Internet messenger based smart virtual class learning using ubiquitous computing

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Abstract. Internet messenger (IM) has become an important educational technology component in college education, IM makes it possible for students to engage in learning and collaborating at smart virtual class learning (SVCL) using ubiquitous computing. However, the model of IM-based smart virtual class learning using ubiquitous computing has empirical evidence that would favor a broad application to improve engagement and behavior are still limited. In addition, the expectation that IM based SVCL using ubiquitous computing could improve engagement and behavior on smart class cannot be confirmed because the majority of the reviewed studies followed instructions paradigms. This article aims to present the model of IM-based SVCL using ubiquitous computing and showing learners' experiences in improved engagement and behavior for learner–learner and learner–lecturer interactions. The method applied in this paper includes design process and quantitative analysis techniques, with the purpose of identifying scenarios of ubiquitous computing and realize the impressions of learners and lecturers about engagement and behavior aspect and its contribution to learning.

1. Introduction

The idea of a smart campus today is incredibly powerful. Smart campus has been widely accepted and used in strategy of education reformation in several countries in the world for improving the quality of the campus learning environment[1]. With the adopted of technological development of smartphone technology, smarter campuses are built to benefit the lecturer and learner, manage the available resources and enhance user experience with proactive services anytime and anywhere[2].

Within the context of smart campus, technology of smartphone devices can be used to support teaching and learning in ubiquitous environment through Interactive internet messenger (IM). Some examples of IM in educational activities are content generating, interacting, collaborating and sharing [3][4], Content generating occurs when affective interaction and developing Question and Answer sessions. This application is designed to provide a platform for learners to share their knowledge, broadcast news, and asks for help [3][5][6]. Member are able to share or publish their work and ideas by message for others to view and download. For example, multimedia and documents (like pdf, ms. Office product) files can be shared with message[3][7]. IM can be used by learners to collaboratively learn how to solve problems with members of a group, or to organize collaborative learning and study groups[3][4]. By collaborating, learner extends their interactions by establishing active communication with their peers, with the aim of working towards particular outcomes.
Many researchers have discussed and focused on the infrastructure required for constructing smart campuses and applications that related to learning at ubiquitous environment, in [8] have proposed a framework specification for u-learning in a smart campus model that integrates real world learning resources with a social network of campus. This model aims to embed of learners within a smart campus environment that provides context based personalized learning and interaction or feedback, in [5] has designed and implemented a prototype system based OnCampus scheme. The model developed in three functional modules, namely Group, Transaction, and Forum modules to provide services related to learning. The model OnCampus can significantly contribute in the following: through the creation of social environment based on interests mining, the equipping of educational guidance based on emotion analysis, as an information sharing platform, and by developing a secondary platform that aimed at the optimal allocation of campus resources, in [9] has proposed an adaptive contents delivery model for context aware ubiquitous learning according to three level service models, which create the adaptive contents for learners to get a all access in learning according to learners’ interest and contexts. The evaluation of a Ubiquitous learning system shows that the learners may not only study in media on mobile device at anytime and at any place and also get a better learning experience, e.g. Learners may get instant help from other participates with ubiquitous device and access the rich contents.

The majority of mobile and u-learning model studies showed positive effects. However, the IM based SVCL using ubiquitous computing and empirical proof that would favor a broad application of mobile technology devices and ubiquitous learning in smart virtual class settings to improve engagement and behavior is still limited. In addition, the expectation that mobile learning could improve engagement and behavior on smart virtual class cannot be confirmed because the majority of the reviewed of studies followed instructions paradigms. This paper aims to design and implement and showing empirical evidence about IM based SVCL using ubiquitous computing to improve engagement and behavior for learner–learner and learner–lecturer interactions on smart campus. The method applied in this paper includes model design process and quantitative analysis techniques, with the purpose of identifying scenario of the project and realize the impressions of learners and teachers about the engagement and behavioral aspects, and its contribution to learning.

2. Literature review

2.1. Ubiquitous Computing on Smart Virtual Class Learning (SVCL)

Education in a smart virtual class supported by mobile and smart technologies, making use of smart tools and mobile devices, can be considered smart education with ubiquitous environment. In this respect, we observe that novel technologies have been widely adopted in campus for provides connectivity between learners and their surrounding environments. For learners, learning goals is inherently identified to trigger didactic models which guide their instruction around real world data, based on unique learning contexts and delivered with the right information, at the right time, at the right place, at the right way, to the right person[10]. This is a new enhancement for academic from pedagogical processes through which learning is diffused just in one time like a process of production, when learner are ready to achieve a targeted level of instruction.

The smart campus environment provides such settings of ubiquitous learning in which virtual and electronic resources are made available through smart and mobile devices that help learners navigate the real and the surrounding physical world[5] learning happens all around the learners without any conscious effort on the part of the learner. The learning process as ubiquitous learning doesn’t restrict to be in the classroom or formal learning environments. On the contrary, the learning involves situating learners in both the real and the virtual world to extend learners’ learning experiences[11]. Therefore, ubiquitous learning on smart campus must provide learners with opportunities to learn in their own environment, with another term, selecting and using the proper equipment for their work and with their living experiences.

The Development concept of SVCL and ubiquitous computing in educational scenarios is very broad and new challenge for research. This approach can also be defined as: processes supported by the use of
smart and mobile device technology to integrate learners with their learning context and its surrounding environment, so that it can support an ongoing, contextualized and useful learning to the learner[12]. As for systems designed to support learning should have the following characteristics[13]:

- Permanency: The content of learning information remains except the learners purposely remove it.
- Accessibility: The content of learning information has been always available whenever the learners need to use it.
- Immediacy: The content of learning information can be retrieved with immediately by the learners.
- Interactivity: The learners can communicate with peers, lecturer, and experts with efficiently and effectively.
- Context-awareness: The learning environment can adapt to the learners like a real situation for providing adequate information for the learners.

Finally, the challenges of a ubiquitous computing system go beyond providing the information in any time or place, as they also aim to provide the right information at the right time and the right way. Considering these aspects, the system must be able to survive and play a key role.

2.2. IM based smart virtual class learning using ubiquitous computing

The Enhancement of smart devices based on mobile group communication technologies becomes one of the important factors that brings into new various services on campus. Internet Messenger (IM) can be used an alternative approach to smart campus based learning environment, IM has a series of attractive features, including multiform messaging (e.g., Document, image, audio, and video), instant access to messages (e.g., Timely transmission, recordation, storage media and retrieval of messages over the Internet), move quickly cross device sharing (e.g., PC, tablet, and smart phone)[6].

Interaction in IM provides a mobile group communication service among members of the campus community and divides the campus into small regions, if a group member send a message to a group, the member sends the message to the IM server and then the server forwards it towards the each of a group members. This interaction makes the IM as an essential component of the learning process. In the u-learning environment, interaction among participants is a crucial concern to lecturer and learner[14]. As a complex and multifaceted component, interaction provides a diverse range of functions in u-learning, and is vital for effectively improving learning[14]. Some researches indicated a positive effect of interaction on learners' academic achievement and performance as well as their satisfaction[15].

2.3. IM to improve engagement and behavior

The engagement concept of learner and lecturer is an important concern in in the learning process at the campus. Some literature used term of engagement to indicate readiness for devotes considerable energy to studying, desire and compulsion to actively participate in everyday campus activities involving things like attending to classes, participates actively in learner organizations, adherence to lecturer's directives in the class like submit a report of progress or assignment[16][17]. Learner engagement includes both the academic and non academic activities and when get more engaged in campus experience, it tends to generate high quality learning[18].

The rapid development of IM like whatsapp, Catfiz, facebook messenger has sparked the creative incorporation of media into current pedagogical application and processes, this technology are rapidly moving beyond their original purpose and significantly increased, even impact on learner’s collaboration and engagement[19]. At the lecture course, the lecturers devise instruction between a direct presentation and via IM, which is physically closer, provides a more individualized way of displaying information for learners, thus contributing to the improvement of learning efficiency and learner engagement when the specific instruction is aimed to encourage learner-centered activities[20].

This literature review examines the link between interactive internet messenger group to be used as a medium for ubiquitous learning in order to improve learner engagement and behavior on a smart campus. The concepts of cognitivism and constructivism were introduced as the foundation paradigms
are important to this study. Secondary theories embodied the issues of learner motivation; learning styles; the special needs of learner on campus; and interactive learning in the campus setting. In research has shown collaboration, active participation and learner-centered and most importantly for this study is the model of ubiquitous learning using IM stimulates learner interest and attention leading to increased motivation and engagement during lessons. The college learner engagement, as evidenced by behavior during lectures, is an essential component in learning. Incorporation of technology into campus instruction not only kindles attentiveness learner, satisfies the accommodation of learner needs, and use instructional strategies that are consistent with the application of innovative technologies available today, but also complies country mandates about use of technology in education.

3. Approach and methodology

In this section will be discussed about methodical approaches to modeling of IM based SVCL using ubiquitous computing to improve engagement and behavior for smart campus. In describing the methods used to conduct this research, the model design of IM based SVCL using ubiquitous computing, participants, data collection and analysis will be discussed and follows the guidelines of quantitative research technique[21]. In general, the main purpose of this research was designed and implement and showing empirical evidence about IM based SVCL using ubiquitous computing to improve engagement and behavior for learner–learner and learner–lecturer interactions on smart campus. To further enhance the credibility of the research, standardized observations of classes were conducted. Data collected from the source using a questionnaire that includes a semi-structured questions and express an opinion, and threats to validity were managed as closely as possible.

3.1. IM based SVCL using ubiquitous computing Model

This modeling technique adopted to purpose development of scenarios and conceptual design of the u-learning environment as illustrated in fig. 1, the scenario shows that a learner can learn in the ubiquitous learning environment, Notifications and adaptive learning support messages are sent to learners by IM on the group, like illustrated in fig. 2. The learner can use the smartphone or mobile devices to perform learning tasks quickly. Moreover, the model of learning system can be recommended by lecturers to learner to consult on their learning problems by IM.

![Figure 1. Scenario and conceptual design of the u-computing environment](image)
The platform based on IM provides learners and lecturer with an interactive learning environment using a combination of multimedia communications (e.g., Document, instant text, image, audio and video messages). It allows them to access, exchange and share their ideas so as to provide sufficient opportunities of interacting anywhere and anytime. In this model we designed a four-mode interactive mechanism for the platform. The first mode is to change a class for certain subjects into groups, lecturer as admin can assemble, organize and coordinate those groups by themselves, and the learner can join to group after registration and approved by the lecturer. The second mode is the scenario to post and circulate information using this platform, for example: lecturer transmit and distribute information like curriculum, syllabus, college contract and learning material. During online course, the learner can control what is distributed by the lecturer, the discussion pace and posting and demonstrate their own understanding or the result of the test or homework via text or visual media. The third mode is to track and record. When interaction exists between lecturer and learner, The IM platform automatically recorded all of feedback on every work from all learners and lecturer. The final mode is to conclude with brief remarks about the learners’ knowledge acquirement and achievement via self-report based on the feedback.

3.2. Participant
In 2015/2016, participants in this study were two lecturers of UIN Walisongo Semarang and 147 learners (80 Male, 67 Female) from five classes, they were enrolled form dakwah and communication faculty. The ages of learners ranged from 20 to 23 years and the class sizes ranged from 25 to 35 learners.

3.3. Data collection and analysis
The investigation of this research using a quantitative same-subjects approach for data collection through systematic direct group or class observations combined with a post study survey to assist in addressing the results. Because this was a same group class, subjects were exposed to both conditions in the research, instruction without model use (Control class), followed by model use during lesson instruction (experiment class), and use of the IM based SVCL using ubiquitous computing was the independent variable in this investigation, the dependent variable, student engagement and behaviour evidenced by their behavior during lessons and interaction.

After the socialization of learning model for students in the mid lecture on December 2015, next, an initial questionnaire was given to the whole class of 147 learners before the start of the experiment to find out if they owned mobile devices and whatsapp. Those who did not have smart phones were encouraged to to buy or merge with a nearby friend while those without whatsapp applications were
encouraged to download application and install them. While initially some students were slow in opening installs whatsapp application when they learnt from colleagues how they were easily accessed and communication with the group or their peer friend, they managed to create one for themselves. During the pilot program, daily activities of the group were facilitated by the lecturer that as a group administrator, moderator and driver to set the discussion or communication within the group, and researchers join in the group to monitor and determine the extent of use of the IM based SVCL using ubiquitous computing for engagement and collaboration between learner’s communities, learner and their lecturer. Just before the end of the semester, the evaluation questionnaire was used to collect data from the students to measure the impact of model on their engagement and behavior. Each participant was provided a questionnaire consisting of 22 items was designed. The survey contained questions regarding learner self-perception of their engagement during model use. The results of attitude survey were converted into a numeric system allowing calculation of mean scores for each question and for each learner. There were five-point Likert-scale items were used that ranged from 1 (strongly disagree) to 5 (strongly agree). Data aggregated into tables, from this information, an analysis was conducted to determine whether use of the model significantly affected learner engagement behaviors during classroom instruction, and whether the observed behavioral scores differed from the learners’ perceptions of the influence of IM based SVCL using ubiquitous computing use on their behavior.

Measurement of learner attitudes towards IM based SVCL using ubiquitous computing was obtained using an existing attitude survey modified by the researcher. There were a number of questionnaires about learner attitudes toward technology. There is the Computer Attitude Questionnaire (CAQ) a 65-item Likert-scale type instrument for measuring of learners’ attitudes was chosen by the researcher. Same item for measuring the importance and enjoyment of computer use were modified into an attitude survey to measure learner perceptions of the impact of the instructional technology being investigated, that is IM, and their perceptions about their enjoyment and its importance in groups instruction. This is a free instrument available online at https://iitl.unl.edu/content/computer-attitude-questionnaire-caq developed by The Technology Applications Center for Educator Development. There are 7 subscales measuring various learner attitude components, but only part 1 was used and it was modified by changing the word "computer" to "IM based SVCL using ubiquitous computing. This instrument has been tested and used extensively by researchers. The reliability and validity data of CAQ are provided as part of the survey packages conducted in 1995 by Knezek and Christensen with a population of five hundred eightylearner and eight seventh and eighth grades in Texas to determine stability of measurement for the instrument. This attitude survey was modified by the researcher for comparative analysis of actual actual learner behavior and their own perception of their attitudes towards the model.

4. Result
This section presents the results obtained from the model defined and implemented in order to develop u-learning model and analyze its impact in real environment, the results of the research based on the data collected and presented. Results are analyzed and presented in various sections below;

- Do you have a smart phone?
This question required for detection of participants to indicate if they had a cell phone and if so which type (for example, smart phone or normal phone). As shown in Table 1, 100% of the participants had a mobile phone and 85% of those devices were smart phone with the capabilities of accessing the internet, sending instant or multimedia messages, and other applications.

| Table 1. Mobile device ownership. |
|----------------------------------|
| Mobile device ownership          |
| 100% of the Students Own a Phone |
| Smart phone 85%                  |
| Normal phone 15%                 |
Do you have a whatsapp application?
With our research, it was important to find out the average number of participants that had whatsapp applications on their mobile phone. As represented in Table 2, the data show that 95% of the participants who have a smartphone, they also have a whatsapp application and 5% did not have and did not use whatsapp for personal reasons.

Table 2. Whatsapp application ownership.

| Mobile device ownership | Yes | No |
|-------------------------|-----|----|
|                         | 87% | 13%|

How often do you use your smart phone to chat with whatsapp application?
This question was directed at finding out how often students used their mobiles to access whatsapp for class-related matters like discussion with peer friends or consult with their lecturer before and after learning models included. It was important to find out the contribution of the learner while accessing whatsapp to ascertain the number of the learner who were active participation, or sometimes or those who were not participating at all. The results are presented in Table 3.

Table 3. Chatting with peer learner or lecture

|              | Regularly | Sometimes | Never did |
|--------------|-----------|-----------|-----------|
| Before       |           |           |           |
| With lecturer| 5%        | 11%       | 84%       |
| With Peer learner | 66%   | 23%       | 11%       |
| After        |           |           |           |
| With lecturer| 71%       | 21%       | 8%        |
| With Peer learner | 76%   | 17%       | 7%        |

Learns perceptions about benefit using whasapp
The learner was asked to specify their level of agreements or disagreements on a scale to measure of subject attitude. Learner self-perception of personal attitudes of IM based SVCL using ubiquitous computing was collected using the modified CAQ. The results are presented in Table 4.

On the information accessed on the whtasapp as shown in table 4. 74% either agreed or strongly agreed that they are enjoy classroom instruction in the model of IM based SVCL using ubiquitous computing, while 11% neutral and 15% either disagreed or strongly disagreed. Similarly, 79% of participants agreed or strongly agreed if IM based SVCL using ubiquitous computing can make concentrate better on the lesson and 67% agreed or strongly agreed if they are know how to interaction in model they will be able to get a good job. It is inversely with they are who tired in the IM based SVCL using ubiquitous computing as shown in table 4, 14% either agreed or strongly agreed, while 8% neutral position and 78% either disagreed or strongly disagreed.

On the issue of usefulness of IM based SVCL using ubiquitous computing for engagement (Table 4 Item 1, 3 to 11, 13 to 17, 19, 21 and 22) a large number of 78% of the participants believed that the IM based SVCL using ubiquitous computing helped them to engage and be informed about the module in and outside the classroom. 11% neutral position and 11% disagreed.

The results of this observation and investigation showed that the IM based SVCL using ubiquitous computing use has a positive effect on the behavior of all learners, thus, on their engagement with the ubiquitous learning environment. Overall, learners were aware of the positive impact of IM based SVCL using ubiquitous computing use on their engagement in ubiquitous classroom instruction. They regard
positively, and this was evidenced by their task behavioral improvement. The investigation data showed general improvement in student behavior which translates into improved student engagement.

Table 4. IM based SVCL using ubiquitous computing Attitude Survey Results

| No | QUIZ                                                                 | Strongly agree | Agree | Normal | Disagree | Strongly disagree |
|----|---------------------------------------------------------------------|----------------|-------|--------|----------|------------------|
| 1  | I enjoy classroom instruction in the IM based SVCL model using ubiquitous computing | 32%            | 42%   | 11%    | 7%       | 8%               |
| 2  | I am tired in the IM based SVCL model using ubiquitous computing   | 7%             | 7%    | 8%     | 46%      | 32%              |
| 3  | I will be able to get a good job if I know how to interaction in the IM based SVCL model using ubiquitous computing | 33%            | 34%   | 21%    | 9%       | 3%               |
| 4  | I can concentrate better on the lesson in the IM based SVCL model using ubiquitous computing | 38%            | 41%   | 12%    | 7%       | 2%               |
| 5  | I would work harder if in the IM based SVCL model using ubiquitous computing | 25%            | 49%   | 13%    | 7%       | 6%               |
| 6  | I know that the IM based SVCL model using ubiquitous computing gives me more opportunities to learn new things | 42%            | 37%   | 12%    | 7%       | 2%               |
| 7  | I understand the lesson better when the IM based SVCL model using ubiquitous computing is used | 36%            | 39%   | 12%    | 9%       | 4%               |
| 8  | I believe that if more teachers used the IM based SVCL model using ubiquitous computing, I would enjoy school more | 38%            | 38%   | 11%    | 7%       | 6%               |
| 9  | I believe that it is important for me to be able to use technologies such as the IM based SVCL model using ubiquitous computing | 47%            | 35%   | 9%     | 6%       | 3%               |
| 10 | I can learn new things when the IM based SVCL model using ubiquitous computing is used | 41%            | 36%   | 9%     | 9%       | 5%               |
| 11 | I feel comfortable in the IM based SVCL model using ubiquitous computing | 53%            | 32%   | 5%     | 8%       | 2%               |
| 12 | I think lessons take longer in the IM based SVCL model using ubiquitous computing | 3%             | 8%    | 3%     | 36%      | 50%              |
| 13 | In the IM based SVCL model using ubiquitous computing does not scare me | 43%            | 35%   | 10%    | 8%       | 4%               |
In the IM based SVCL model using ubiquitous computing does not make me nervous | 51% | 31% | 9% | 6% | 3%
---|---|---|---|---|---
In the IM based SVCL model using ubiquitous computing not difficult | 38% | 46% | 8% | 5% | 3%
In the IM based SVCL model using ubiquitous computing, I want to work and learn whenever I can | 53% | 31% | 5% | 8% | 3%
I work very hard on my schoolwork | 33% | 34% | 21% | 8% | 4%
I do not try hard in school | 5% | 9% | 14% | 46% | 26%
I pay attention in class | 27% | 47% | 13% | 8% | 5%
When I am in class, I just act as if I'm working | 4% | 20% | 46% | 21% | 9%
It is important to do my best in campus | 48% | 36% | 5% | 8% | 3%
I always try to complete my assignments | 47% | 35% | 8% | 7% | 3%

*The scoring scale for questions 2, 12, 18, and 20 was reversed*

### 5. Conclusion and Recommendations

The result of this research shows that the IM based SVCL using ubiquitous computing emphatically positive and can improve significantly on learner's engagement and behavior. Our analysis indicates that learners and lecturer, highly engaged in the learning process in ways transcended traditional classroom activities. The experimental evidence shows that IM based SVCL using ubiquitous computing can be used as an educational tool in smart campus to help learners to engage and collaborate. Therefore, we conclude that, IM based SVCL using ubiquitous computing could be effective for student to engage as well as succeed in their campus activities.

For future work, the opportunities exist for further studies in this area. Corporation between u-learning model with mobile learning or e-learning it is possible to be done to produce models more smart in order to create a smart campus dream, so the learning activities between students and professors increasingly interwoven dynamic and output is expected to have high competitiveness.

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