

mPatch

Microlearning Application in a Multimedia Environment to Enhance Students Learning

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Abstract: Lessons are often being taught in a long length of information, which leads to the concern of holding and capturing considerable attention from the students' and having them to engage throughout the lesson. This paper presents the development of microlearning application in a multimedia environment built within microlearning dimensions and outlined by Gagne's Nine Events of Instruction to enhance learning understanding amongst undergraduate students. Student feedback was gathered and indicated a positive response towards the microlearning approach found within the multimediariched environment. Students' motivation, understanding were enhanced in the learning environment, which supports the use of microlearning application through web and mobile devices access in a technology integrated classroom in higher education institutions.

1 INTRODUCTION

Technology innovation has shown to improve the education landscape. Teaching and learning have been introduced in a variety of approaches using multimedia tools and web-based platforms to accommodate wider learning scopes beyond the classroom. However, lessons are often being taught in a long length of information which leads to the concern of holding and capturing considerable attention from the students' and having them to engage throughout the lesson (Castell and Jenson, 2004). In using technology integration in our class, mobile devices as multimedia platform application lacks of proper guideline to assist students throughout learning. Lectures are still in long length even after it has been brought over to smaller sized screen such as mobile phone and tablet. This has contributed to the study to look into using microlearning application in a multimedia environment incorporated with an instructional outline of Gagne's Nine Events of Instruction to motivate and enhance students' understanding in their learning process. This study seeks to investigate adapting Gagne's Nine Events of Instruction (1985) within microlearning learning environment (mLe), as lesson are often taught in long length and holding considerable attention from the

students. Therefore, the objective of this research is to develop a microlearning application using Gagne's Nine Events of Instruction (1985), to investigate students' perception towards the microlearning application in their learning process and to list key factors of using microlearning to enhance students' learning process.

2 CONVENTIONAL LEARNING AND ATTENTION SPAN IN CLASSROOMS

With the current technology advancements, learning is still being taught conventionally in class and lecturers remain to be the main facilitator and would have full control over the content delivery. Given the traditional setting of a classroom, long length of information in the form of text is commonly used during lessons delivery in class. As according to Wilson and Korn (2007), students experienced a decline in attention in the first 10 – 15 minutes when the lesson begins. Hence, this contributed to the concern of gaining and maintaining students' attention throughout the lesson (Silapachote and Srisuphab, 2014).

2.1 Multimedia and Educational Technology

The emergence of 21st century technology has advanced mobile devices, web-based platforms and internet connectivity that allows innovations to take place in every aspects of education. These tools are used to enhance teaching and learning process, which include providing information, for example curriculum contents and online notes, facilitating 'student-teacher' and 'student-student communication', and also connecting students to a large volume of information from anywhere around the globe. Media elements such as graphic, animation, audio and video are seen as growing components commonly used in classrooms to make learning process more enticing for the students.

2.2 Microlearning

Microlearning was introduced from the concept of micro content in the understanding of learning, education, and training. Dimensions on determining a microlearning environment includes small units, narrowed down topics, short in duration, and bite-length contents (Hug, 2005). Net Generation (millennial) is more in tune with current technology such as mobile devices and social media as compared to the previous generations (McMahon and Pospisil, 2005). Therefore, this is a contributing factor of why microlearning has gained a distinctive place in the digital workspace and ubiquitously found within any mobile connectivity, where information can be delivered online, in small sized, and at the learner space and time. A few implementations of microlearning practices in communication technologies has been used in the teaching and learning process, i.e. short message service (SMS) and e-mail (Hug, 2005). According to Hartley (2010), microlearning can be used to challenge students' knowledge and to reflect on what they have learned during the course. However, learning a more complex set of skills will require more time and hands on practice such as learning a musical instrument, a new software, and learning teamwork or managerial skills.

2.3 Gagne's Nine Event of Instruction as Instructional Design Theory

Instructional design is referred as a discipline that aims to strategize learning material and information resources to encourage learning. Gagne's Nine Events of Instruction has developed a systematic way of designing instruction and has been shown to effect

high levels of engagement in learning and is considered a seminal model for developing instruction. Gagne's Nine Events of Instruction has developed effective outline to an instructional module which firstly suggests that learning has to begin with gaining the students' attention. Followed by informing learners of the objective and stimulating recall of prior knowledge as to set learners expectations and later to reflect learning itself. Next, students will go through the learning process with the content presented in the module and an opportunity to evaluate their knowledge and skills by practices with feedback with for each learner's outcome. This helps the learner to gain satisfaction and confidence in assessing their own capability and lastly help learners to strengthen their understanding and enhance retention.

3 METHODOLOGY

An interactive microlearning multimedia environment module was developed to assess students' perception, attitude, and their learning performance. Participants were a group of undergraduate students (n=51), within the same course, taking a particular subject. These students were given pre-test and post-test to assess academic outcome, Likert-scale survey to measure the students' attitude attached together with 5 open ended questions and a focus group interview further investigate their responses.

3.1 Development of the Interactive Microlearning Environment with Gagne's Nine Events of Instruction

The learning content developed consists of microlearning dimensions (Hug, 2005), incorporated with Gagne's Nine Events of Instruction (1985). The interactive microlearning environment is named 'mPatch' as a Microlearning Environment (mLe). The content for the mLe development are selected subtopics entitled "White Space" and "The 2:3/1:3 Rule" from the Web Design class which is an actually class syllabus taught in Faculty of Creative Multimedia. Students were demonstrated with the mLe modules after they have gone through the subtopics' lecture in class. Next, an URL was then distributed to each of the students for them to access the mLe modules anytime, anywhere at their own convenience using their computer, or mobile devices such as smartphones, tablets and iPad. These mLe

modules were designed with the use of Adobe Creative Suite software's. Gagne's Nine Events of Instruction (1985) were adapted and incorporated into the mLe modules. These principles were presented in the modules designed for the students to learn from:

- **Gaining attention:** A short animation of the 'White Space' title at the beginning of the video was used to attract students' attention.
- **Inform objective:** Students were then informed of the objective and outcomes to help them understand what they will gain in completing the mLe module.
- **Stimulate recall of prior learning:** This event was to help students make sense of the information or reflecting it to something that they have learned in class. From the mLe module, students were asked of questions about their understanding of the subtopic.
- **Present the content:** Content were shown and demonstrated in a form of a short interactive video, which consist of text, narration, graphics and animation to explain 'White Space'.
- **Provide learning guidance:** In the mLe module, visual images and examples were mainly used to provide learning guidance for the students.
- **Elicit performance:** A set of interactive questions were asked within the video. The video will pause and students can answer accordingly, allowing them to practice their understanding.
- **Provide feedback:** The students then received immediate feedback for every correct or

incorrect answer. From this, student can assess and facilitate learning.

- **Assess performance:** In assessing performance, a post-test was conducted to check knowledge mastery.
- **Enhance retention and transfer to the job:** Students can then share the video for discussion with peers. A list of link was included at the end for further references.

Figure 1 shows a conceptual design of the students' learning process in this environment. A part of the mLe module as shown in Figure 2 enabling students to practice their understanding before they can proceed to the next part of the video. This part is followed by a feedback upon right or wrong answer to the quiz including an explanation to help them evaluate their knowledge and deepen their understanding.

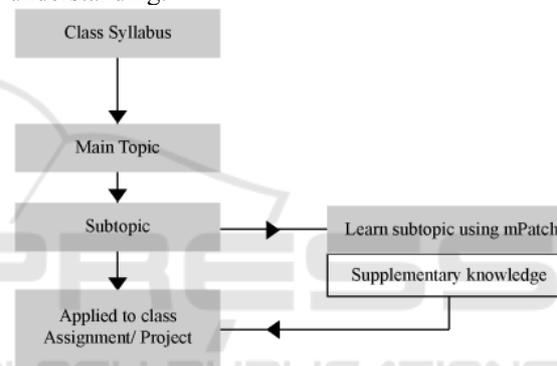


Figure 1: The student's learning process in the mLe.

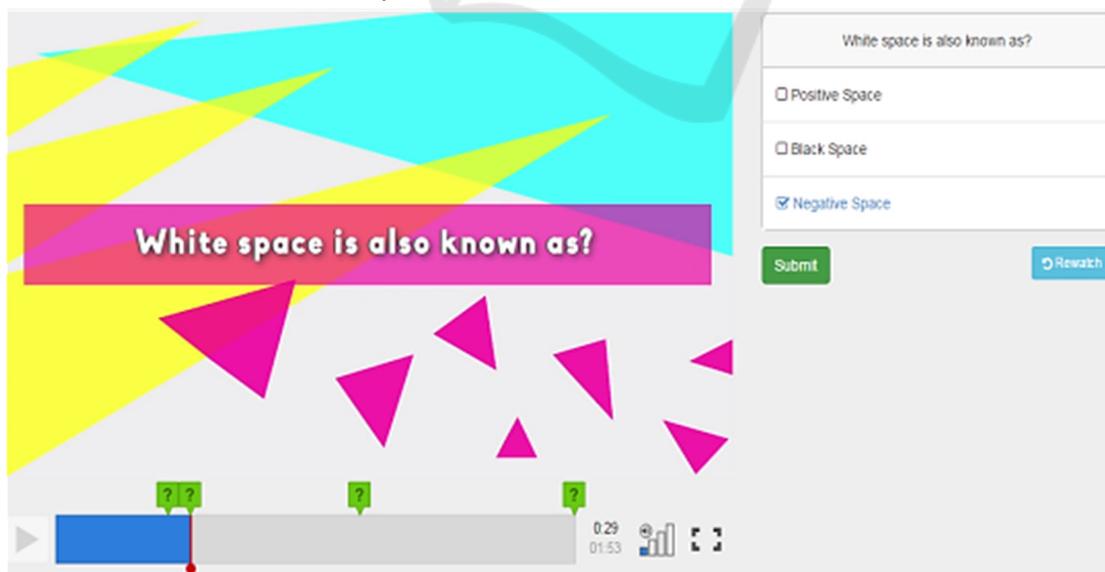


Figure 2: A screenshot of Gagne's instruction event 6, 'eliciting performance' is shown. Students were given a set of questions within the video to practice.

3.2 Students Learning Outcome: Pre-test and Post-test

Results from the pre-test and post-test are analysed and shown. This includes the mean and standard deviation generated from students' score from the test. This is to identify whether there is a statistically significant improvement in the learning. Followed by the descriptive statistic for each survey questionnaires collected. Table 1 shows the results of the pre-test and post-test collected. Result shows that students scored a higher mean of 9.16 after going through the mLe module before taking it (mean = 7.20), which indicates an increase in understanding of the content. A paired sample t-test as 95% confidence level was also conducted in order to measure the significance of the 1.961 change in the score. These results suggested that students' learning outcome was statistically significant ($p < 0.05$) and was at satisfying level. This indicates that the students' learning outcomes were enhanced after using the mLe module.

Table 1: The statistical data from pre-test and post-test results from the mLe.

	Paired Differences				
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Differences	
				Lower	Upper
Pretest-posttest	-1.961	2.391	.335	-2.633	-1.288
Pretest score	7.20	1.866	t	df	Sig. (2-tailed)
Posttest score	9.16	1.255	-5.856	50	.000

3.3 Students' Perception and Attitude Evaluation: Survey

Students' responses on the Likert-scale survey distributed were collected and analysed. From the result, selected mean from the overall responses and the accumulative percentage of 'Agree' and 'Strongly Agree' of respective statements from the survey are presented in a descending manner. Students who answered positively, from 4 and above (Mean) on the scale are shown in Table 2. These results are then clustered into 5 categories: motivation, mobile, microlearning, multimedia and interactivity, and content.

Table 2: Descriptive statistic result for survey.

No	Surver Items	Mean	(%)
1	The content was simple and straightforward	4.24	84.5
2	I was able to learn on the go	4.14	84.5
3	The module helped me to reflect what i have learned in class	4.14	86.2
4	It didn't take me too long to finish my module	4.12	82.7
5	I had no problem going through the module on my own	4.12	84.5
6	The content was brief enough for me to understand	4.12	84.5
7	I was able to assess my progress within this module with the 'Quiz'	4.07	81.1
8	It did not take me much effort to understand the content of this module	4.03	79.3
9	The short, engaging content in the module gave me confidence in my learning	4.02	82.7
10	I was able to understand better with the video demonstration	4.02	79.3

3.4 Student Feedback

Feedbacks from both open-ended questions and interview sessions were recorded to further solicited deeper and richer understanding towards students' perceptions and personal experience after learning the subtopics via the interactive learning environment. A selective of feedbacks reflects students' perception and attitude towards the learning module are shown in Table 3.

Table 3. Selective student comments on interactive microlearning environment module.

No	Student Comment
1	<i>Easy to understand and simple.</i>
2	<i>It is easy, efficient and effective. Makes the topic interesting.</i>
3	<i>Makes it easier to understand a certain topic.</i>
4	<i>It is a fun way of learning because we can answer the question on the phone.</i>
5	<i>It is very convenient to learn the topic while on-the-go.</i>
6	<i>I liked it as it is accessible on phone and laptops...</i>
7	<i>It's really good because it is important and short and simple so that it is easy for the students to repeat and catch the important things.</i>
8	<i>It is very straightforward and helped me to understand the content better.</i>
9	<i>I think it is more interesting than normal slides because if I study myself I will be very boring.</i>
10	<i>...I had a few information that was easy to memorize.</i>
11	<i>...I think that's a good way to reflect our understanding regarding the subject itself.</i>
12	<i>Quiz helped me recall what I have learned in class.</i>

4 DISCUSSION AND CONCLUSIONS

From the overall perception obtained, students acknowledged features surrounding 5 categories; motivation, microlearning, multimedia and interactivity, content and mobility. The mLe module had motivated them to learn more of the subtopic and that it has helped them to understand better supplementing as a quick revision. For microlearning, students like the small-sized information included and find the mLe module easy and fast to learn with. The portability of accessing via mobile has encouraged students to learn anytime, anywhere conveniently. The idea of including multimedia and interactivity elements within the module has found to be enjoyable and engaging throughout the learning process.

Based on item 1, the responses ($M = 4.24$) have shown the mLe module was overall simple and straightforward. Student reported that it did not take much effort nor time for them to understand the content within the module (Item 4, $M = 4.12$ and Item 8, $M = 4.03$). In term of microlearning, 84.5% of students found the content were brief enough for them to understand (Item 6, $M = 4.12$). With regards of the mobility, responses for Item 2 ($M = 4.14$) shows students agreed that they were able to learn on the go. Furthermore, students have shown positive feedbacks towards the use of multimedia and interactivity elements found within the module. This is shown by the responses obtained from Item 10 ($M = 4.02$) indicating students' likeability towards the use of video within the mLe module. Students perceived the short, engaging content in the module gave me confidence in my learning, shown by the responses collected for Item 9 ($M = 4.02$). From the results, it is clear that the students accepted and moreover, were likeable towards the mLe modules as a part of their learning process. In term of content, a high majority of 86.2% students reported that they were able to reflect what they have learned in class (Item 3, $M = 4.14$) and that they were able to assess their own progress in understanding the content within the module (Item 7, $M = 4.07$). From result Item 5 ($M = 4.12$), it shows that student agreed that they did not have any problem in going through the module on their own.

Overall, this study has suggested that microlearning application with the incorporation of Gagne's instructional model within a multimediariched environment is a working strategy to enhance students' understanding in their learning process. In addition, critical factors of using

microlearning application within the learning process were determined; (i) microlearning was effective as a fast learning approach and; (ii) microlearning increased comprehension; (iii) motivation is as an important outcome of the mLe modules; (iv) Gagne's Instructional Events exist and was an effective instructional design for the module; (v) multimedia and interactive elements were effective components as a part of student learning process; (vi) mobile was an acceptable and still growing learning platform. The mLe module has provided a platform for learning to take place anywhere and anytime as it allows students to access the class content via resolutions fit to be viewed on computer or mobile devices.

However, a number of unavoidable limitations have been recorded along the study, which includes internet connection for the use of accessing the module. Some students faced difficulties to access the module especially when the module was conducted in class due to unstable internet connection within the campus. Despite of that, students were given a duration of time to access and explore at their own leisure time after class. Besides, another limitation found was that not all of the students had the advantage to own a personal smartphone or a tablet. Identifying an instructional strategy well suited for microlearning application in a multimedia environment for better learning outcomes was an aim of the study. The learning module was developed with a suitable instructional model, adaptable with the microlearning dimensions and practical within a multimedia environment in particularly for mobile devices platforms. The research outcomes also show that the instructional design can exist in a microlearning environment and that the students had positive feedbacks towards the application. This is supported with the significant improvement in the students' learning performance via the mLe modules. In this study, we have incorporated Gagne's Nine Events of Instruction (1985) within microlearning application (mLe) and investigated students' perception towards the microlearning application in their learning process and listed key factors of using microlearning to enhance students' learning process. As a conclusion, microlearning application in a multimedia environment with the incorporation of Gagne's instructions as a practical strategy in enhancing understanding and increase the effectiveness in learning

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