

# Mobile Platform for Study and Collaborative Knowledge Construction in Students Course Learning

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Received Date: 24 April 2021

Revised Date: 25 May 2021

Accepted Date: 28 May 2021

**Abstract** — Mobile technology has seen a tremendous growth in power and importance in recent years. Today, even a low-cost smart phone can provide functions such as Internet access and video conferencing. Undoubtedly, the sheer power and ease of access to these devices have paved the way for numerous opportunities for their use, including educational purposes. In particular, the use of mobile technology as an enabler for collaborative learning has recently been envisioned as the next step to improving the effectiveness of the education system. Under this vision, it is expected that mobile collaborative tools, such as WhatsApp or Google group chat, can be used by students to improve their overall learning outcomes. Moreover, the vast penetration of mobile phones into poorer regions of the globe, such as Africa, means that a collaborative learning approach is still feasible even in countries with limited funding towards Education: In this paper we investigate the effectiveness of a collaborative learning approach in a third-level institution based in Nigeria. In particular, this research aims to study the relationships between the perceived satisfaction of collaborative knowledge construction using mobile applications to improve the learning outcomes of students. We conduct a quantitative design-based study comprising a total of 45 Students studying computer science at the Alex Ekwueme Federal University Ndufu-Alike Ikwo in Nigeria. Our research indicates that there is a positive relationship on how university students perceive mobile learning for collaborative knowledge and their satisfaction while engaged in the study.

**Keywords** — Collaborative learning, mobile platform, pedagogical approach, student learning satisfaction

## I. INTRODUCTION

It suffices to say that learning is an inborn pattern of behaviour that is often responsive to specific acts that arouse action, whereas education is not. The outcome of education lies in a student's learning [1]. It does not matter how an educator teaches, but rather how they

facilitate a student's learning [2]. The current-day learning systems, ICT infrastructures, and teaching practices have proved themselves to be more of a hindrance than a help when it comes to the use of mobile technologies, such as smartphones or tablet computers, to support the learning efforts of students. In addition, third-level institutions have been unable to cope with the vast variety of mobile devices and operating systems being used by students. All in all, the ways in which students have been using these technologies to support their learning have been poorly understood by educators and teaching bodies. Educators intrinsically mistrust student-led use of mobile devices in face-to-face contexts, and some have even gone as far as forbidding the use of devices entirely within classroom settings [3]. However, with more understanding around the ways in which students rely on mobile technologies to support their learning, educators have become more amenable to the introduction of mobile learning initiatives, both inside and outside the classroom. At the time of this research, there has been a clear shortage of examples which address the issues related to mobile use and how this may benefit the learning experiences of both students and teachers alike, especially within higher institutions across Africa.

Current research has linked collaborative tasks to student engagement in knowledge construction [4, 5]. Also, instructors who use computer-supported collaborative learning (CSCL) can monitor student understanding and achievement in collaborative learning activities [6]. Students can review what they wrote or what their peers wrote, and instructors can analyze the discourse of team members using semiautomatic data analysis procedures for facilitation, moderation, or grading purposes [7]. This paper showcases a collaborative learning approach by conducting a quantitative design-based research with a total of 45 students from a Nigerian University by providing them with Google tools that foster group work, such as the Moodle learning management system and WhatsApp platform.



These tools are used in mobile platforms to better manage and observe the views of students with regards to their levels of understanding on each topic within a course. The students provide views on what they have learnt and also provide feedback regarding the means of approach the teacher should use in the next class [2]. In addition, research suggests that use of Google tools can have a positive impact on a class's sense of community [8], as these tools host a variety of activities like brainstorming, peer review, resource sharing, and live chat. This would ensure that everyone participates and interacts in a constructive manner, i.e. by asking questions and providing answers. Thus, the benefits of this technique are many-fold. For example, students are more likely to become inspired by their peers, and those who may be 'passive' in the class would have an unprecedented opportunity to learn from the 'active' students and to adopt similar strategies of study and learning; bringing different forms of knowledge, understandings, skills, and experiences among the teachers and the students, which can mutually benefit a collaborative pedagogical effort.

## II. LITERATURE

There have been numerous discussions about collaborative learning via technology-supported tools, especially within the context of higher education. Johnson and Johnson [9] were one of the earliest to discuss the developments of new tools to support collaborative learning. The emergence of constructivist-based approaches to teaching and learning [5] is based on the belief that teaching is most effective when learners are actively involved. There is a definitive need to create more powerful and engaging learning environments [10]. The aim of technology-supported collaborative learning is to create an environment which fosters collaboration between students in order to enhance their learning processes [11], facilitate collective learning [12], as well as group cognition [13]. The use of mobile technologies to aid online learning can increase a student's satisfaction and motivation to learn [14]. There are many factors that contribute to successful learning in a mobile-based platform, with motivation being perhaps the most important [15]. Motivation can be defined as a person's internal needs and desires, traits which ultimately determines one's attitude [16]. Motivation has a profound impact on how learners use technology for mobile learning and learners are more likely to use mobile technology if they feel it can improve or further enhance their satisfaction [17]. Thus, content and perceived usefulness of mobile technology can positively influence a learner's satisfaction with the application. Ease of use and layout design can also positively affect a mobile learner's behaviour, as shown by previous research [18].

## III. MATERIAL AND METHODS

The following study was designed to determine how computer science students from a Nigerian university perceive mobile learning with collaborative knowledge while engaged within a mobile collaborative learning

platform, in comparison to the traditional non-collaborative approach. The data for this study was collected from 45 students studying at Alex Ekwueme Federal University Ndufu-Alike Ikwo in Nigeria. The study ran from December 2017 up until March 2018. The data was collected using questionnaires and comments from the students via the WhatsApp platform. To protect the privacy of the students and mitigate any sources of bias, the students were asked to export and completely anonymize the WhatsApp thread.

Each student was assigned a unique identifier that was unrelated to their name, student number or their telephone number. Consistent identifiers were used for those who changed their phone numbers associated with their WhatsApp accounts during the study. In addition, 600 photos and 50 voice-notes that might have potentially identified students were also removed from the thread. The list that identified students was stored separately from the file that was used during the analysis. There were 44% male respondents and 56% female respondents. The questionnaire contained questions about each student's experience and satisfaction level. The aim of these questions was to analyze the perceived differences in the use of mobile learning in the current system of learning against that of the newly proposed alternative system of learning, which involved the use of mobile collaborative learning tools such as google group work and WhatsApp.

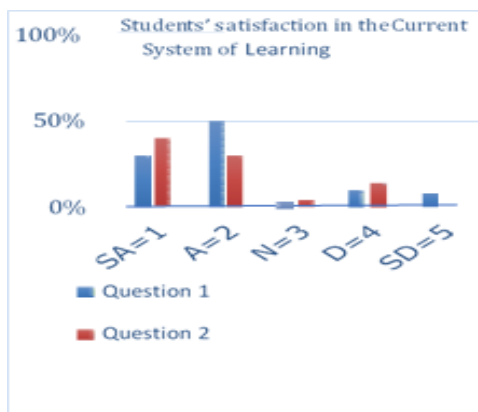
The new system examines the students views about how they felt about each topic covered by a teacher; what students successfully understood from each topic, the difficulties they faced in understanding what the teachers had taught them in class, as well as any improvements they would like the teachers to make in the next class in order to make teaching and learning more enjoyable, increase retention or facilitate collaboration. The use of technology-based collaborative learning needs to be justified in terms of the benefits presented to the students (product variables). Some of the emerging evidence of this learning method suggest benefits, such as the development of higher order thinking skills, student satisfaction with the learning experience, and improved productivity. However, the current level of research within this context still lacks an adequate analysis regarding the product variables themselves [7]. This paper focuses on the student's satisfaction in the use of the mobile platforms to aid their learning experiences.

### *Students satisfaction in the use of mobile platforms before the start of the course*

WhatsApp and Google platforms were used by the 45 student participants in this study. The mobile platforms were used during and after the classes for the duration of the teaching semester. In order to investigate the students' satisfaction about the use of mobile platforms in learning, the students were asked via a series of questions to describe their own levels of agreement with use of these tools, both before and after the study was conducted. For most of these questions, a structure of phrasing was chosen to reflect an increasing value of the relevant satisfaction indicator being assessed (i.e. from Strongly

agree to Strongly disagree or vice versa, depending on the particular question). For consistency in our data analysis, the relevant choices for each question were assigned numerical scores ranging from 1 to 5. Hence, a score (i.e. 1 or 2) would indicate a high satisfactory level of the corresponding performance indicator while scores such as 4 or 5 would imply a poor or unsatisfactory level of the corresponding performance indicator, for all the questions. For convenience, we will refer to the considered choices, given by ‘‘Strongly agree’’, ‘‘Agree’’, ‘‘Neutral’’, ‘‘Disagree’’, and ‘‘Strongly disagree’’ as ‘‘SA’’, ‘‘A’’, ‘‘N’’, ‘‘D’’, and ‘‘SD’’ respectively, throughout the remainder of the paper.

Fig. 1 presented information based on two questionnaires that the students were asked to fill out. The theme of each questionnaire focused on answering two general questions. Question 1 was based on whether the use of the mobile platforms have had a positive impact with regards to the participation and interactive learning of the students. Question 2 was based on whether students would be happy to use the mobile technologies during their learning process. With regards to question 1, 10% of respondents disagreed, 8% strongly disagreed, 2% neither agreed nor disagreed, 50% agreed and a further 30% strongly agreed with the above claim. In the case of question 2, a total of 70% of respondents agreed, 4% neither agreed nor disagreed, while 16% disagreed with the claim. A weighted average of both parameters reflect a satisfactory experience amongst 75% of respondents and an unsatisfactory experience of 17%, as shown in Fig. 1.



**Fig. 1. Proportions of the students’ perception about the use of mobile platforms in learning before the start of the course**

**Students satisfaction in the use of mobile platforms during and after the course**

There is strong and consistent evidence across educational research studies indicating that students who are actively engaged in peer interaction, whether face-to-face, technology-based or both, tend to display greater positive attitudes toward subject matters, increased motivation to learn about the subject, and are typically more satisfied with the overall learning experience, in comparison with students who have fewer opportunities to

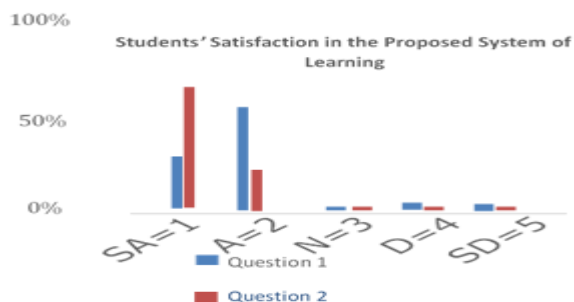
interact with their peers and instructors [19, 20]. The use of both face-to-face and collaborative learning via mobile platforms, such as Google group work and WhatsApp, were used in teaching an undergraduate-level course comprising 45 students from the Computer Science Department. The students’ views about how they felt about each topic during the course were assessed; in order to make teaching & learning more enjoyable, increase retention or facilitate collaboration. In Table 1, we illustrate samples of some of the conversations that took place during the collaborative learning tasks using the mobile WhatsApp platform.

**Table 1. Sample Conversations in WhatsApp platforms**

- 1/10/17, 8:22 PM – CSC 205 created group ‘‘CSC 205’’
- 1/14/17, 1:01 PM – AE000: I am very glad to be part of this group and as we discussed in class today, I will start by explaining our intent to accommodate others that were not in class today. We provided this platform to take points of views of every student on how they feel about each topic taken by me, what they have learnt and suggestions, seek help on the ‘‘how and means’’ of approach to use to learning, based on any difficulty they face in understanding what I have taught you in class and the improvements you would like me to make in the next class. Everybody should partake in this platform by asking questions and providing answers. Please strictly maintain the above rules and regulations. Let us kick off the discussion. Thank you.
- 1/20/17, 8:57 PM – AE001: Yes I’m in
- 1/20/17, 8:57 PM -AE002: very creative
- 1/21/17, 12:04 PM – AE003: Okay
- 1/21/17, 12:08 PM -AE003: On process management O.S perspective we have two types...
- 2/21/17, 8:07 PM – AE000: Good guys! I just want us to comment on how the lecture was delivered and any improvement you would like on the next class.
- 2/21/17, 10:13 PM -AE002: The lectures so far have been wow, for me, am quite satisfied with it!
- 2/21/17, 10:40 PM – AE004: The explanations on File Management was really helpful and easy to understand, and the slide on file management is the most simplified slide I’ve seen, very easy to understand and I love it. So far, the class has been great...
- 3/1/17, 12:22 AM - AE000: I’m very impressed reading through your questions and comments. However, I want to throw more light on path, a path is a general form of the name of a file or

At the end of the classes, students were asked to provide feedback about their experience and satisfaction during and after the course. Correspondents were asked to state the extent of their agreement or disagreement (ranging from Strongly agree to Strongly disagree, and vice versa depending on the phrasing of the question). The aggregated data from this feedback is shown in Fig. 2, in which question 1 refers to the satisfaction of the students with respect to the proposed collaborative learning technique (using Google group and WhatsApp platforms) and question 2 refers to the students satisfaction with respect to the encouragement they felt while using these mobile technologies. With regards to question 1, 4% of respondents disagreed, 4% strongly disagreed, 2% neither agreed nor disagreed, 60% agreed, while 30% strongly agreed with the above claim. In the case of question 2, a total of 94% of respondents agreed with this claim, 2% neither agreed nor disagreed while 4% disagreed. A

weighted average of both parameters reflects satisfactory student experience amongst 94% of respondents and 7% unsatisfactory experience, as shown in Fig. 2. These results imply that there is a positive relationship on how university students perceive mobile learning for collaborative knowledge and their satisfaction while engaged in the study in the proposed system.



**Fig. 2. Proportions of the students' perception about the use of mobile platforms in learning during and after the start of course**

**IV. RESULT AND DISCUSSION**

A paired t-test was conducted in order to compare the students' experiences and satisfaction levels across the two systems (current learning system versus the new collaborative learning system). The results indicate that there is a significant difference across the satisfaction levels of the current learning system (M=1.98, SD=1.158) and that of the newly proposed collaborative learning system (M=1.33, SD=0.603), under the conditions,  $t(44) = 2.922$  and  $p = 0.005$ . These results suggest that students are more satisfied with the use of both the face-to-face and technological based collaborative learning system. Specifically, our results suggest that students were more satisfied with the face-to-face and collaborative learning approaches (facilitated via Google group and WhatsApp) than the traditional method of learning, which does not include the use of mobile platforms.

A similar analysis was also performed in order to investigate the hypothesis that the satisfaction rates between female and male participants differ throughout the study. The results of this test indicate that there are no significant differences between the satisfaction rates of male and female participants, both before and after the study was conducted; before the study started (M= 2.16, SD= 1.201) and after the study concluded (M=1.92, SD = 0.922) (see Table 2). Mobile collaborative learning approach is a learner-centered pedagogical approach. It improves on the satisfaction and learning outcomes of a student by means of encouraging them to participate actively in the collaborative learning process. It also creates a greater sense of empowerment by providing students the opportunity to provide feedback to the instructor and guide their own learning content. This approach will aid the students to learn at their own pace, using ways that are more suited towards them and where they can exercise choice over when and how they learn. Through this approach, students would acquire active learning strategies and would become more motivated to

take charge of their own learning, as they become self-regulated learners

**Table 2: Table 2: t-Test for the two conditions (Current & Proposed)**

		Mea n	N	S D	SE M
<b>Pair 1</b>	Experience - Baseline	2.16	45	1.201	.170
	Experience - Post	1.92	45	.922	.130
<b>Pair 2</b>	Satisfaction - Baseline	1.98	45	1.158	.173
	Satisfaction - Post	1.33	45	.603	.090
		N	Co rr.	Sig.	
	Experience - Baseline & Experience - Post	45	-.228	.112	
	Satisfaction - Baseline & Satisfaction - Post	45	-.347	.019	

Moreover, it further provides the opportunity to inject new pedagogical models. For instance, the mobile WhatsApp platform was used to demonstrate effective learning. Thus, the aim of the study is to improve on a student's learning outcome. The students provide feedback after each topic that was taken in the classroom, by using google group and WhatsApp platform. The platform is used to gain immediate feedback from students during and at the end of each lecture class. The key element to show the relationship between student satisfaction, retention and this formal/informal blended approach is feedback. Feedback enables the lecturer to gain a quick perspective of where the class is in terms of understanding on any aspect of the lecture and to adjust subsequent teaching by concentrating on areas of student need [21]. This method helps the lecturer re-align teaching input based on students' needs. At the same time students get immediate feedback from the assignment as to whether they have understood. They can also compare their progress with the rest of the class thereby reducing any sense of isolation and anonymity in lectures. It helps in supporting teacher-student dialogue where classes have large numbers of

students. The students would go to the platform, describe and explain what they felt about the lecturer's teaching methods and styles, and what they had learnt. This approach enables students to learn to teach themselves, to better understand what they had been taught in the classroom, and to reflect on any improvements they would like to see in the next class. The students participated and provided suggestions, asked questions and contributed answers on the platform. This captured the minds of the students towards using this technology to learn outside the classroom and paving the way for different forms of knowledge, understanding, skills, and experiences among the lecturers and students. Hence, this constitutes a collaborative and persuasive Teaching/Learning Technique that involves both formal and informal education. At the end of the course, almost all those who had actively participated in the platform managed to achieve an excellent grade in their examinations. Some of the students were interviewed on how they feel about giving immediate feedback to students in class. Therefore, it suffices to say that there is a positive relationship on how university students perceive mobile learning for collaborative knowledge and their satisfaction while engaged in the study.

## V. CONCLUSION

The use of current and modern technologies to provide new techniques of learning, training and education that will be easy access and available to all who wish to be part of it, is the main goal of the next generation of the learning systems [22]. Mobile learning improves students' productivity by making knowledge and learning available anytime and anywhere, enabling learners to interact and participate in learning activities without the traditional place and time restrictions [22]. Mobile learning allows teaching and learning to go beyond the traditional classroom and provides a wide range of opportunities that facilitate collaboration among students and instructors [21]. However, it can create an isolation or a feeling of being indifferent for both instructors and students who may not always have mobile connectivity [23]. The days of classrooms where a teacher sits at the front and the desks of the students are neatly aligned in rows are swiftly coming to an end. Technology-based pedagogies are not only changing the teaching process but are also reshaping the learning process. For example, less than a decade ago, the levels of technology found in the typical classroom were almost non-existent. Today, however, a glimpse into our future classroom hints towards a systematic approach, whereby the goal of achieving a good education can be met using a wide host of approaches. Although it is difficult to discuss the classroom of the future with great certainty, the truth is that education is changing right now. Technology and expanded knowledge of the learning processes have already resulted in a metamorphosis of the classroom and of teaching methods. Thus, a mobile Learning Technique that can lead to a positive learning experience for students is also likely to diminish the number of students losing their confidence about their academic abilities. In particular, this paper has pointed out

the need for students to engage in both face-to-face and mobile learning and provided a deeper understanding of how students feel about the creation of mobile platforms for collaborative learning. Of course, the implications for students' learning may be far-reaching in certain contexts as institutions are required to move beyond traditional methods and practices, which still predominate throughout most institutions. Particularly in regions that may suffer from limited funding capabilities, such as countries in Africa, we believe there is a definitive need to explore other alternative pedagogies such as mobile platforms for study and collaborative knowledge construction in course learning.

## ACKNOWLEDGMENT

Many thanks to the students of Computer Science unit Department of Mathematics, Computer Science, Statistics, and Informatics, Alex Ekwueme Federal University Ndufu-Alike Ikwo for their tremendous support in the acquisition of this research data. Also, many thanks to Pieter S. Barnard, a PhD student at Trinity College Dublin for proofreading this work.

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