# An Interactive Mobile Lecturing Model:
## Enhancing Student Engagement with Face-To-Face Sessions

*Olutayo Boyinbode, University of Cape Town, Cape Town, South Africa*

*Dick Ng'ambi, Centre for Educational Technology, University of Cape Town, Cape Town, South Africa*

*Antoine Bagula, Department of Computer Science, University of Cape Town, Cape Town, South Africa*

## ABSTRACT

*Although use of podcasts and vodcasts are increasingly becoming popular in higher education, their use is usually unidirectional and therefore replicates the transmission mode of traditional face-to-face lectures. In this paper, the authors propose a tool, MOBILect, a mobile lecturing tool that enables users to comment on lecture vodcasts using mobile devices, and aggregated comments become an educational resource. The vodcasts are generated through Opencast Matterhorn and YouTube. The tool was evaluated at the University of Cape Town with students' own devices. The paper reports on the architecture of the MOBILect, its framework for student-vodcast interaction, and evaluation results. The paper concludes that the MOBILect has potential for use as a supplement to the traditional face-to-face lectures especially in scenarios of large classes, or where the medium of instruction is not the students' mother tongue.*

*Keywords:* *Deep Learning, Face-To-Face Lecture, MOBILect, Mobile Devices, Mobile Learning, Mobile Lecturing, Vodcast*

## INTRODUCTION

Students of higher education institutions (HEIs) in South Africa face many challenges: One of the challenges is the academic under-preparedness of students (Nzimande, 2009). Most students from disadvantaged educational backgrounds are generally under- prepared and have some areas of academic skill deficit (Dzubak, 2005; Dzubak, 2009; Hardman & Ng'ambi, 2003). Academic under-preparedness refers to a student whose academic skills fall below those needed to be successful in higher education (Dzubak, 2005). The major causes of academic under-preparedness in higher education students can be a product of several combined variables;

DOI: 10.4018/jmbl.2013040101

societal and cultural influence, poor economic background, previous academic experience, geographical location and huge differences in race and age (Dzubak, 2005). The challenge of dealing with under-prepared students is further complicated when combined with a large class population (Nicol & Boyle, 2003; Jaffer et al., 2007). Another major challenge is that most higher education institutions (HEIs) in South Africa adopt English language as a medium of instruction which makes it difficult for students who speak and write English as a second or third language to cope with face-to-face(f2f) lectures (Haddad, 2006; Jaffer et al., 2007; Spiegel et al., 2003). The students face the problem of not being able to cope with the face-to-face (f2f) lectures which are didactic, unidirectional and lack persistence; when students fail to understand the f2f lectures during the once off f2f sessions, there is no opportunity to playback the lecture. Many solutions have come up in the form of recording f2f lectures i.e. Podcasts, Opencast Matterhorn (Ketterl et al., 2010), Virtual presenter (Ketterl et al., 2006), OpenEya (OpenEya, 2012), E-Chalk project (Friedland et al., 2004) and Tele-task (Wolf et al., 2010); these solutions solved the problem of lack of persistence (inability to replay the lecture) inherent in f2f lectures, but the problem of unidirectional communication still persist. Students still engage with lecture recordings in a unidirectional manner (one way communication) i.e. speaker to listener, there is no actual interaction and engagement of the students with f2f lectures to foster a deep and meaningful learning experience.

Lecture recordings and dissemination seek to impact delivery of teaching and learning resources in HEIs in South Africa, where some HEIs are already exploring the potential of podcasting and vodcasting as a way of widening access to learning resources and improving learning among their students (Boyinbode et al., 2012; Evans, 2008, Lee &Chan, 2007; Ngambi, 2008b). A podcast is simply a collection of digital media files (audio) distributed over the internet using Really Simple Syndication (RSS) technology or Atom feeds (RSS, 2002). In vodcasting VOD stands for "video-on-demand"; the difference from podcasting is that the content is video and not audio (Brown & Green, 2006; Copley, 2007). Many scholars have shown that the use of podcasts and vodcasts have potential to alleviate the problem of lack of persistence of face-to-face (f2f) lectures (Edirisingha et al., 2010; Heilesen, 2010; Mcgarr, 2009; Ngambi, 2008a; Walls et al., 2010). However, the challenges of using podcasts and vodcasts in higher education are the educator's time to record, edit and upload files to a podcast server and the artefacts are unidirectional, providing no ways of 'interacting' or 'engaging' with what students are listening to or watching. Thus, podcasts and vodcasts suffer the risk of reinforcing didactic teaching approaches. Opencast Matterhorn has been adopted as a recording technique at University of Cape Town, South Africa (UCT). Opencast Matterhorn an open-source platform is used to produce lecture recordings, manage existing video and serve designated distribution channels. It has the advantage that it offers all the relevant processing functionalities as an integrated whole; which reduces the amount of manual work needed to process media across different sub-systems, thus increasing productivity, reliability and time saving (Ketterl et al., 2010).

Most students are ready to adopt m-learning (Traxler, 2007). In South Africa, the mobile device is the only technology most students have, and only have access to computers when they come to university campuses. In most HEIs South Africa, students already own a mobile phone; a recent survey of mobile devices usage among University of Cape Town (UCT) students indicated that 85% of the students possessed smart phones (UCT Student Survey, 2011). Mobile devices offer numerous benefits for students in higher education (Crawford, 2007; Motiwalla, 2005). Also m-learning will reinforce f2f lectures in that students are always with their devices and can re-play the f2f lecture, add comments or read other student comments on their mobile devices after the f2f lectures at their convenience. Ng'ambi (2008a) states that although social usage of mobile devices is very common among students, there has been little

evidence to demonstrate how these mobile devices actually contribute to student learning. An interactive mobile lecturing model is proposed which will emphasize mobile devices as tools for enhancing learning among students through a high-level engagement. Deep learning will result from high-level engagement of students with lecture vodcasts on their mobile devices (Dyson, 2011).

This paper describes the architecture, implementation and evaluation of MOBILect; an interactive mobile lecturing tool, which seeks to enhance students' engagement with face-to-face (f2f) sessions in higher education institutions (HEIs). The rest of the paper is organised as follows: the second section explains Mobile lecturing and Mobile learning. The third section describes our proposed interactive mobile lecturing model (MOBLEC). The fourth section describes the methodology adopted for this work. The fifth section discusses the results of the evaluation of MOBILect. The final section discusses the contributions, limitations, future work of MOBILect and the concluding remarks.

## MOBILE LEARNING AND MOBILE LECTURING

With the advances in wireless technologies such as Wi-Fi, Bluetooth, GPS, 3G, 4G and mobile devices like smart phones, iPhone, iPad and Tablets; mobile learning (m-learning) has become prominent in the higher educational landscape (Cheon et al., 2012; El-Hussein & Cronje, 2010). Mobile learning (m-learning) is a rapidly growing supplement to educational strategy for enhancing learning among mobile learners. With m-learning the limitation of learning in a fixed location is eliminated by the use of mobile devices such as smart phones, tablets and iPads. Learners can conveniently access learning content from anywhere and at any time on the move. M-learning can be considered as "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies" (O'Malley et al., 2003, p. 6). While m-learning has the potential to support all forms of education, higher education is a particularly appropriate venue for the integration of student-centred m-learning because mobile devices have become ubiquitous on college campuses (Crawford, 2007). M-learning can enable learners to re-listen to classroom lectures, when exercising or walking. One of the tools aiding this trend is the use of podcasts or vodcasts. Hence learners can listen to a lecture podcast or watch a lecture vodcast on their mobile devices while on the move (mobile lecturing). Mobile learning does not have to take place in a fixed location, such as a classroom, or within a specified time, instead learning can occur in any location and at any time (Sharples et al., 2008). Though students learn on the move with their mobile devices at any time and any place, the role of the educator in the m-learning experiences has remained minimal and is in some cases absent, while this is useful, such learning has remained unevaluated. Here we define mobile learning as a type of learning that allows students to engage and learn with mobile technologies when they are on the move with minimal or no involvement of the educator while mobile lecturing is defined as a form of learning in which students engage in high-level interactions with lecture vodcasts on their mobile devices to enhance their learning with the educator specifying the learning tasks to trigger students' learning to foster deep learning. Warburton (2003) defines deep learning as a form of learning where students construct meaning and understanding from learning materials and experiences. He further indicates that deep learning is dependent on a student's level of engagement with the learning content thus educators must be able to provide an environment where students develop a strong personal interest in learning. Anderson (2003) also indicates that "Deep and meaningful formal learning is supported as long as one of the three forms of interaction (student to teacher; student to student; student to content) is at a high-level" In this paper we define deep learning as a learning which occurs when students construct meaning and understanding from learning resources

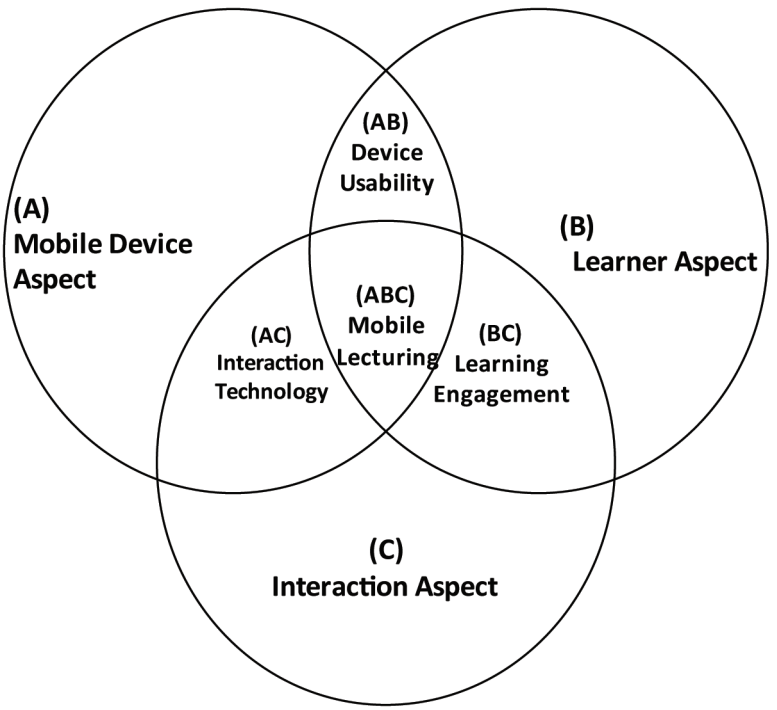
and experiences through high-level interactions. Deep learning results from high-level engagement with peers and teachers. High-level engagement is achieved through commenting and questioning after student engagement with lecture vodcasts. Students engage in high-level interactions by asking questions or commenting after watching a lecture vodcast (student-to-content interactions). They interact by giving answers to the questions or adding additional comments (student-to-student interactions). Teachers interact by asking students questions to prompt and motivate the students to engage with the lecture vodcasts and also to add comments to remove any form of misconception in the students' comments (student-to-teacher interactions). Deep learning results from high-level engagement of students with learning vodcasts and their peers (Dyson, 2011). Many researchers focused on m-learning acceptance and adoption in higher education (Cheon et al., 2012; Cheng et al., 2010; Haag, 2011; Liu et al., 2010), but few on how mobile learning can enhance learners engagement with f2f lectures to foster deep learning. In the next section an interactive mobile lecturing model is proposed.

## MOBLEC: AN INTERACTIVE MOBILE LECTURING MODEL

MOBLEC, an interactive mobile lecturing model, is proposed. This model aims to use mobile lecturing to foster deep learning through students' high-level engagement with lecture vodcasts on their mobile devices. Anderson's six types of educational interactions (Anderson, 2003) are integrated into FRAME (Koole, 2009) to form MOBLEC. The MOBLEC model is shown in Figure 1.

The reasons for merging FRAME with Anderson's interactions to form MOBLEC model are: The FRAME model was successfully used to evaluate the potential and suitability of mobile devices as learning tools in distance

*Figure 1. MOBLEC framework. Adopted from Koole (2009) and Anderson (2003)*



learning, but did not effectively address the relationship between the mobile technology and the phenomenon of learning to foster deep and meaningful learning. Dyson (2011) argues that mobile technology alone is insufficient to create a deep learning experience. Kenny et al. (2009) also argue that evaluating mobile devices strictly on the basis of their hardware and software characteristics will not effectively address the relationship between technology and the phenomenon of learning. Anderson (2003) provides a way of understanding how deep and meaningful learning happens through interactions. Anderson (2003) argues that deep and meaningful formal learning is supported as long as one of the three forms of interaction is engaged at a high-level (student-to-teacher; student-to-student; student-to-content). In view of these arguments, it seems reasonable to embrace both mobile technologies and learning interactions to enhance both formal and informal learning. Anderson's interactions did not specify the interface for which interaction occurs. FRAME model provides an interface via mobile devices where learning interactions can occur to foster deep learning. Students engage with lecture vodcasts on their mobile devices anywhere and at any time and on the move using these learning interactions (Anderson, 2003). These interactions encourage learning at individual pace and foster deep learning.

The MOBLEC model is proposed to establish a description of the mobile lecturing process. The researcher's view is that learning is enhanced by engagement. This is reflected in the MOBLEC model. The context for the MOBLEC model is learning. Learning may occur through different types of interactions. Within this context, the MOBLEC model is represented by a Venn diagram in which three aspects intersect (Figure 1). The three circles represent the Mobile Device (A), Learner (B), and Interaction (C) aspects.

The Mobile Device Aspect (A) of the model presents the functional and physical parts of mobile devices, i.e. the path through which learners interact and the impacts on their physical and comfort levels. Physical characteristics refer to the size, weight and storage capacity of the device. The user's physical comfort with a device is a reflection of these characteristics. Physical comfort also refers to how easily the user can handle and operate the device. Mobile devices provide the interface between the learner and the learning task.

The Learner Aspect (B) refers to the individual learner's abilities and prior knowledge, social-cultural and historical context of the learner and learners' familiarity with mobile devices.

The Interaction Aspect (C) describes learning interactions in terms of Anderson's six educational interactions for learning.

While the three main aspects are clearly important, the interactions between them are those most likely to determine the effectiveness of mobile lecturing. These interactions are represented in the intersections as device usability (AB), interaction technology (AC) and learning engagement (BC).

- **Device Usability (AB):** The Device Usability (AB) contains attributes that are common to both the mobile device (A) and learner (B) aspects. Mobile devices' portability, intuitiveness and ability to provide "anytime and anywhere" access to information help to characterize their affordances. This intersection relates characteristics of mobile devices to learning tasks such as the acquisition of knowledge as well as the manipulation and storage of learning processes. These processes are affected by how intuitive the device is or how quickly a learner can begin to understand the device.
- **Interaction Technology (AC):** Mobile device (A) and Interaction (C) aspects form the basis of the interaction technology intersection. This intersection refers to the ability of learners to interact with each other; it describes how mobile devices enable interaction and collaboration. Here, the software tools provided by mobile technologies for interaction constitute the interaction technology. These tools allow learners to interact in groups where they can

acquire information and share knowledge. Mobile devices have networking mechanisms for connecting to the interaction tools i.e. Wi-Fi, 3G networks etc. It describes the affordances of mobile devices to engage in high-level interactions. It defines a mobile lecturing tool (See Figure 2) to enhance interaction in the MOBLEC model.

- **Learning Engagement (BC):** Learner (B) and Interaction (C) aspects form the basis of the learning engagement intersection. It focuses on the learning interactions (Anderson interactions) that are enabled by the interaction technology. Usually these interactions will be driven by a learning task or a desire to know something or consult with the knowledgeable others, etc.

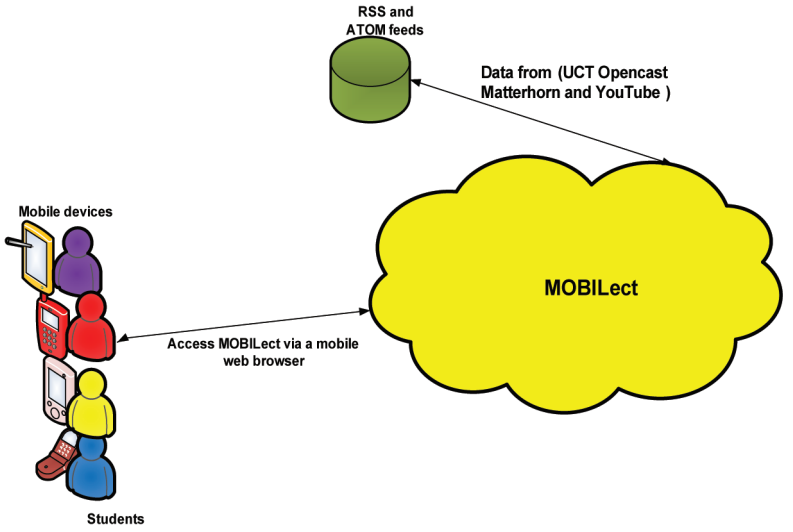
All three aspects overlap at the primary intersection (ABC) which is located in the centre of the Venn diagram. The primary intersection, a combination of all three aspects, represents and defines the mobile lecturing process. In this model mobile lecturing enables students to engage in high-level interactions with lecture vodcasts on their mobile devices to foster deep learning. High-level interactions here involve interactions using Anderson's educational interactions.

Mobile Lecturing (ABC) is the primary intersection of the MOBLEC model; it integrates the Mobile Device (A), Learner (B), and Interaction (C) aspects. Mobile lecturing provides enhanced engagement and collaboration among learners. Effective mobile lecturing empowers learners to engage in high-level interactions with lecture vodcasts on their mobile devices to foster deep learning. Figure 2 describes the proposed architecture of this mobile lecturing tool "MOBILect" (an interactive mobile lecturing tool).

## An Interactive Mobile Lecturing Tool (MOBILect)

Mobile technologies can be used for learning outside f2f lectures, students engage with lecture vodcasts on their mobile devices to enhance learning. The MOBLEC model describes a mode of learning in which learners engage with mobile lectures to enhance their learning. In the MOBLEC Model; the interaction technology (AC) defines a mobile lecturing tool to enhance interaction in the model. Figure 2 describe the proposed architecture of this mobile lecturing

*Figure 2. Proposed architecture of MOBILect*



tool "MOBILect" (an interactive mobile lecturing tool). In the proposed architecture:

- **Mobile Devices**: Students access MOBILect via mobile web browsers. These provide interfacing for the students. Mobile devices display and store images of videos and audios accessed from MOBILect.
- **MOBILect:** is a web-based application (hosted on a website) that can be accessed by entering a specific URL (www.ngportal.com/opencast) in the web browser that is already installed on a mobile device or PC. Mobile applications can be provided as either client-side applications that run on the mobile device or as web-based applications that run on a remote server and are displayed on a mobile web browser (Wagner et al., 2008). Not all client-side applications are portable to other platforms; Web-based application is desirable because it is easy to transfer applications from one platform to another. MOBILect provides the fields to access data on the mobile device. It has a database to store metadata for the data that was last gathered from the last mobile query (query). It gives a record of updated resources from various access points (comments from other users that use it).

## METHODOLOGY

This section presents the research design that was followed in this paper. It also describes the research method for the procedure for data collection and analysis. Details of the methodology are described in the following sequence: Participants, Evaluation, Analysis of students' comments and Analysis of focus group Discussion.

### Participants

The Participants were undergraduate students of UCT. The choice of UCT students as case study stems from the fact that English is the medium of instruction at UCT. An increasing number of students do not speak English as their mother tongue (Spiegel et al., 2003): some of the students come from academically challenged backgrounds (Nzimande, 2009), which makes learning in f2f sessions laborious.

Students of UCT were invited to participate in an evaluation. In UCT f2f lectures are usually conducted for 45 minutes and there is often no adequate time to engage in discussions about the lecture – the f2f lectures are unidirectional. Some of the students do not understand the f2f lecture enough to ask questions or they may be shy to ask questions so as not to make a fool of themselves or there may not be enough time to ask questions. Some podcasting projects such as Ng'ambi (2008b, 2010) have attempted to address this problem. These projects benefit students in that they can download and listen to podcasts or watch lecture podcasts after the f2f lecture to revise, re-listen or take down notes. The engagement is at a low-level because the mode of interaction is still unidirectional and students can only replay the f2f lecture but the students cannot interact by asking questions or accessing aggregated comments from other students. MOBILect enables students to engage in high-level interactions where students comment on lecture vodcasts using mobile devices, and the aggregated comments become accessible as a learning resource for the students.

Participants were invited to evaluate MOBILect. To qualify to participate in this study, students should be enrolled in the f2f lecture which was recorded and accessible on MOBILect. Participating students would need to have a Wi-Fi-enabled smartphone that they are familiar with to enhance usability. The evaluation took place first semester using course, CSC 1000F. The course was chosen for evaluation mainly because the course has been recorded by UCT Opencast Project and the vodcast was available on http://media.uct.ac.za/engage/ui with the permission of the course lecturer. For some of these students, English was not their mother tongue. The allocated teaching time for the f2f lectures of these courses was about 45 minutes, in which, given the limited time, interaction was near impossible. The course

title of CSC 1000 F is Introduction to Computer Programming, where F stands for a first semester course. The course title is anonymised. The course is taken by first-year students at UCT.

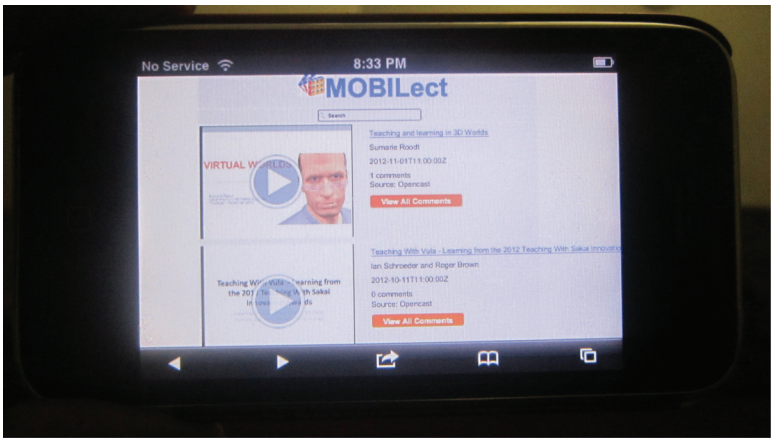
To invite the students for the evaluation, an announcement was placed on the course site. Twelve students responded, nine of whom participated in the evaluation; the other three did not possess smartphones. This number of students was sufficient for a qualitative evaluation of the tool as it allowed for an in-depth understanding of user experiences. According to Marshall (1996) samples for qualitative investigations tend to be small and an appropriate sample size for a qualitative study is one that adequately answers the research question. All nine students were enrolled for course CSC1000F. The nine students were made up of two females and seven males. Seven of the students acknowledged that English was not their mother tongue. The students brought their own mobile devices for evaluation purposes to enhance device usability, allowing students to focus on the learning task and not the mobile device (Antoniou & Lepouras, 2005; Kukulska-Hulme, 2007). Researchers (Attewell, 2009; Traxler, 2009; Lindsay 2010) also argue that it is cost-effective that educational institutions take advantage of the mobile devices students own, rather than rely on institutional provision of similar hardware. Each of these participants signed a consent form and was allocated an identity number for the purpose of the evaluation to keep their identities anonymous.

## Evaluation

Students were asked to access MOBILect on their mobile devices (Figure 3) to watch the lecture vodcast of CSC 1000F on their different mobile devices. During the evaluation the students were kept in the same space but worked independently. The researcher used the following criteria within MOBLEC model to structure the procedure for the evaluation:

- **Device Usability (AB):** Students were asked to bring their mobile devices for the evaluation. This request was made to help avoid usability problems. Kukulska-Hulme (2007) indicates that when mobile devices belong to users, the user's level of familiarity with the device helps to avoid many potential usability problems and focus on the learning task and not the device. During the evaluation the students focused on achieving the learning tasks and none had any problem with the usability of their devices.
- **Learning Engagement (BC):** Students were instructed on how to interact using the following interactions (Anderson, 2003):

*Figure 3. MOBILect*



student-to-content, student-to-student and student-to-teacher interactions.

- **Interaction Technology (AC):** Students engaged with MOBILect using the three interactions, student-to-content, student-to-student and student-to-teacher. A task was set up by the teacher on the tool to enhance student revision and learning after f2f lectures. The following tasks were posted by the teacher and students were asked to watch the vodcast for 15 minutes and answer the questions.

1. What are the key points in this lecture?
2. What questions are being answered by the lecture?

- **Student-to-Teacher Interaction:** Teacher posted the tasks on MOBILect to trigger students' engagement.
- **Student-to-Content Interaction:** Students watched the vodcast on MOBILect for 15 minutes (see Figure 3) and then posted comments to answer the two questions indicated above.
- **Student-to-Student Interaction:** Students viewed other students' answers/comments and then posted another set of answers/comments based on other students' comments (see Figure 4, 5)
- **Student-to-Teacher Interaction:** Teacher viewed the entire comments posted on MOBILect by students to check for any misconception.

Eight different smartphones were used during the evaluation and were classified according to their operating systems. Two of the students used the same device (iPad). A focus group discussion followed the evaluation. The following devices were owned and used by the students for the evaluation:

**Student #1:** iPhone 3G
**Student #2:** iPad
**Student #3:** Samsung Galaxy S
**Student #4:** iPad2
**Student #5:** Blackberry 9790
**Student #6:** Samsung Galaxy y
**Student #7:** iPad
**Student #8:** iPod Touch
**Student #9:** iPhone 4G

## Observation

It was observed that during the evaluation that student posted their comments using SMS Lingoes (Alejandro, 2011). SMS lingoes are SMS list of text message short hands. Example of comments posted by student #6 using SMS lingoes: Posted by Student#6: Find max nd min of list of nos. figure out how 2 solve a problm using a algorithm inst ed of a progrm. cn the comp understnd < signs? Yes. Franki askd sumthin... Cudn't hear his q. Cud hear otha q's being answerd bt cudn't hear the actual q's. These SMS 'lingoes' provided a

Shorthand form that allowed students to rapidly post their comments and interact with other students since students are conversant with the language. The SMS lingoes allow students who have problems with the language of teaching, for whom English is not their mother tongue, to communicate with peers with SMS lingoes with which they are familiar.

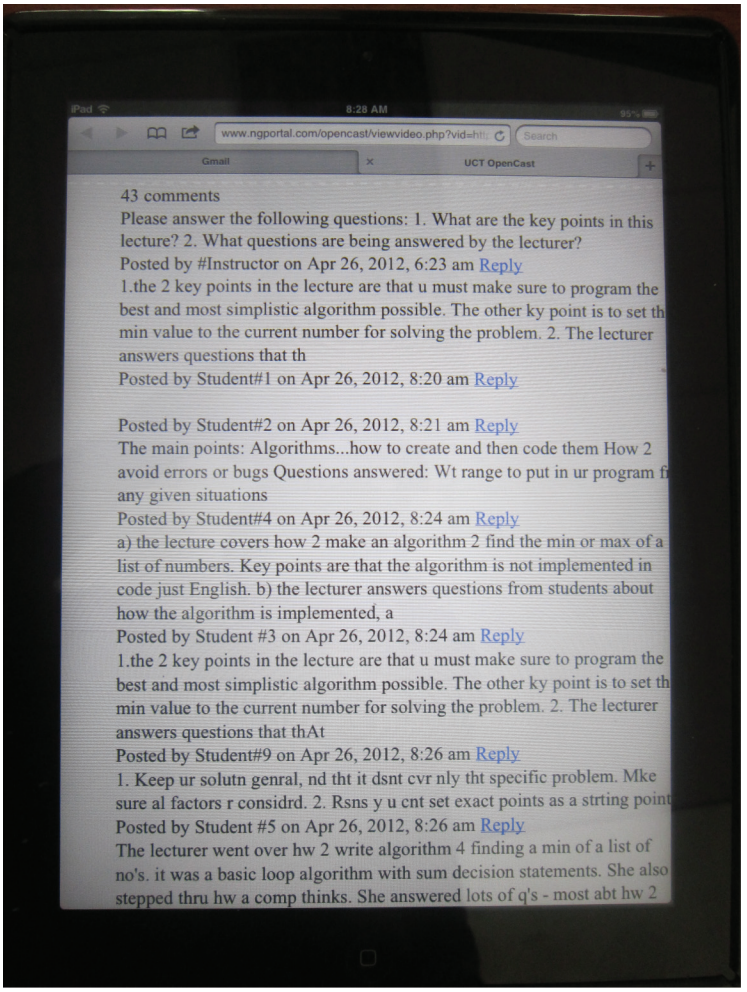
## Analysis of Students' Comments

Student-to-teacher interaction, the teacher posted questions to prompt interaction and motivate the students to engage. The questions were:

1. What are the key points in this lecture?
2. What questions are being answered by the lecture?

- **Student-to-Content Interaction:** Students interacted with lecture vodcast by posting their comments i.e. Student#4 commented that the main point in the lecture is about algorithms, how to code them and avoid errors or bugs, hence showing his high-level interaction with the lecture vodcast (See Table 1).
- **Student-to-Student Interaction:** These interactions show how students interacted

*Figure 4. MOBILect on iPad device*



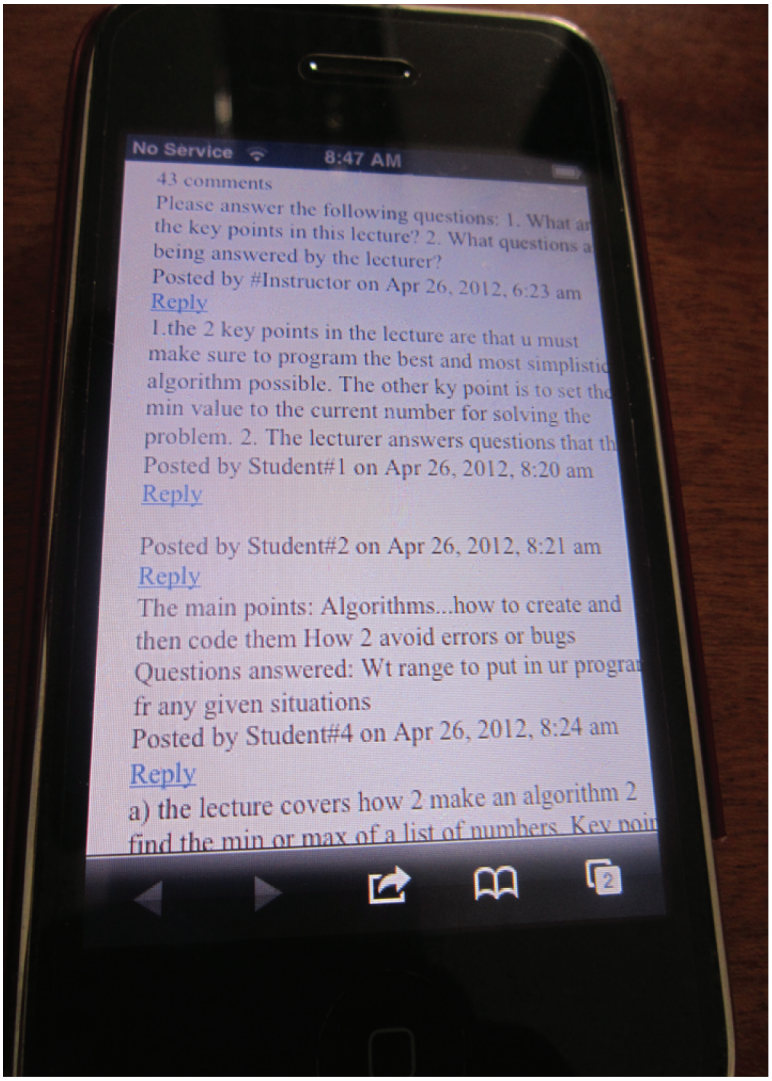

with other students' comments by posting answers to reply; it can be seen that Student#3 and Student#9 replied to comments posted by Student#5. See Table 1 below for explanation of some of the interactions.

From the interactions that occur in the above case study, 43 comments were posted. Of these 14 comments were posted as student watched the lecture vodcast, which suggests student-to-content interactions. 29 comments were posted in response to postings made by other students (student-to-student interactions). Based on Anderson (2003) that deep and meaningful learning is supported as long as one of the three forms of interaction (student-to-teacher; student-to-student; student-to-content) is engaged at a high-level. Students engaged with each other more as evidenced in the "replies" to peers' postings at a high-level with 29 comments, hence deep and meaningful learning has been achieved.

## Analysis of Focus Group Discussions

Qualitative data was collected in this study through focus group discussions. Focus group discussions were recorded and transcribed

*Figure 5. MOBILect on iPhone 3G*




immediately following the discussions. Audio recordings were transcribed. Transcripts were checked for errors to ensure reliability (Creswell, 2009). Audio recordings were listened to multiple times and transcripts were double-checked to ensure accuracy by an expert.

Using the MOBLEC model as a mode of reference, questions were developed for the focus group discussion sessions. All the questions were based upon the device usability (AB), learning engagement intersection (BC), and interaction technology intersection (AC) of the MOBLEC model. This section contains the analysis of the focus group discussions.

## Device Usability (AB)

### *Describe Your Experience of Using this Tool on Your Own Mobile Devices?*

Students commented on the ease of using their mobile devices for accessing MOBILect. All

*Table 1. Explanation of interactions*

| Mobile Lecturing | Interactions | Explanation |
|---|---|---|
| Student-to-Teacher Interaction | CS Teacher: 1. *What are the key points in this lecture? 2. What questions are being answered by the lecture?* | Teacher interacted with student by posting a learning task to prompt students to interact. |
| Student-to-Content Interaction | CS Student#1: *The 2 key points in the lecture are that u must make sure to program the best and most simplistic algorithm possible; the other key point is to set the min value to the current number for solving the problem.* | Students interacted with lecture vodcast prompted by the questions posted by teacher. In this interaction. Student#1 and Student#4 interacted with lecture vodcast by answering the question "What are the key points in this lecture"? |
| | CS Student#4: *The main points: Algorithms...how to create and then code them How 2 avoid errors or bugs Questions answered: Wt range to put in ur program fr any given situations.* | Here the students use SMS lingoes (SMS abbreviation) to interact. Students interacted with lecture vodcast prompted by the second question posted by teacher. |
| | CS Student#3: *The lecture covers how 2 make an algorithm 2 find the min or max of a list of numbers; Key points are that the algorithm is not implemented in code just English. The lecturer answers questions from students about how the algorithm is implemented.* | Students interacted with lecture vodcast prompted by the second question posted by teacher. |
| | CS Student#6: *Find max nd min of list of nos. figure out how 2 solve a problm using a algorithm inst ed of a progrm. cn the comp understnd < signs? Yes. Franki askd sumthin... Cudn't hear his q. Cud hear otha q's being answerd bt cudn't hear the actual q's…* | In this interaction. Student#3, Student#6 and Student#8 interacted with lecture vodcast by answering the question "What questions are being answered by the lecture? |
| | CS Student#8: *The lecturer went over hw 2 write algorithm 4 finding a min of a list of no's. it was a basic loop algorithm with sum decision statements. She also stepped thru hw a comp thinks. She answered lots of q's - most abt hw 2 rite the algorithm nd gave sugges.* | Here the students use SMS lingoes (SMS abbreviation) to interact with lecture vodcast. Students interact here to create their own meaning of the lecture. |
| Student-to-Student Interaction | Reply @student#3 *Yes she did make it clear that the algorithm could be in english ie pseudo code. Posted by Student#4.* | Student#4 replies Student#3. |
| | Reply@student#5: *I agree with what you have to say. She used specific decision statements. That being for while loops. Posted by Student#9.* | Student#9 replies Student#5. |
| | Reply@student#5: *I agree with you that the solution should be general, and that an algorithm should be generalities solve any list of numbers. Posted by Student#3.* | Student#3 replies Student#5. |
| | Reply@student#8: *She also gave rsns why certain algrthms wld nt wrk nd hw thy cld be made mre efficient. Posted by Student#5.* | Student#5 replies Student#8. |
| | | Here students engaged in high-level interactions by responding to other students' questions or comments. This interaction exposes students to ideas and concepts of other students, hence fostering deep learning. |

the participants were currently enrolled in the corresponding f2f lecture. The students participated using their personal mobile devices. One student reported that "yes, first round you can see what it was meant to do as I looked at it". MOBILect has a simple and friendly interface that the students found it easy to access on their devices. Another student commented that "For new users, you can just say this is what you are supposed to do, and then once they have it should be easy from there on and I think at first glance I could probably see what I have to do. I don't really need a lot of help going around from page to page. I can actually see what it does …." This indicates the simplicity of the tool. Another student indicated that the name "MOBILect" was most suitable for the tool and allows a student at first glance to know what the tool is all about.

### *What are the Limitations Posed by These Mobile Devices?*

Though some of the students had limitations in accessing MOBILect on their mobile devices due to small screen; students responses indicated that with smaller devices like (iPhones, iPod touch etc.), it was a bit difficult to watch the video and to move around the screen to read comments because of the small screen, but this was not actually a limitation because the students were already familiar with their devices and were able to navigate successfully through MOBILect. Kukulska-Hulme (2007) indicates that when mobile devices belong to users, the user's level of familiarity with the device helps to avoid many potential usability problems. The students reported certain limitations to their devices:

*Using an iPOD Touch I find it difficult to look at people's replies and it's kind of hard to scroll down and look at things and somebody complained that you kind of lose the format that you wrote and you can't see how many comments and it's kind of not ordered like all the replies to my statement down so that I can keep track of them.*

*I have a Nokia N97 … I constantly had to refresh, so I had to refresh to see the latest comment.*

*Using a small phone (iPhone 3G) you have to zoom in and zoom out, it's a bit difficult to maintain a chat.*

Although the students faced these limitations, their familiarity with their devices assisted and enhanced the device usability.

## Learning Interaction (BC)

### *Student-to-Content Interactions: How Would You Describe Your Learning Experience? What Did You Learn Through This Interaction?*

Students were asked to interact with MOBILect using student-to-content interactions and student-to-student interactions. Teacher interacted with the students by assigning a task to trigger students' learning (student-to-teacher Interaction). Commenting on the task posted by the teacher, students interacted with the lecture vodcast on MOBILect via their mobile devices. Their responses on the benefits of the student-to-content interactions are:

*I just think the whole thing is nice to see the video after the lecture because then people talk about it, people understand the video more clearly, then you can read what they say and then it gives you lots of opinions about what happened in the lecture and it helps.*

*I think it's nice if I didn't get the lecture, if I wasn't able to ask the lecturer questions or I didn't understand. It depends if I am sick and not able to attend f2f lecture then it will be beneficial…*

*Given that we have already heard the lecture, it would be good for revision and reinforcement of what we have heard; it's kind of like a revision thing.*

*It allows students who are shy to ask questions freely.*

The use of the tool gave the students more insight into what was taught in the f2f lecture. The students indicated the benefits of the interaction as being good for revision, and to listen to the lecture vodcast on MOBILect if absent from the f2f lecture.

Student engagement with MOBILect was anonymous; students did not use their real names but were given a specific student number for evaluation. Because of this anonymity the students felt confident to post questions and comments. Students further interacted with the comments of other students posted on MOBILect. One of the students commented that the anonymousity would give a lot of students the confidence to actually ask questions and others would benefit from it. Other responses are:

*The fact that it is anonymous gives a lot of people confidence to actually ask the questions and then they themselves and others benefit from it.*

*They can probably ask questions that students are shy to ask, because when you ask a question digitally then you're not as scared of putting yourself out there; asking a dumb question or a question you may think is dumb, then they could help students who don't really want to ask questions in class.*

He further commented,

*You would be less shy, for example, because in a lecture you might be afraid to ask stupid questions, though it might be a valid question but you are afraid that if you ask this question, other people might just be thinking that this is a really dumb question, because that was exactly what was happening in the first semester course.*

A student gave a real life experience he said "At the beginning of the semester, people who were never on this programme asked questions and the people who were familiar with the programme were like saying 'Aahhhhh', and these people stopped asking questions because of that." The students confirmed that there were questions that they would never ask in f2f lectures but would ask when using the tool. The students' responses indicated that shy students that could not ask questions during the f2f lecture will find the tool useful.

### *Student-to-Student Interactions: How did Seeing what Other Students had Commented Help You?*

Students interacted with other students by viewing other students' comments and also posting their comments. One student commented that seeing other student comments was a good way to evaluate yourself whether you really understand the concept or not. He stated

*I would say it is a good way to evaluate yourself whether you understand the concept or not, because if someone explains something better, you can gauge yourself on where you are ...*

Another student commented that

*The difference between the lecturer's train of thought and the students train of thought can be different so you find yourself relating to how another student has interpreted the information that they source and in that case you can learn a bit better.*

One of the students further explained that student-to-student interaction can really help to understand the course concept much more by getting answers to questions from different students. She stated that "if you have a question then you can just ask it, generally someone will know the answer so it will benefit you in the sense that it does not necessarily have to be the lecturer replying to you". She further said that "if you post a question, someone in the 300 or so who have actually attended the lecture will know the answer so it will benefit you, and the good thing is that if someone replies with one answer, then someone replies with a different answer; eventually there will be an answer that is consistent. So you will have a broad idea, which gives room for discussion". Other student responses on the benefits of student-to-student interactions are:

*Useful.*

*Valuable information.*

*Many people know lots and you discover it through them seeing the comments.*

*Many people know much more than we think they do, it is really helpful if your peers know things you don't.*

The students indicated that the comments of other students assisted to post meaningful comments. It exposed students to other people's ideas on the lecture. Students also benefited from the accrued knowledge of others, i.e. from the aggregated comments (the comments posted by other students), students reported that the different opinions and ideas of others had allowed them to gain deeper understanding of the lecture.

### Student-to-Teacher Interactions: How is the Interaction with the Lecturer Through this Tool Different from f2f?

Students responded to the benefits of the student-to-teacher interactions: In student-to-teacher interaction, the teacher interacted with the students by posting learning tasks on the MOBILect to trigger student interaction with the tool. The students posted comments to answer the learning tasks. The students indicated that interaction with the teacher through the tool would be an eye-opener for the teacher: The teacher would be able to discern the understanding level of the class, whether the class really understood the concept of the course or not. One student commented that "It would be an eye opener for her, to know whether what she's teaching in class is getting through or not". The teacher would be able to know the level of the class, whether f2f teaching was making sense to the students or not. She would know the questions some of the students were struggling with but could not ask in the f2f class. One student commented that "She will be able to know the level of the class, maybe know the 'dumb questions" students were afraid to ask, know some of the questions students are struggling with". One student further commented "The lecturer will be able to focus her presentations to be more effective in the way that the students are receiving". The students believed that interaction with the teacher via the tool will be quite useful and different from the f2f lectures in that they are not limited to the time and space of classroom.

## INTERACTION TECHNOLOGY (AC)

### Interaction Technology (AC) Questions

#### *Comment on the Functionality of the Tool? Did it Work for the Purpose for Which it was Designed?*

The students indicated the positive functionality of the tool (MOBILect). The students affirmed that the tool fulfilled its purpose. They responded to the benefits and functionalities of the tool. They indicated that the tool had ability to enhance and improve their understanding of the f2f lecture. One of the students acknowledged the usefulness of the tool as a good tool for preparing for a test or for quick revision; He stated that students' aggregated comments were "a good tool for preparing for a test, basically people will give you key points of the lecture, so you don't have to scan through the whole course".

The tool was designed to be simple and easy to use. The students indicated that the tool was easy to access and use and that for a newcomer to the tool it is easy to know what the tool is all about. They further indicated that the name of the tool "MOBILect" (Mobile lectures) is most appropriate. One of the students observed that at first glance of the tool "I could probably see what I have to do, I don't really need a lot of help going around, from page to page, I can actually see what it does".

### *How do You Recommend this Tool be Improved?*

The students indicated various ways that the tool could be improved; they commented that though navigating the tool with their devices was easy, the tool could be made more user-friendly. They suggested that there should be clearer boundaries between comments and replies, automatic updates of comments should be made possible and an offline version of the tool should be developed. The comments of the students below indicate some of the suggested improvement to the tool:

*One student suggested vibration of the phone when a new comment is posted on the tool: "And maybe its number on this phone and maybe is someone replies, it kind of vibrates, it's going to be cool."*

*Another thing I can actually add to that is you have a web-based version but you can also have non-web based version, for example dedicated platform versions. Like an actual application that would run on Android, IOS or Blackberry.*

*Also I think with what you are aiming at, as you said, the workplace or being on the move, with the audio, it's much easier to listen to something and do something else, than to sit there and stare at the screen, when you on the move it is easier to listen.*

Though students indicated that a non-web version of MOBILect should be made available, Web-based applications are desirable because they can be accessed on most operating system platforms. Non-web based applications require modifications to port to different platforms (Wagner et al, 2008). Web-based MOBILect has been accessed from different platforms such as Symbian, Blackberry, iOS, Android, Opera mini etc.

The students also suggested that the tool should have different versions i.e. audio version which students can listen to while walking and also to limit the bandwidth usage. Most vodcasts have the ability of retaining students' attention for longer period of time than does podcasts, (Daly-Jones et al., 1998) though podcasts may be preferable in situations where student is walking or driving and watching when Vodcast might pose a risk.

### *Please Give Advice to Students who will be Using this Tool in Future. Recommendations/Caution/Hints*

The students gave the following recommendations, cautions and hints for the potential users of the tool. The students' responses are as follows:

*I recommend the students be proactive about it and even if they do comment or give an answer, they must be able to give a comprehensive answer and things like that, it would simplify things for people who are reading it, that's exactly what I am talking about.*

*Still go to lectures and then later on you can watch this and use it more as a recap, because sometimes in a lecture you get distracted and you miss a section then you don't want to say 'please repeat that' because lecturers sometimes don't like repeating things …*

*Use it as an extra, a supplement, not to replace f2f.*

*Don't replace your lectures with this*

*I think students must be able to refer other students to other useful references, to say you can look up this in this book chapter…*

In summary, students encouraged their peers not to replace f2f lectures with the tool but engage with the tool as a supplement to f2f lectures.

## DISCUSSION

The challenges of f2f lecture remains how best to improve and enhance learning in HEIs. In this

paper the following challenges were discussed as limitations to f2f learning in HEIs South Africa: the challenge of medium of instruction, the challenge of large classes, and the challenge of academic under-preparedness. Many students in HEIs in South Africa who do not speak English as their mother tongue, coupled with different levels of academic preparedness and large classes, found it difficult to understand the f2f sessions. From the data obtained from the study; majority of the students do not speak English as their mother tongue. It was also observed that student posted their comments using SMS Lingoes. This sort of interaction allowed students to post comments in a *language* that is understood by most of the students since they are used to sending SMS lingoes through their phones. These SMS 'lingoes' provided a shorthand form that allowed students to rapidly post their comments and interact with other students, since most of the students are conversant with the *language*. SMS lingoes offered the students especially those who have difficulties with the language of teaching (for whom English is not their mother tongue), to communicate with peers using SMS lingoes, which they are familiar with. Data collected from analysis of student comments indicated that students were able to learn using MOBILect. From the interactions that occurred in the study: student-to-student interactions were engaged at a high-level with 29 comments posted, hence mobile lecturing has engaged learners in deep and meaningful learning. MOBILect is learner-centred; a student can interact with MOBILect to construct his/her own knowledge. Students can watch a lecture vodcast on MOBILect; create their own knowledge of the lecture and learn at their own pace; MOBILect provides avenue for student to interact with other students and also with their teacher. F2f lecture is teacher-centred where the teacher is the one directing the pace of learning as compared with MOBILect where students are in control of their learning and teacher mainly provides support. In the evaluation of MOBILect that was conducted at University of Cape Town (UCT), students reported the positive impact of this tool to solve the challenges that motivated this work. Advantages of MOBILect are numerous:

- It works on most mobile devices because of its cross platform web-based HTML5;
- Comments are aggregated and made available in a space which becomes an educational resource for students;
- Students can download lecture vodcasts to their mobile devices;
- MOBILect allows fast and very precise navigation to required lecture vodcasts on mobile devices;
- The user interface of MOBILect is user friendly; navigation is designed to be as simple and easy to use.

## Limitations and Future Works

MOBILect can display only 10 lecture vodasts from UCT Opencast (http: http://media.uct.ac.za/feeds/atom/0.3/latest/index.xml) and 25 lecture vodcasts from (http://www.youtube.com/rss/tag/uct.rss) in YouTube (# UCT tag). The feeds are dynamically generated, as other videos are being loaded by the feeds the existing videos are pushed out. The lecture vodcasts available on MOBILect at any time depend on the generated feeds. The search result option can only search from the list on the main menu (35 lists). Students can use the tool to watch or download video on campus where the internet is free, but may be costly to operate outside campus because of the video files. MOBILect displays only the presentation.MP4 from UCT Opencast out of the four available media files ; Presenter.avi (Video Clip) Presenter.mp4 (Video Clip) Presenter.mp3 (MP3 Format Sound) Presentation.mp4 (Video Clip) Presentation.avi (Video Clip). Future work might be to integrate into MOBILect other media formats.

# CONCLUSION

Our motivation for the interactive mobile lecturing model (MOBLEC) was based on enhancing student engagement with f2f lectures

through mobile learning interactions to foster deep learning. Students interact with lecture vodcast, students interact with other students and students interact with teacher with their mobile devices. In this work we have been able to implement MOBILect a mobile lecturing tool that enhances student engagement with lecture vodcasts through mobile learning to foster deep learning. Students responses indicated that with smaller devices like (iPhones, iPod touch etc.),It was a bit difficult to watch the video and to move around the screen to read comments because of the small screen, but this was not actually a limitation because the students were already familiar with their devices and were able to navigate successfully through MOBILect. Kukulska-Hulme (2007) indicates that when mobile devices belong to users, the user's level of familiarity with the device helps to avoid many potential usability problems. MOBILect was developed in a cross platform HTML5 solution which allows the tool to run on 8 different mobiles devices with three popular operating systems. Through the focus group discussion we were able to conclude that MOBILect developed based on MOBLEC model has the capacity to engage students with lecture vodcast to foster deep learning. MOBILect is a good supplement to the traditional face-to-face lecture in HEIs South Africa and can also be indispensable to other developing countries of Africa especially in scenarios where there are large population of students in the f2f lectures.

## REFERENCES


Alejandro, X. (2011). *Abbreviations for texting: IM, chat and SMS slang.* Retrieved from http://www.buzzle.com/articles/abbreviations-for-texting-im-chat-and-sms-slang.html.

Anderson, T. D. (2003). Modes of interaction in distance education: Recent developments and research questions. In M. G. Moore, & W. G. Anderson (Eds.), *Handbook of distance education* (pp. 129–144). Mahwah, NJ: Erlbaum.

Antoniou, A., & Lepouras, G. (2005, June 28-30). Using bluetooth technology for personalised visitor information. In *Proceedings of the IADIS international Conference on Mobile Learning*, Qawra, Malta.

Attewell, J., Savill-Smith, C., & Douch, R. (2009). *The impact of mobile learning: Examining what it means for teaching and learning.* Kempston, Bedford: Newnorth Print Ltd.

Boyinbode, O., Bagula, A., & Ng'ambi, D. (2012, March 11-13). An interactive mobile learning system for enhancing learning in higher education. In *Proceedings of the IADIS International Mobile Learning Conference*, Berlin, Germany (pp. 331-334).

Brown, A., & Green, T. D. (2006). Video podcasting: When, where and how it's currently used for instruction. In M. Simonson & M. Crawford (Eds.), *Proceedings of the 29th Annual AECT* (pp. 32-38). Retrieved from http://www.ahbrown.com/aect/podcasting_brown_and_green.pdf

Cheng, S., Hwang, W., Wu, S., Shadiev, R., & Xie, C. (2010). A mobile device and online system with contextual familiarity and its effects on English learning on campus. *Journal of Educational Technology & Society*, *13*(3), 93–109.

Cheon, J., Lee, S., Crooks, M., & Song, J. (2012). An investigation of mobile readiness in higher education based on the theory of planned behaviour. *Computers & Education*, *59*(3), 1054–1064. doi:10.1016/j.compedu.2012.04.015.

Copley, J. (2007). Audio and video podcasts for lectures for campus-based students production and evaluation of student use. *Innovations in Education and Teaching International*, *44*(4), 387–399. doi:10.1080/14703290701602805.

Crawford, V. M. (2007). Creating a powerful learning environment with networked mobile learning devices. *Educational Technology Magazine: The Magazine for Managers of Change in Education*, *47*(3), 47–50.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage Publications.

Daly-Jones, O., Monk, A., & Watts, L. (1998). Some advantages of video conferencing over high-quality audio conferencing: Fluency and awareness of attentional focus. *International Journal of Human-Computer Studies*, *49*, 21–58. doi:10.1006/ijhc.1998.0195.

Dyson, L. (2011). Does going mobile always make learning better? In T. Bastiaens & M. Ebner (Eds.), *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2011* (pp. 2957-2966). Chesapeake, VA: AACE. Retrieved July 13, 2012 from http://www.editlib.org/p/38282

Dzubak, C. (2005). What skills and whose standards: Why are students under-prepared? *Synergy: The Journal of the Association for the Tutoring Profession*, *1*(1), 1–13.

Dzubak, C. (2009). Role modelling to under-prepared students. *Synergy: The Journal of the Association for the Tutoring Profession*. Retrieved May 30, 2012, from http://www.myatp.org/Synergy_1/Syn_a11.html

Edirisingha, P., Hawkridge, D., & Fothergill, J. (2010). A renaissance of audio: Podcasting approaches for learning on campus and beyond. *European Journal of Open Distance and E-Learning.* Retrieved June 18, 2012, from http://www.eurodl.org/?article=393

El-Hussein, M. O. M., & Cronje, J. C. (2010). Defining mobile learning in the higher education landscape. *Journal of Educational Technology & Society*, *13*(3), 12–21.

Evans, C. (2008). The effectiveness of m-learning in the form of podcast revision lectures in higher education. *Computers & Education*, *50*, 491–498. doi:10.1016/j.compedu.2007.09.016.

Friedland, G., Knipping, L., Tapia, E., & Rojas, R. (2004). Teaching with an intelligent electronic chalkboard. In *Proceedings of ACM Multimedia 2004, Workshop on Effective Telepresence,* New York, NY.

Haag, J. (2011). From elearning to mlearning: the effectiveness of mobile course delivery. In *Proceedings of the Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC)*, Orlando, FL.

Haddad, C. (2006). *Practical tips for teaching large classes: A teacher's guide.* Retrieved May 26, 2012, from http://www2.unescobkk.org/elib/publications/095/Teaching_Large_Classes.pdf

Hardman, J., & Ng'ambi, D. (2003). A questioning environment for scaffolding learners' questioning engagement with academic text: A university case study. *South Africa Journal of Higher Education*, *17*(2), 139–146.

Heilesen, S. B. (2010). What is the academic efficacy of podcasting? *Computers & Education*, *55*(3), 1063–1068. doi:10.1016/j.compedu.2010.05.002.

Jaffer, S., Ng'ambi, D., & Czerniewicz, L. (2007). The role of ICTs in South Africa: One strategy for addressing teaching and learning challenges. *International Journal of Education and Development using Information and Communication Technology, 3*(4), 131-142.

Kenny, R. F., Park, C. L., Van Neste-Kenny, J. M. C., Burton, P. A., & Meiers, J. (2009). Using mobile learning to enhance the quality of nursing practice education. In M. Ally (Ed.), *Mobile learning: Transforming the delivery of education and training*. Athabasca, AB: Athabasca University Press.

Ketterl, M., Mertens, R., Morisse, K., & Vornberger, O. (2006, June 26-30). Studying with mobile devices: Workflow and tools for automatic content distribution. In *Proceedings of the World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED-Media),* Orlando, FL (pp. 2082-2088).

Ketterl, M., Schulte, O., & Hochman, A. (2010). Opencast Matterhorn: A community-driven Open Source Software project for producing, managing, and distributing academic video. *International Journal of Interactive Technology and Smart Education*.

Koole, M. L. (2009). A model for framing mobile learning. In M. Ally (Ed.), *Mobile learning: Transforming the delivery of education and training*. Athabasca, AB: Athabasca University Press.

Kukulska-Hulme, A. (2007). Mobile usability in educational contexts: what have we learnt? *International Review of Research in Open and Distance Learning*, *8*(2), 1–16.

Lee, M. J. W., & Chan, A. (2007). Reducing the effects of isolation and promoting inclusivity for distance learners through podcasting. *Online Submission*, *8*, 85–105.

Lindsay, S., Parmar, N., Cameron, M., Reader, K., & Sultany, A. (2010). Before I begin, can I ask all students to switch their mobile devices ON? *Conference Introduction and Abstracts* (Oxford, UK, ALT-C 2010). Retrieved May 29, 2012, from http://repository.alt.ac.uk/798/

Liu, Y., Li, H., & Carlsson, C. (2010). Factors driving the adoption of m-learning: An empirical study. *Computers & Education*, *55*(3), 1211–1219. doi:10.1016/j.compedu.2010.05.018.

Marshall, N. T. (1996). *Sampling for qualitative research family practice* (Vol. 13, pp. 522–525). Oxford University Press.

McGarr, O. (2009). A review of podcasting in higher education: Its influence on the traditional lecture. *Australasian Journal of Educational Technology*, *25*(3), 309–321.

Motiwalla, L. F. (2005). Mobile learning: A framework and evaluation. *Computers & Education*, *49*, 581–596. doi:10.1016/j.compedu.2005.10.011.

Ng'ambi, D. (2008a). Podcasts for expansive learning: A case of reflective student stories. *South African Computer Journal: SACJ*, *42*, 9–14.

Ng'ambi, D. (2008b). Podcasting for reflective learning. In G. Salmon, & P. Edrisangh (Eds.), *Podcasting for learning in universities* (pp. 132–145). Open University Press.

Ng'ambi, D., Lombe, A., Johnston, K., & Kabanda, S. (2010, October 19-22). Podcasting for mobile learners: Using ubiquitous technologies to enhance learning in large classes. In M. Montebello., V. Camilleri., & Dingi, A. (Eds.), *Proceedings of the 9th International Conference on Mobile Learning*, Valletta, Malta. (pp. 256-262).

Nicol, D., & Boyle, J. (2003). Peer instruction versus class-wide discussion in large classes: A comparison of two interaction methods in the wired classroom. *Studies in Higher Education*, *28*(4), 457–273. doi: 10.1080/0307507032000122297.

Nzimande, B. (2009). *Some challenges facing the South Africa higher education system.* Retrieved May 9, 2012, from http://www.politicsweb.co.za/politicsweb/view/politicsweb/en/page71656?oid=139807&sn=Detail

O'Malley, C., Vavoula, G., Glew, J., Taylor, J., Sharples, M., & Lefrere, P. (2003). *Guidelines for learning/teaching/tutoring in a mobile environment.* Ricerca, Italy: MOBIlearn/Giunti. Retrieved June 12, 2012, from http://www.mobilearn.org/download/results/guidelines.pdf

OpenEyA. (2012). *OpenEyA.* Retrieved May 9, 2012 from www.openeya.org/openeya

RSS. (2002). *RSS 2.0 specification.* Retrieved May 12, 2012, from http://feed2.w3.org/docs/rss2.html

Sharples, M., Sanchez, A., Milrad, M., & Vavoula, G. (2008). Mobile learning: Small devices, big issues. In N. Balacheff, S. Ludvigsen, T. de Jong, A. Lazonder, & S. Barnes (Eds.), *Technology enhanced learning: Principles and products* (pp. 233–249). Heidelberg, Germany: Springer.

Spiegel, M., Khotseng, B., Gxilishe, S., Kaschula, R., Van der Merwe, C., … Ramesar, R. (2003). *Towards a language plan for the University of Cape Town: 2005-2010.* Curriculum Working Group of the University of Cape Town.

Traxler, J. (2007). Defining, discussing and evaluating mobile learning: The moving finger writes and having writ…. *The International Review in Open and Distance Learning*, *8*(2), 1–13.

Traxler, J. (2009) *Students and mobile devices: choosing which dream* (Oxford, ALT-C 2009 Research Papers). Retrieved May 29, 2012, from http://repository.alt.ac.uk/643/1/ALT-06_web_0288.pdf

UCT Student Survey. (2011). *Student mobile phone survey*. September 2011.University of Cape Town.

Wagner, R., Gruber, F., & Hartmann, W. (2008). Distribution patterns for mobile internet applications. In *Handbook of research on mobile multimedia* (2nd ed.). Hershey, PA: IGI Global. doi:10.4018/978-1-60566-046-2.ch067.

Walls, S. M., Kucsera, J. V., Walker, J. D., Acee, T. W., McVaugh, N. K., & Robinson, D. H. (2010). Podcasting in education: Are students as ready and eager as we think they are? *Computers & Education*, *54*, 371–378. doi:10.1016/j.compedu.2009.08.018.

Warburton, K. (2003). Deep learning and education for sustainability. *International Journal of Sustainability in Higher Education*, *4*(1), 44–56. doi:10.1108/14676370310455332.

Wolf, K., Linckels, S., & Meinel, C. (2007). Teleteaching anywhere solution kit (tele-TASK) goes mobile. In *Proceedings of the 35th Annual ACM SIGUCCS Conference on User Services*, (pp. 366–371). ACM.

*Olutayo Boyinbode, PhD, is a recent doctoral graduate from the Department of Computer Science's ICT4D research group the University of Cape Town, South Africa. She is a lecturer in the Computer Science Department at the Federal University of Technology, Akure, Nigeria. Her research interests are in Mobile Learning, Ubiquitous Learning and Mobile Networks. She is a professional member of ACM and IEEE.*

*Dick Ng'ambi, PhD, is an Associate Professor and a leading researcher in mobile learning in resource constrained environments. He works for the Centre of Educational Technology at the University of Cape Town (UCT). He is currently the Coordinator of a postgraduate programme in educational technology, and a convener of a doctoral programme in the School of Education at the University of Cape Town, South Africa.*

*Antoine Bagula, PhD, is a Senior Lecturer in the Department of Computer Science at the University of Cape Town, South Africa. His research interests are mainly in the areas of Telecommunication with applications to smart inter-networked devices and ICT4D. More specifically, he focuses on wireless sensor networks, RFID, their integration and their application in developing countries.*