because I am a slow leaner. So I might take longer time than others to learn something*" *(*see Table 2 under Navigation & GUI for more student responses).

4. Multimedia & Interactivity
The use of graphic visualisations and multimedia for presentation of information received encouraging responses. 96.2%, of the respondents agreed to the notion "*I found the graphics and multimedia useful in visualising the concepts*" (see Table 1, Item 15, Web m=4.35, p=96.2). One commented, *"The interactive features give a deep image in my mind after study" ."* (see Table 2 under Multimedia & Interactivity). The effectiveness of multimedia and interactivty as a learning medium clearly supports knowledge transfer and at the same time promotes engagement in learning which surpasses its status quo of a mere tool of delivery. Many students had reported high interests resulting from enriching multimedia experience hence harnessing ownership in self-learning. This was reflected in some responses such as *"It was more interesting to learn where there's interactivity involved" , "Want to click on it (curiosity) because of the illustrations"* and *"The interactive features will lock the information that I just read in my mind longer."* (see Table 2 under Multimedia & Interactivity for more student responses).

5. Web Features
Whether it was online chats, web links or the variety of resources made available, students felt that the Web features were helpful for learning. *"External resources via the web links reinforce knowledge of the subject",* said the respondents. The following data confirmed the comment; m=4.19, p=84.6 (see Table 1, Item 21). A student said, *"The best features of a web module are the external links. The external links and animations are helpful"* (see Table 2 under Web features). A very interesting insight from a student had revealed how the Web can help him to participate in a communal learning experience. In his response, *"Yes I enjoy the Web module because I am not learning alone anymore."*

CONCLUSION
In general, this study have found that interactive learning using this Web-based environment is feasible and is a viable alternative to the traditional classroom which has proved to be limited in achieving the necessary needs of the students in the modern learning context. Students were positive towards active learning and were confident in enforcing self-paced strategy. This is a viable learning strategy and should be encouraged by educationists.

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