DEVELOPING A MOBILE APPLICATION TO SUPPORT STUDENTS' LEARNING WITHIN THE FLIPPED LEARNING PEDAGOGICAL MODEL

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Abstract

Flipped learning is a pedagogical model that has recently attracted the interest of many researchers globally. It is simply described as reversing the practices happening in a typical lecture with those performed at home by the learner. Even though flipped learning has benefited students compared to the traditional learning environment, some issues, such as low motivation prior to lectures, and engagement in tasks performed at home remain and still need improvement. This study sought to develop and assess a mobile application that support learners on time and enhance their motivation and engagement prior to lectures within the flipped learning settings. The main purpose of the study was to seek whether using the developed tool will help in increasing students' motivation to learn and raise their object oriented programming skills. Also the study assessed students' attitudes toward using the developed application in supporting their learning. Within the flipped pedagogical model, two groups of undergraduate students registered in a programing course at faculty of computer, Information Technology department were examined. The experimental group used the developed mobile application, while the control group was introduced to the normal flipped model. A comparison between the two groups was made using post application scores for motivation scale, and skills were measured by assessing the quality of their final projects. Finally semi-structured interviews were conducted with the students who experienced using the mobile application in their learning to gain more understanding about the acceptance of using the application. Paired sample test showed statistically significant differences on motivation in the sake of the experimental group. However no significance were found in programming skills between the two groups. Also students were found to highly favor using the application in out-of-class activities. Methodological and pedagogical implications were introduced.

Keywords: Flipped learning, Mobile application, motivation, programming skills.

Introduction:

The flipped model is an approach that helps in organizing time and structure as it enables students to be active learners to a great extent. It can be seen as an application of the student-centered instructional model rather than direct teaching model (Felder, 2012) which is actually based on the constructivist theory of learning where knowledge is socially constructed (Strayer, 2012). Thus, practices related to collaborative work, inquiry based learning and problem based learning take place in that new learning environment (Bergmann & Sams, 2012; Herreid & Schiller, 2013).

Flipped learning can be simply described as a pedagogical approach where teachers reverse the traditional lecture activities versus homework activities. In this approach, teachers provide students with lecture content in the form of videos that students watch at home to be prepared to attend in class. The allocated time of lectures is then used to work on in-class activities that are designed to allow students practice what they have learnt at home (Bergmann & Sams, 2012).

Redekopp & Ragusa (2013) found that the advantages of the flipped model lies in time spent in active-learning strategies and students engagements in various activities rather than just gaining conceptual and factual knowledge. This allows students to achieve higher-order learning outcomes and increase problem solving and modeling of skills.

Despite the advantages of the flipped leaning, there are some challenges associated with it. Many researchers claimed that students' motivation to learn can passively affect their achievement in constructivist settings (Liu,

Bridgeman, & Alder, 2012; Lopez-Perez, et al, 2011). No doubt that this applies to the flipped learning model as being part of a constructivist learning environment.

According to Green (2014) one of the challenges associated with the flipped learning is level of students' motivation and the resistance that creates for the students to be engaged in learning, where some students are not prepared well before attending lectures. He argued that this resistance leads the teacher to deal with two different groups in the class, some of whom may be unenthusiastic to actively participate in class activities. However, some strategies can be used to maximize the level of students' motivation while doing the pre-class work. Increasing pre-class activities and including formative testing or quizzes might be a good practice that leads to improving motivation (McLaughlin et al, 2013)

Nowadays, with the appearance of web 2.0 applications, delivering the content prior to lecture has become easier and more effective. Using podcasts and vodcasts for example has been found to be effective web tools in the flipped learning context (Herreid & Schiller, 2013). Such tools have raised the quality and effectiveness of produced materials as well as method of delivery.

New technologies like mobile technology can also be of a great support for the students to achieve the intended learning outcomes (Virvou & Alepis, 2005). Not only the power of this technology lies in becoming part of students' life (Muhlhauser & Trompler, 2002), but also lies in its enhanced power of running synchronous and asynchronous communication as well as its animated, stimulated and interactive multimedia capabilities.

That kind of technology fits well in the flipped learning model where students take more responsibility on discovering and learning new materials individually or in groups prior to face-to-face sessions. Using mobile capabilities in that particular part of the flipped is likely to raise the engagement of the students and motivate them to explore new materials and be prepared well before attending discussions, deliberations, and activities that run during lecture time. (Idrus, 2015)

Through mobile applications teachers can create online learning communities that can enhance students learning and motivate them in fostering core content individually or in groups. That is due to the affordances of online communities that offer the potential to provide clear purpose, flexible location, specific members' roles, and online as well as offline events (Kim, 2000). Greener (2015) added that the power of such communities is providing interactive support for learners, and opportunities to develop communication and collaboration between peers and teachers out of class time.

In that context, Barber (2015) argues that flipped learning can be strengthen with these characteristics when facilitated by technology and make learning convenient and accessible using mobile devices. In his findings, he concluded that creating online communities within the flipped learning model showed positive results on student's engagement, this is due to the fact that students felt responsible to one another to stay connected outside the class time.

Thus, it is recommended that teachers use such mobile applications in providing continuous support to students' learning and construct short messages that can develop good study habits while working out of class time (Idrus, 2015).

No doubt that the flipped learning model has proved to be a successful teaching method that can allow the student to be active and participate in class activities. However, many students still cannot benefit from that approach as they feel that they are not prepared well before attending the lecture. This problem may be due to many reasons related to the duration of learning, the quality of videos/materials presented to students in out-of-class activities and/or to what extent students can be responsible for investigating new learning materials by their own in an opposite didactic approach that they are used to for many years. Also this problem might reveal more when trying to teach programming skills.

Accordingly, the current study aims to investigate the effect of developing a mobile application to be used in out-of-class activities aiming to create a constructivist learning environment and provide continuous support to the students. This might increase students' engagement and raise their motivation to learn before attending the in-class

activities which, in turn, is expected to raise their programming skills in flipped learning settings. Also the study aims to investigate students' opinion in using the developed application in supporting their learning.

Methodology:

To achieve the previous aims, the researchers developed an android application that has the ability to keep students always connected to learning. The mobile application is meant to be used in supporting learners while working outside the lecture in investigating learning materials so that they will be ready to participate in lecture activities. The application is used as a platform that facilitates cooperative activities, peer interaction, instructor-student communication and instant support. It also provides easy access to videos and other learning materials.

The study sample (n=20) were chosen from the faculty of computer, Information Technology department. The students are undergraduate and registered in a programming course where students study about c# language. The sample was divided into two equal groups (experimental and control groups). Both groups studied the course using the flipped learning pedagogical model; however, the experimental group was instructed to use the developed android application. By the end of teaching the course the students were asked to develop their own projects using the c# programming language that they have learnt.

An adapted motivation scale and project evaluation checklist, were administered prior the start of the semester and after the treatment. However, attitudes of the experimental group were qualitatively measured using semi-structured interviews to gain more understanding about the acceptance of using the developed application.

As the sample size was small, statistical analysis for the collected data were done by applying both Wilcoxon and Mann-Whitney nonparametric tests for small groups.

Results:

To compare between the pre and post application of the research instruments within a single group, Wilcoxon test was used and indicated the following:

A Wilcoxon test indicated that the motivation scale mean ranks in the pre and post application in the control group were significantly greater in the sake of the post application where Z= (2.504) with significance level of (0.012). Also for the experimental group they were significantly greater in the sake of the post application where Z= (2.810) with significance level of (0.005).

As for the programming skills, a Wilcoxon test indicated that the project evaluation checklist mean ranks in the pre and post application in the control group were significantly greater in the sake of the post application where Z= (2.812) with significance level of (0.005). Also for the experimental group they were significantly greater in the sake of the post application where Z= (2.809) with significance level of (0.005)

To compare between the post-application of the research instruments between the two groups, Mann-Whitney test was used and indicated the following:

A Mann-Whitney test indicated that the motivation scale mean ranks were significantly greater for the experimental group than the control group, where p = (0.005)

As for measuring the significance in programming skills , a Mann-Whitney test indicated that there is no significance in programming skills between the post application of both the experimental and control groups where p = (0.315) which is greater than (0.005). However, the mean rank of the experimental group was (11.90) which is slightly higher than that of the control group (9.10). This might be related to the small sample size.

Semi-structured interviews were administered once after the end of the treatment. All experimental group (n=10) participated in the interviews. After doing the transcription and coding process for the interviews, participants were found to highly favor using the application in out-of-class activities in general.

Four themes revealed from the analysis as follows:

Support: The first theme revealed from the analysis was about the instant support that students receive from the tutor which helped in clarifying difficult issue revealed while students were studying by their own. For example on

of the participants stated the following: “This is the second time for me to study using the flipped learning method, but this time was very different as I found instant support while watching videos and reading codes”. While another participant said: “Many times I got stuck with the materials and I couldn’t follow up, but it was easy for me to instantly reach the teacher who provides needed support.”

Follow up: A Second theme revealed was about the continuous follow up the tutor made with the experimental group. For example one of the participants stated the following: “The teacher’s continuous messages encouraged me to finish reading the materials and watch the videos before the lecture”. Another said: “I felt responsible to finish all the tasks before the next lecture”

Collaboration: A third theme about working collaboratively revealed from the analysis, where most of the participants saw that it was very beneficial for them to work with their peers and tutor online to discuss hard matters in the leaning materials while working from distance. For example, one participant said: “It was really helpful to have time to discuss with my colleagues issues related to some programs and try to interpret together how they work!”

Motivation to learn: A fourth theme was about students’ motivation to learn, where most of the participants felt motivated to complete the required tasks and read the related materials. This allowed them to be prepared to participate in lecture activities as one of the participants indicated: “I really felt very motivated to participate in lecture activities”. Another one said: “Programming courses are difficult to learn; now I feel I can overcome any programming problem in the lecture”

Conclusion:

Responses indicated that using the flipped learning pedagogical model, in general, increased the students’ motivation to learn especially when provided mobile support for the experimental group. Other than just preparing videos by the tutor to be presented to the students out of class, it was clear that using the developed mobile application as a platform to provide offline/online learning materials and to support students’ learning has increased their engagement.

However, no significance was recorded concerning acquiring programming skills. Although mean ranks were slightly higher in the sake of the experimental group which can be interpreted due to the small sample size. This leads the research to qualitatively investigate students’ attitudes towards the new method applied in order to gain more understanding to the phenomenon.

It was apparent that the method itself helped the students to stay connected, bear personal responsibility to accomplish tasks, and be confident in performing within in-class activities. Establishing this learning community and the knowing that instant support is ready and available any time helped to increase motivation especially for beginners in the early stages.

The power of the experiment lies in mobility and using familiar applications to the students (i.e. YouTube Channel, Facebook, and "Blackboard - virtual classroom"). Also following some motivational strategies to raise students’ motivation and keep them always connected to learning had a great effect on doing more progress in the module which in turn helped in achieving the intended learning outcomes.

Finally, in order to raise students’ engagement and enhance their knowledge, it is recommended that students should always have access to support online/offline communities which will be able to provide guidance, instant support, and collaborative work.

It is recommended to choose bigger sample size and measure increase in knowledge related to programming skills in future research. Also it is recommended to use mixed methods approach to gain more understanding to the phenomenon.

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