DEPLOYING MOBILE MENTORING INTERVENTIONS IN INITIAL TEACHER EDUCATION: A REVIEW OF THE *MAKMENTOR APP* DEVELOPMENT PROCESS

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Abstract:

One of the strategies which can be used to advance the quality of teacher preparation, is mentoring. Although it is often difficult to effectively enact the process of mentoring teacher trainees during practicum, due to the dispersed locations of teacher trainees in practicum schools countrywide, the authors suggest that utilization of mobile technologies has potential to leverage the process. Following this proposition, a mobile application development tool was used to develop a mentoring app named "Makmentor App". This experimental tool was deployed to provide mentorship to different groups of Makerere University teacher-trainees during practicum. The process of deploying the app was informed by Design-Based Thinking and Koole (2009) Framework for Rational Analysis of Mobile Education – (FRAME). The main potential of Makmentor App was in its ability to bridge the communication gap by facilitating synchronous and asynchronous communication between and among teacher trainees and mentors as well as provision of critical subject-related content that could be accessed by teacher trainees anywhere anytime on a mobile phone.

Keywords: interaction, communication, pupil-teacher, verbal activity

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Introduction

Definitions of mobile learning have been criticized for their much focus on the technology rather than on learning (Ally, Grimus & Ebner, 2014). In this paper the definition will focus on the thesis that mobile technologies can be used and facilitate learning both inside and outside the classroom. Mobile learning (m-Learning) has been defined as "*the process of coming to know through conversations across multiple contexts amongst people and across personal interactive technologies*" (Sharples, et al 2007). A more general definition is given by Brasher and Taylor (2005) as any learning that happens when a learner is not in a fixed, predetermined location or learning that happens when the learner takes advantage of the learning opportunity offered by mobile technologies. A third definition is that, mobile learning, is the delivery of electronic learning materials, with built- in learning strategies and objects on mobile computing devices to allow access from anywhere and from anytime (Ally, 2009). It is worth noting that, mobile learning has moved beyond the information access paradigm, enticing users to work as partners and collaborators in co-constructing their collective wisdom and knowledge (Schuck, Aubusson, Kearny and Burden, 2010). At a pedagogical level, deployment of m-Learning can range from a teacher using mobile devices to simply transmit information to a student, to using mobile devices for engaging students in collaborative construction of knowledge in authentic learning environments (Aubusson, Schuck and Burden, 2009).

Mentoring and Mobile Technologies

One of the strategies for improving the quality of teacher preparation is strengthening the process of mentoring. The authors suggest that utilizing mobile technologies has potential to leverage the process of mentoring. The original connotation of mentor as a wise, experienced adviser nurturing, supporting, guiding and assessing the naïve but eager protégé' seems to have been captured by teachers as indeed it has by other professions, and is a significant improvement on the notion of supervisor. The concept of mentorship suggests an expert professional, guiding the apprentice teacher but with the addition of a more precise instructional dimension. The mentor's role involves being an instructor, a teacher, counsellor and an assessor rather than more simply a craft expert to be copied by a novice (Kate, 1992). Thus, mentoring in pre-service teacher education refers to the process of facilitating teacher learning by a more knowledgeable other. In this context the teacher educators are the mentors and pre-service teachers, the mentees. The functions of mentors include providing access to resources, role

modelling, and counselling, coaching, collaborating teaching, encouraging reflection, helping with career moves and developing friendship (Alleman, 1986; Head et *al*, 1992; Wildman et *al*, 1992; Maynard & Furlong, 1993). The process of mentoring teacher trainees should include: induction into the school-context; induction into the subject area and induction into the teaching profession. It is these functions that the mobile mentoring app will provide to the pre-service teachers anywhere anytime.

It was envisaged that the makmentor mobile mentoring intervention will allow pre-service teachers and teacher educators to become active participants in the mentoring process, where they will collaborate, create and share teacher learning knowledge anywhere, anytime by use of mobile devices. This will essentially allow the mentoring of pre-service teachers to be carried out in both formal (on-campus) and informal contexts –off campus. Specifically the intervention is for off-campus mentoring support.

Pre-Service Teacher Development and Mobile Technologies: What Needs To Be Done?

If pre-service teachers are to learn to transform and transfer new theories into practice and leverage the potential of mobile technologies in the classroom, they must experience mobile learning in their initial training (Ally, Grimus &Ebner, 2014). This therefore suggests that if, mobile devices are used in the instruction and mentoring of pre-service teachers, they will have the opportunity to observe concrete examples of pedagogic and mentoring strategies for mobile learning and to consider what that learning is from a student's perspective (Ally, Grimus & Ebner, 2014). Moreover, in order for teachers to incorporate the advantages of mobile technologies into their practice, "teacher development has been cited as one of the most manageable and cost-effective way of using mobile technologies to break into the cycle and system of education" (Botha et al., 2012, p.2). For teachers, a first necessary step is learning to use mobile technologies themselves, by using technology embedded within a subject or for mentoring support, teachers embrace learning for themselves, and use the tools to transform their own knowledge, and of their subject areas: then they can develop, expand and adjust their teaching repertoire (Sutherland et al., 2004).

Context and Contextualization of the *Makmentor App*

Makerere University is the largest provider of pre-service teacher education in Uganda, with a pre-service teacher population of 4500, and graduating over 1500 pre-service

teachers per year to join the teaching profession as secondary school teachers in the country. With such a large pre-service teacher population there is need to provide blended learning and mentoring opportunities in order to provide quality teacher preparation. On the pre-service programme, pre-service teachers are required to spend 16weeks of practicum experience in secondary schools across the country under the support supervision and mentoring by Supervisors from Makerere University (teacher educators).

While it is assumed that placement of pre-service teachers in schools and allocation of Supervisors will lead to support supervision and mentoring, the dispersed locations of students leads to communication gaps between and among pre-service teachers and Supervisors. Moreover, pre-service teachers continue to present similar problems of inadequate mentoring support. There is evidence that supervisors spend very limited time with pre-service teachers leading to ineffective mentoring. This is compounded by the high pre-service teacher-Supervisor ratio, brief face-face mentoring sessions before and after supervision and inadequate information on how to solve and manage everyday classroom situations as they arise. This is compounded also by the lack of digitized teacher learning resources that pre-service teachers can access off-campus. The available teacher mentoring resources are in print media.

Proposing an Envisaged Intervention of a Mobile App

There is need to complement the inadequate face to face mentoring with mobile mentoring to bridge the communication gap encountered due to dispersed geographical locations of pre-service teachers and lack of mobile learning objects/content that can be accessed using a mobile mentoring intervention. This intervention will:

1. Improve communication between and among mentors and mentees
2. Introduce the concept of mobile mentoring in the teacher education curriculum
3. Increase pre-service teacher access to teacher resources and information
4. Increase mentoring opportunities and spaces for mentors and mentees to share experiences of their mentoring process
5. Provide a content and resources sharing platform

Makerere University is in the early stages of implementing mobile learning support to Distance Education Students. While this has been critiqued for being information-centered, the mobile mentoring intervention was used for mentoring and supervision support to pre-service teachers. The mobile mentoring intervention targeted both pre-service teachers and teacher educators. Teacher educators were

required to provide pedagogical and content knowledge, supervision and mentoring guidance, content to be uploaded for pre-service teacher use. Interactive synchronous and asynchronous communication between and among pre-service teachers and teacher educators was enabled, through real-time mentoring feedback, for instructions, questions, and guidance.

Methodology: Design-Based Thinking and FRAME Model

Research into the design of mobile learning suggests that learning delivered on mobile devices will need to involve quick and simple interactions: It will need to use the technology not only to deliver learning but to facilitate communication, note-taking and time management (Naismith and Collet, 2006), Sharples (2009) also suggests that instructional design should support learners in reaching personal understanding through conversation and exploration. This means supporting their collaboration so that they can construct their common knowledge using technology, working with other learners and teachers. In developing the mobile mentoring intervention, design based thinking was used.

As indicated already, the mobile mentoring app development was guided by design-based thinking and Koole's (2009) FRAME model. First design based thinking guided the developers to learn about the audience, define, ideate, develop a prototype and test the makmentor app following the design-based thinking processes as shown in figure 1 below:
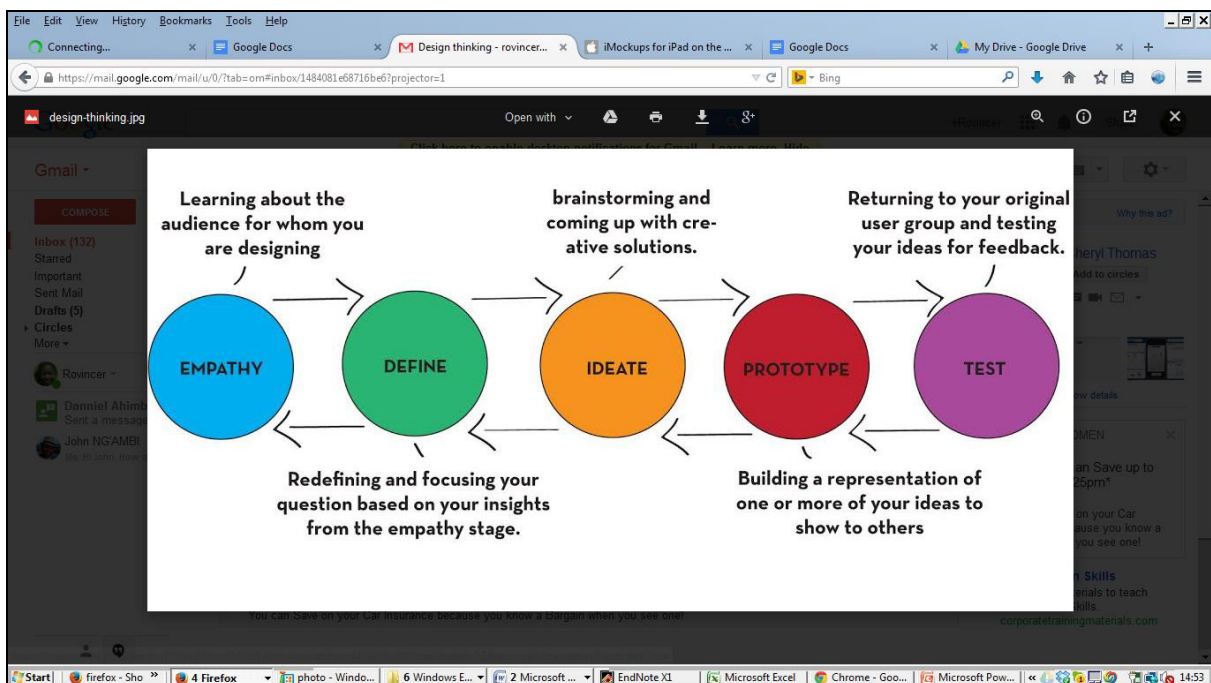

Figure 1: The Design-Based Thinking Process that guided the *Makmentor* app development

Application of Design Based Thinking in the *Makmentor* App Development Process

a.   Empathy

Learning about the audience for whom you are designing, in this case pre-service teachers and teacher educators. In order to generate evidence about the pre-service teachers and teacher educators, data was collected on the viability of mobile devices as a pre-service teacher mentoring tool, the main methods of data collection used included interviews and focus group discussions. Mobile phone usage profile data was collected from teacher educators and pre-service teachers. Data collection revealed that, mobile phones are most commonly used by pre-service teachers and teacher educators as a communication tool. Very few teacher educators and pre-service teachers use mobile phones for multimedia access (i.e. accessing multimedia resources such as e-books, databases, web pages, power point presentations), and for communicating with lecturers.

Mobile phone usage profile

An examination of the types of mobile phones owned by teacher educators and pre-service teachers, frequency of use of mobile phones, as well as the purposes for using them revealed that, SMS and Whatsapp were the most utilised mobile phone features, pre-service teachers mainly use mobile Whatsapp, mobile SMS and a few mobile email for chatting with friends, use it to ask other students about lectures, submission deadlines, and scarcely use mobile phones for accessing teacher resources or to communicate with teacher educators. Pre-service teachers use mobile phones to contact teacher educators for making appointments and supervision schedules, but have not used mobile phones for accessing or leveraging mentoring support.

Further teacher educators and pre-service teachers SMS daily, use the camera function to take pictures on a daily or weekly basis, and a few to audio record exciting moments. A vast majority of pre-service teachers have not used their mobile phones to access information on the web or to send and receive email message.

The six most frequently mentioned functions that pre-service teachers indicated use on the mobile phone are a) calculator, (b) camera, (c) Whatsapp (d) alarm function, (e) calendar, and (f) Internet/intranet/mail. They prefer using mobile phones to desktop computers due to the following reasons: portability of the mobile phone which makes it convenient for students to use during lesson/lecture breaks, lunch and while out of school, or off-campus, low cost price compared to computers, On the other hand, some of the reported dislikes about using mobile phones include: unfamiliarity with some of the phone functions, limited battery life, and memory, small screen size for reading

text, instability of the devices due to hardware crash, difficulties in making inputs using phone keypads, and limited internet browsing due to a majority of websites not rendering in a usable format on small screens.

Teacher educators have a variety of phones ranging with majority having smart phones. Although a significant number of pre-service teachers have basic feature phones most of their phones operate on android operating system and not IOS. There are no mobile learning objects/resources to enable pre-service teacher access to target mentoring resources, information and subject content.

Pre-service teachers and teacher educators indicated that they currently use mobile phones only to communicate dates and time when they will be going to supervise pre-service teachers. There is currently no mobile mentoring data/objects that can be accessed by pre-service teachers on the go.

b.   Define

Redefining and focus your questions based on the insights from the empathy stage. From the data collected, the developers re-defined the problem in relation to the context and need to be addressed and the mobile mentoring intervention. The redefined problem is lack of mobile granulated mentoring resources that can be accessed by pre-service teachers' and limited mentoring support while off-campus during school practice. While pre-service teachers need mentoring support while at campus, even more formal and informal mentoring support is needed while off campus during school practice. This mentoring support can be provided through access to mobile teacher learning resources, communication and collaboration in creation of mentoring resources. A mobile mentoring intervention would bridge the gap, therefore, there is need to use mobile phones by pre-service teacher and teacher educators not only as a communication tool but also as multimedia tool to access, create, collaborate, communicate and share mentoring resources and experiences in mediated processes leveraged by mobile phones.

c.   Ideate: Brain-storming and coming up with creative solutions

Data generated from focus group discussions with mentors and teacher trainees on the possible mobile application tools to be considered for development and inclusion in the mobile mentoring application revealed mobile app features to be considered. Specifically, they indicated that they need a mobile application that will provide the following functions:

a) Mentor Supervision Forms,
b) Links to teacher learning websites,

c) School practice calendar,

d) Supervision sheets and areas of concern;

e) Mentor /Supervisor contact details

f) Pre-service teachers school locations and details

g) Teaching subject support,

h) General teacher learning resources

i) A chat facility.

Based on these suggestions, the following eight makmentor app features/tools were considered and developed: Worldwide web, Mentor forms; School Practice Whatsapp- (SPWhatsapp), My mentor, School Practice connect-(SP-Connect), My Subject, School Practice Access-(SP Access); Live chat.

The search for an appropriate mobile applications tools developer for developing mobile apps relevant for teachers explored the following app development software: Mozilla appmaker, ibuildapp and Mobile Nation. Review of their affordances, appmaker was selected. Therefore, the mobile mentoring intervention proto-type was developed using appmakr. The process of development is shown in (Figures 2,3,4,5,6,7, 8, 9, 10). http://fanapp.mobi/makmentor.

d. Prototype: Building a representation of one or more ideas to show to others.

Following on from the mentoring app functions recommended by teacher educators and pre-service teachers, a makmentor app has been developed. The proto-type of the tools has been presented to the prospective targeted audience on a large screen display and print-media to pre-service teachers and teacher educators highlighting the suggested mobile application features/tools and a snapshot of content for each tool.

e. Test: Returning to your original user group and testing your ideas for feedback:

From the feedback received from teacher trainees and mentors, the makmentor icon was redesigned and uploaded relevant content to all the tools and to ensure functionality of the mobile application features.

f. Proof of Concept: Can the makmentor leverage mobile mentoring for pre-service teachers dispersed across Uganda?

The following makmentor app features/tools were tested with a group of 20 teacher trainees and 5 mentors to determine their affordances for supporting mobile mentoring. The following app features were tested:

i. **WWW-web app tool**

The tool provided several teaching subject websites and links to open education resources for teacher trainees to choose from and upload on the mobile phones for use, references and sharing. The links were updated each time the users run the app allowing updating and addition of new relevant links.

ii. **MY Subject app tool**

The MYsubject tool enabled mentors to provide subject specific support for the relevant content to be uploaded, and this also suggests the need to digitize and chunck subject content and information such that it can be viewed on mobile phones while avoiding creating content and cognitive overload. This provided access to critical topical content for all teaching subjects.

iii. **Live chat app tool:** This is a private chat room facility which was used for sharing events and let pre-service teachers to chat amongst themselves, the tool also enabled users to see each other's location in real time and send instant messages between each other.

iv. **SP Connect app tool:** This is a social wall face book-like feature that was used by pre-teacher trainees and mentors to send and receive SMS messages to the faculty school practice coordinators for circulation to the relevant zone leaders or even ask questions requiring feedback on mentoring support.

v. **MySchool app tool:** This was used to provide directions of school locations using Google maps. This addressed the waste of time and resources spent by mentors in trying to locate the schools where teacher trainees are placed. This addressed the lack of directions and maps to practicum schools.

vi. **Mentor Forms app tool:** The supervision and mentoring forms were digitized and chunked to provide details of the areas of supervision and mentoring support to be focused on by supervisors. Mentoring feedback and highlights of the pre and post lesson observation conferencing sessions were presented by mentors using the google forms to allow continuous reference and retrieval by pre-service teachers. The mobile nature of the forms will allowed mentors to access forms on the go. The mentor forms were developed using woofoo open source software.

vii. **SPwhatsapp app tool:** Provided an ical Google calendar of activities and schedule for planning school practice activities, upcoming time tables, as well as reminders for both pre-service teachers and teacher educators throughout the academic year.

viii. **SPAcess app tool:** This is an HTML page that provides the opportunity for offline, rich text, html, and in-line CSS documents that can be accessed with or without internet. The app feature enabled instant access to important school practice documents,

guidelines, regulations, code of practice on mobile phones any time anywhere while offline.

With the above eight app tools, teacher trainee interacted with the makmentor mobile application, and developed competence in using, sharing and interacting with mobile teacher learning resources to support their learning and mentoring during practicum placement. The makmentor app also enabled teacher trainees to receive mentoring support from a mobile mentor, anytime, anywhere from peers, school-based mentors and University mentors. The mentors provided mobile mentoring support and guidance by uploading and sharing mobile content with teacher trainees, as well as engaging in guided thematic live chats and discussions using the collaboration and messaging app tools. The uploading of mobile content objects especially for the SPAcess app tool was coordinated by a School Practice Coordination Office. This will be in-line with the suggestion that, mobile learning is poised to blur lines between formal and informal learning creating bridges between the two (UNESCO 2013, p.1).

Koole's FRAME Model and the Development and Analysis of Makmentor app

Further, the development of this mobile mentoring intervention has also been guided by Koole (2009) Framework for Rational Analysis of Mobile Education-(FRAME). The FRAME was used to guide decisions on the technical characteristics of mobile devices, as well as the social and personal aspects of learning. Therefore, the makmentor app development process considered the above three aspects in the following ways:

a.   Device characteristics and selection of device for developing the makmentor app

Analysis of mobile phones possessed by teacher trainees and mentors revealed that majority possess android operating system phones. A high percentage of mentors have smart phones including those using IOS operating system such as iPhone 3, 4 and 6. Majority of the teacher trainees use multi-generation order mobile phones ranging from basic feature phones to smart phones. With these varieties, the developers decided to develop a mentorapp that can be accessed by android operating system phones. Majority of these phones have good input and output settings especially in terms of size of screen, these phones possess in-put and out capabilities that can enable use of the mentor app features. Other device issues considered included storage capabilities, power, processor speed, compatibility and expandability. The makmentor app also includes a free HTML5 mobile web version, to increase compatibility with a broad range of smartphones.

b.   Learner Aspect: Designing the mobile learning resources

The learning resources uploaded are within the pre-service teacher education syllabus and are therefore appropriate. These web and HTML resources allowed exploration, discovery and selection of information relevant to their own unique classrooms and contexts. Each teacher trainee received teaching subject resources that apply to their teaching subjects under the "MYsubject tool". The resources were structured into subject specific resources and generic resources in the "SPaccess app tool". The learner aspect has also been addressed by using content within the teacher learning context and transfer to classrooms, and in some way leave room for discovery learning. The collaboration features enlivened the teacher trainee emotions and motivations to use the makmentor app.

c.   Social aspect: SP Whatsapp, live chat, and SP connect app tools

 In the, live chat and SPconnect app tools, teacher trainees were provided with themes to guide their chats and communication. The icons representing the features are those ones which they are familiar with on their mobile phones; they in addition provide functions for interaction. The social aspect was taken into consideration in terms of the processes of cooperation and interaction following rules and guidelines developed by mentors and agreed upon through consensus building with teacher trainees.

d.   Device usability intersection

Mysubject and SPAccess app tools enabled teacher trainees to access rich text data and html data whenever and whenever needed with wireless connectivity or not. Cognitive load was addressed by only availing school-practice related subject content and use of mnemonics and terms to represent what teacher trainees already use and are familiar with.

e.   Social technology intersection

The android operating system phones can access html and rich text data with wireless or no wireless internet connection. This enabled pre-service teacher access to both non-internet and web-based resources. In addition, the prevalence of 3G phone networks and connectivity even in remote schools allowed both online and offline resource access and sharing as well as interactive communication. Majority of the teacher trainees already use the 3G mobile network for face book and Whatsapp facilities. These two collaborative software were included in the makmentor tool because teacher trainees were already familiar with their use and affordances and have used them even in

remote schools without internet. These tools strengthened social learning and collaboration.

f.   Interaction learning intersection

The mentor–mentee relationships were enhanced, moderated and maintained using rules of communication on the makmentor with guidance and disclaimers in the Livechat app and SPconnect app. Further, the University policy on communication in the e-learning environment can be applied. The mentors retained their mentor role and have the opportunity to select and recommend what teacher learning resources, websites and links to open resources should be uploaded for teacher trainees as well as providing the mentoring guidance and support. Teacher trainees participated in this relationship in terms of collaboration and communication with peers, SMS and feedback requests and share experiences of their practicum. They had to sign in to verify their identity in the teacher mentoring and learning community of practice.

g.   Mobile learning

The mobile learning intervention, transformed the process of interaction by teacher trainees and mentors to interact on a mobile platform both formally and informally. The calendar of activities referred to here as SPwhatsapp provided systematic communication from the School Practice Coordination office on the schedule and time table of activities. Mentors and teacher trainees were informed about the value of using mobile technologies to provide mentoring support, so as to prepare them for the change. The provision of guidance themes for chat discussions enabled teacher trainees to select relevant content from the uploaded resources to guide their discussions while also incorporating context specific information and experiences.

It was envisaged that the makmentor app features/tools will promote social learning, collaboration, and facilitate new generation learning. Teacher trainees were provided with collaboration spaces, and resources that they can access independently anytime anywhere, therefore fostering independent learning. The app also provided just in time content and mentoring support: the provision of html micro subject content afforded flexibility of use. Conversation and data sharing features will also facilitate just in time mentoring support.

The Makmentor App Development Process

The figures below represent the app development process, the prototype and final makmentor app. The publication and promotion figures are also included.
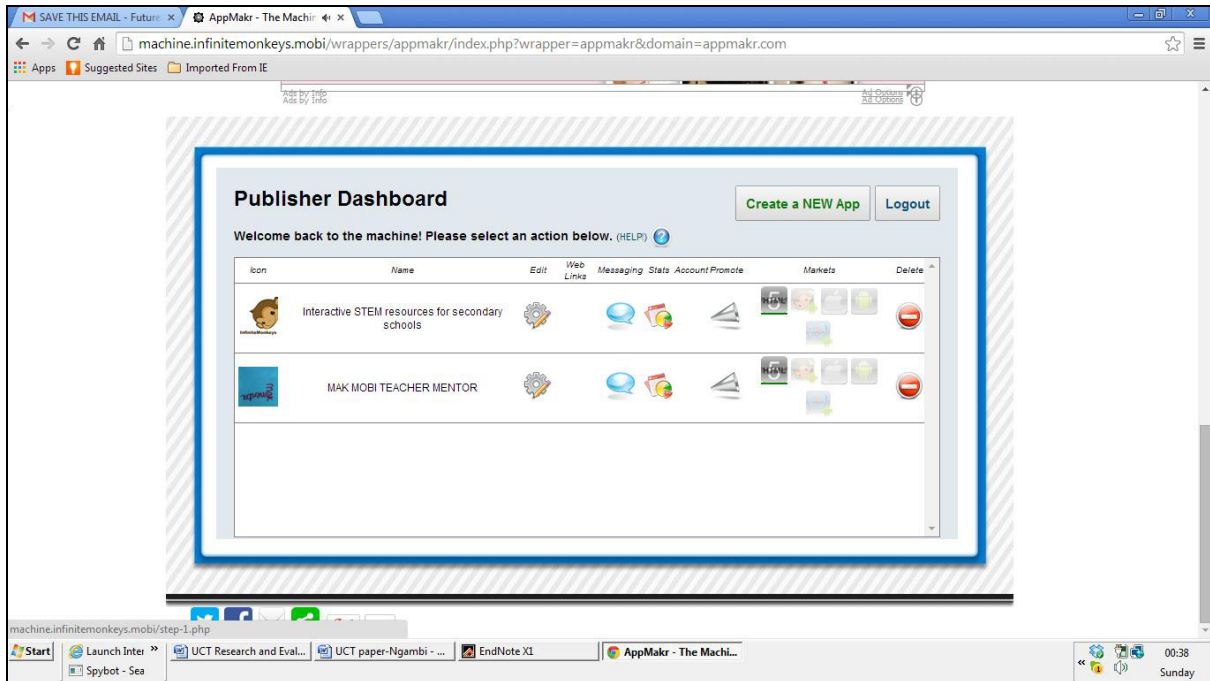
Figure 2: The appmakr publisher dash board
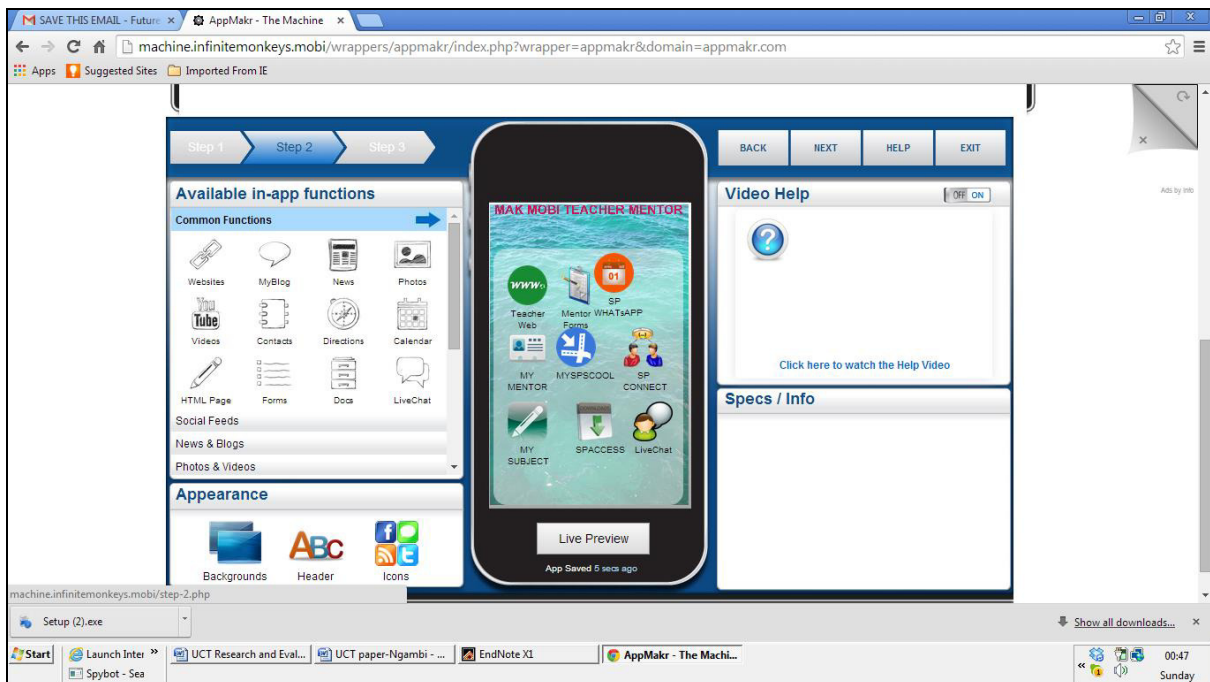
Figure 3: Appmakr in-put functions
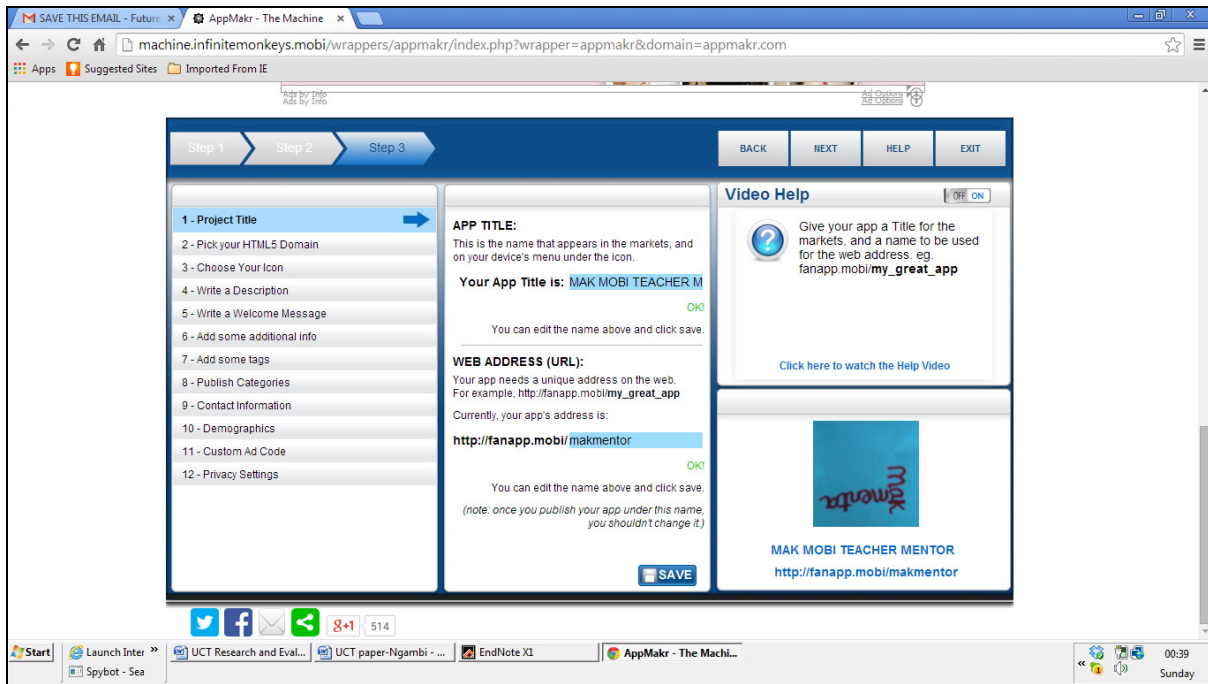
Figure 4: Appmakr machine detailed app feature content development
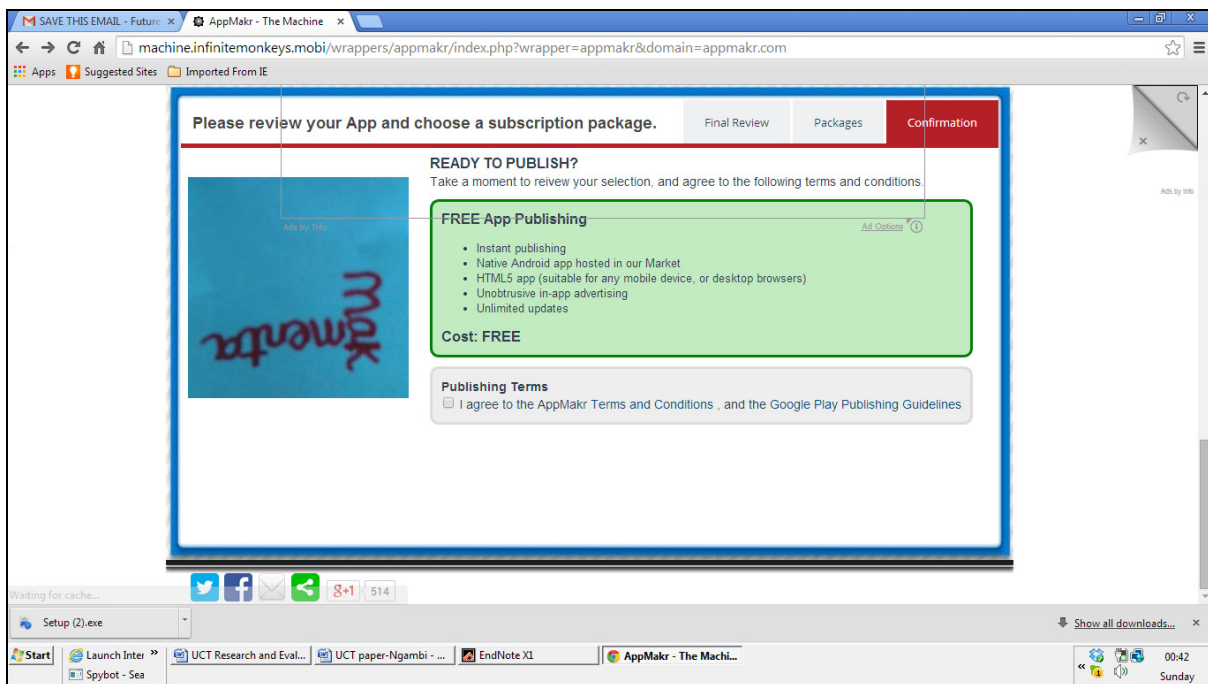
Figure 5: Review of the app
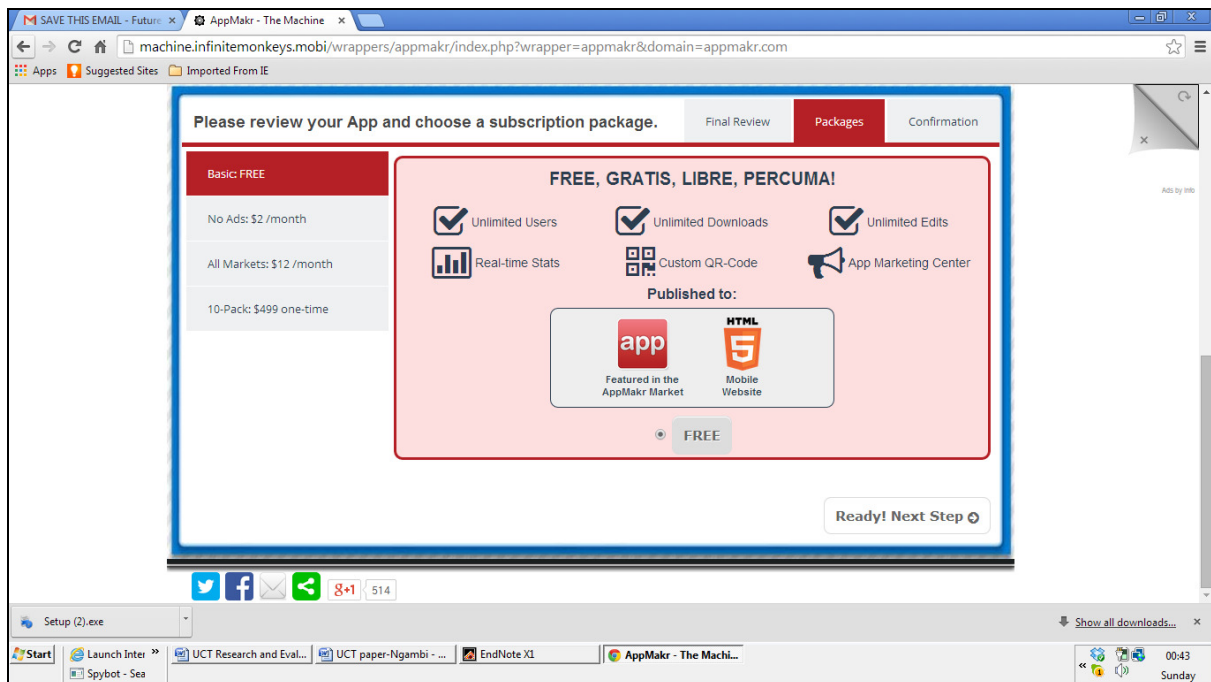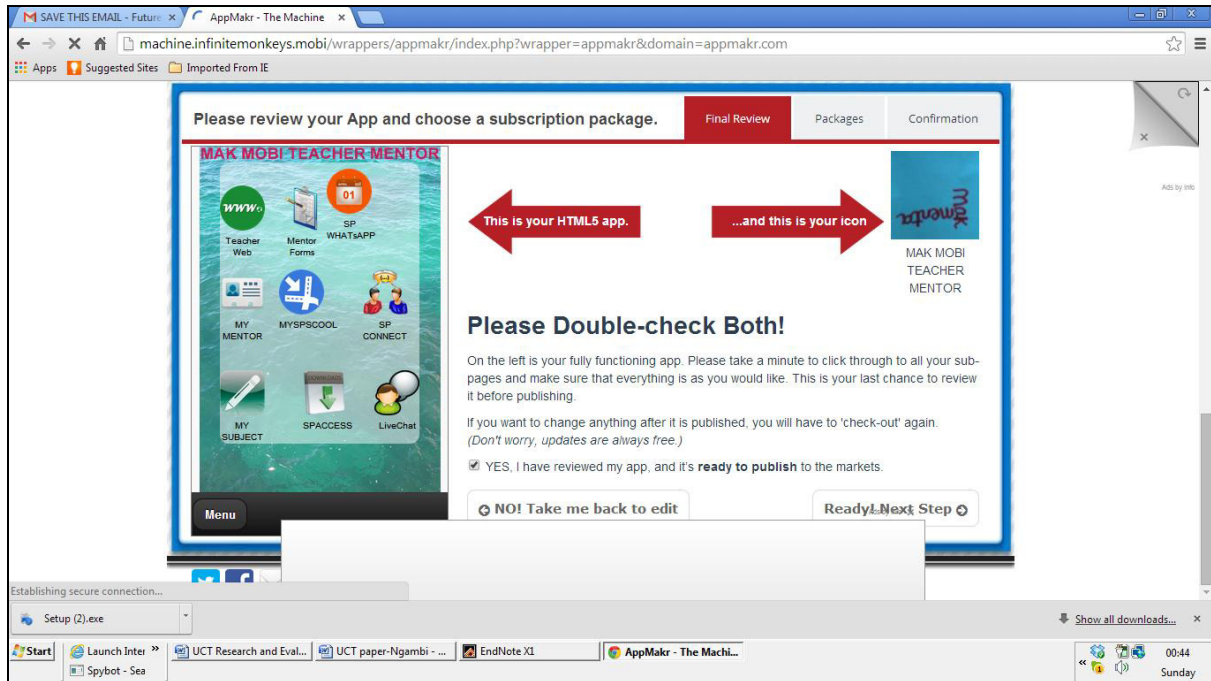
Figure 6: Publication Subscription page
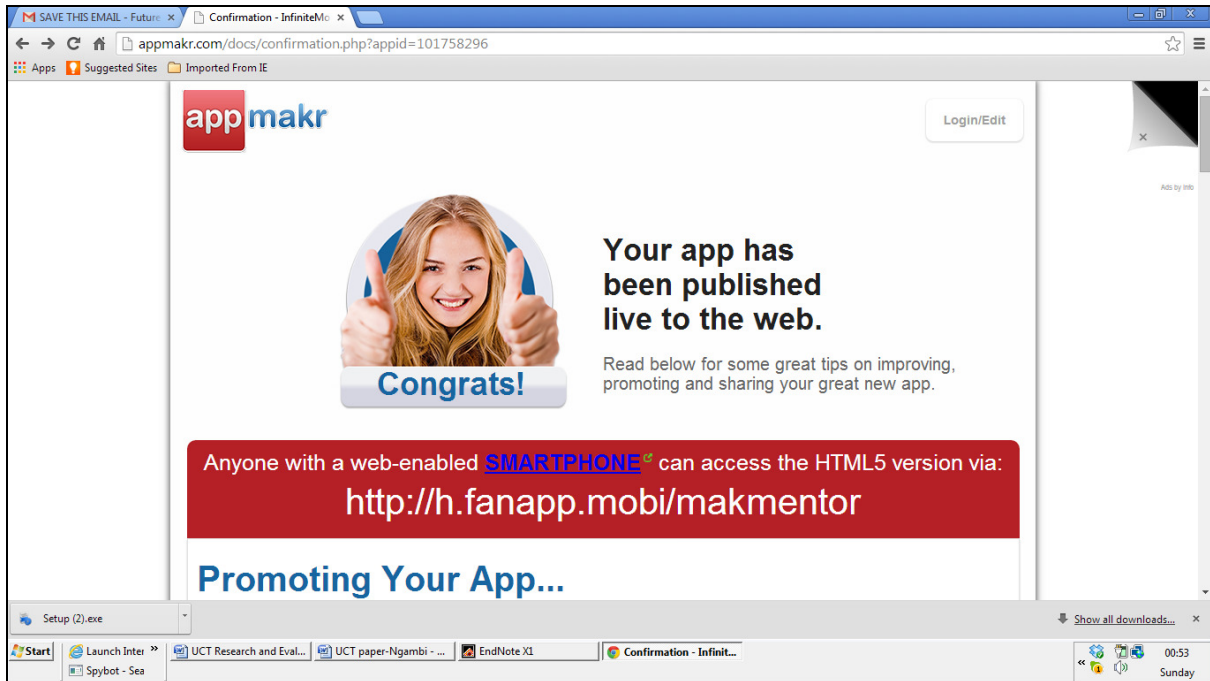
Figure 7: Makmentor Publication Page
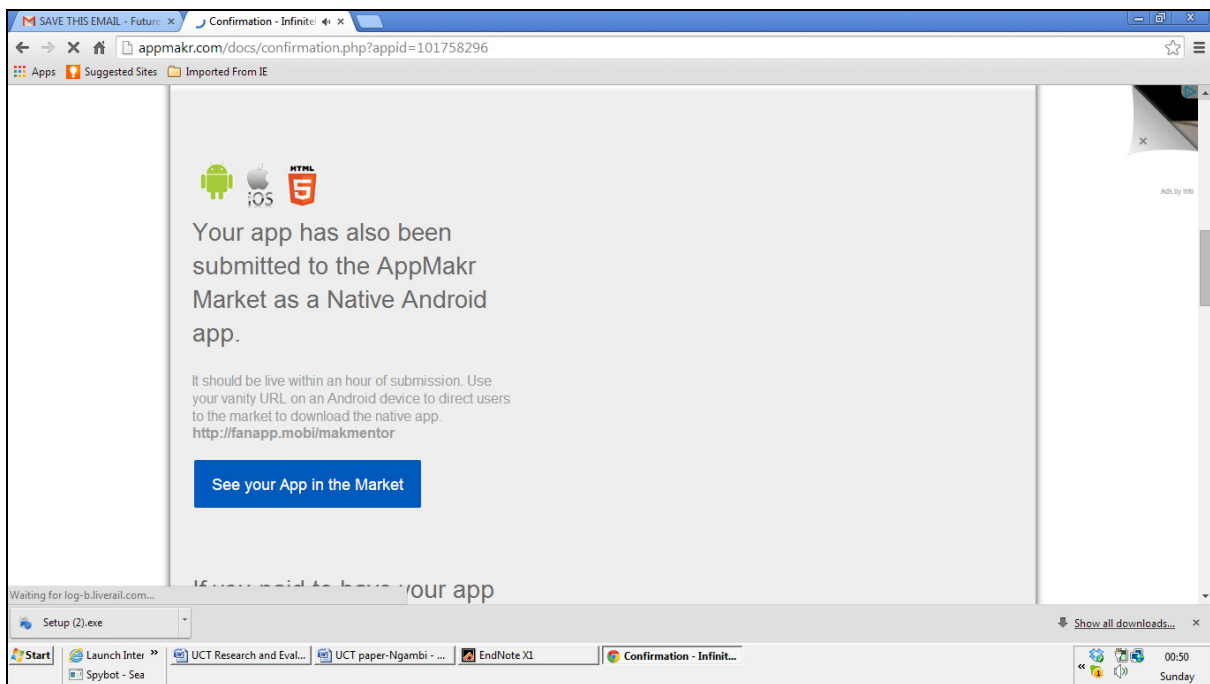
Figures 8 and 9: Promoting the makmentor app
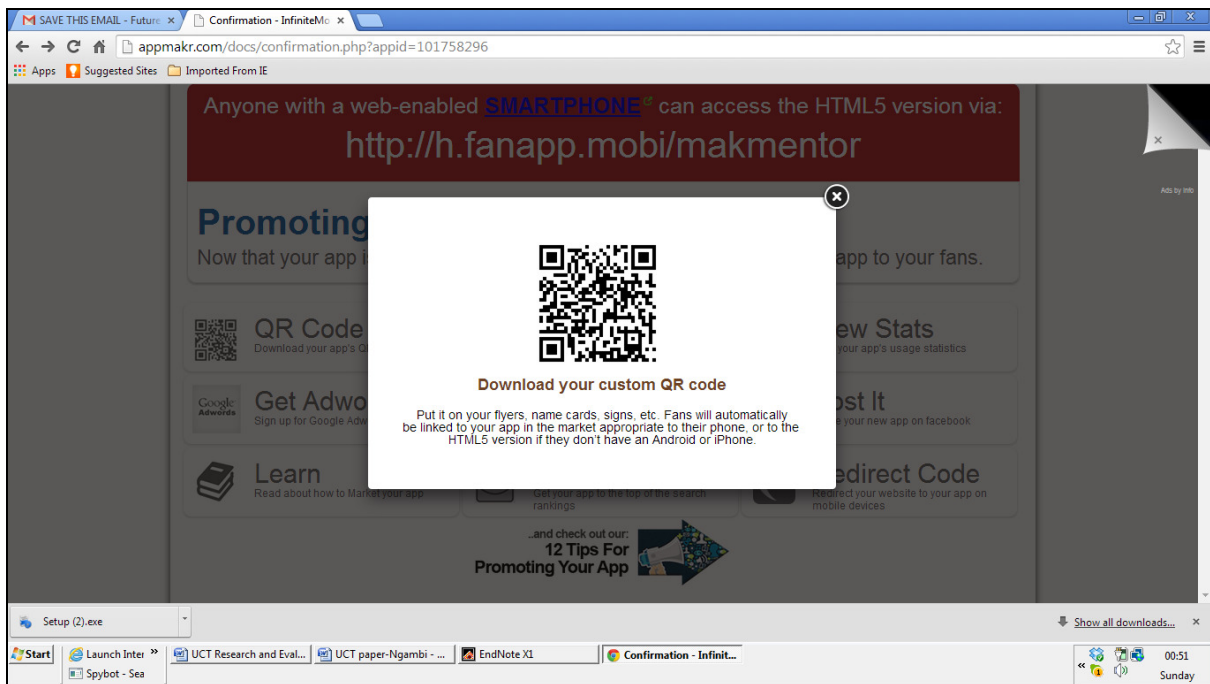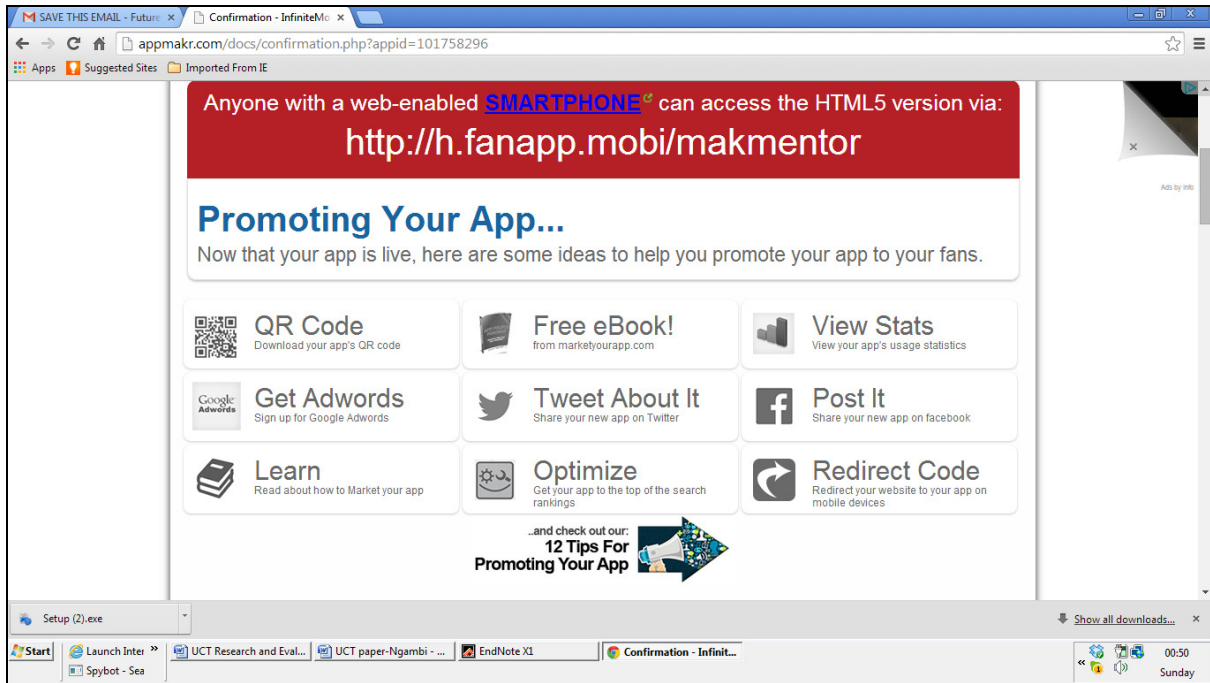
Figure 9: QR Code for Makmentor app
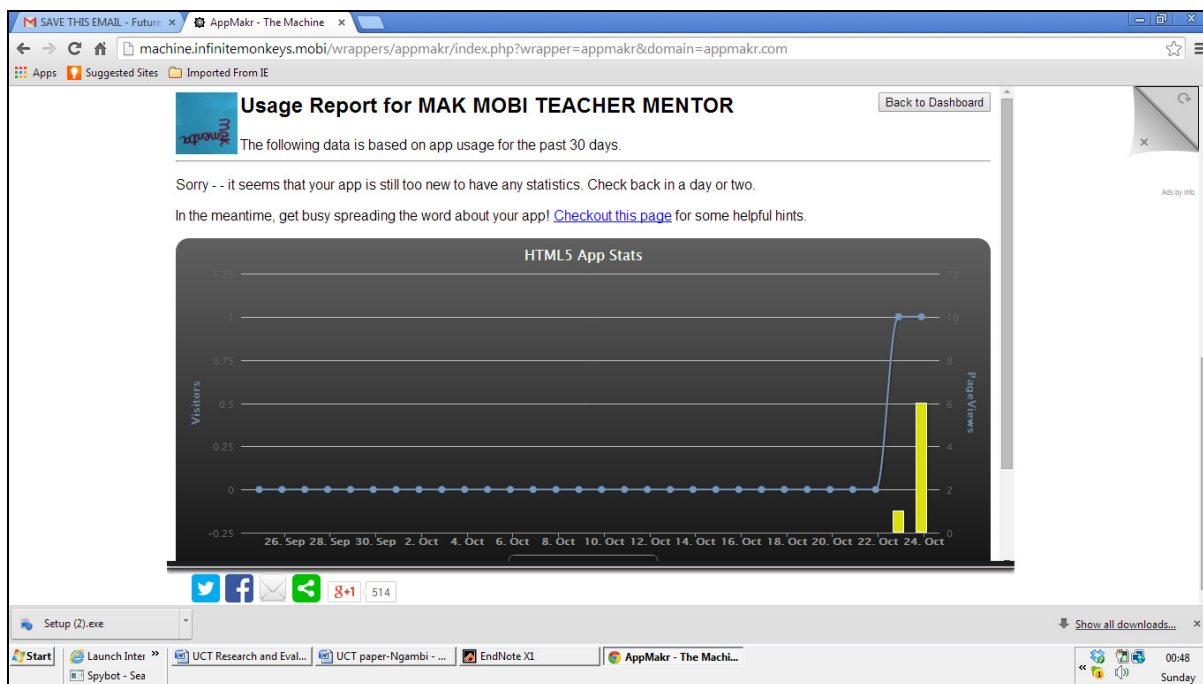
Figure 10: Evaluation of the Makmentor app

Discussion

The makmentor app development process has allowed the opportunity to engage with the mobile application development tools. Lessons generated indicate that app development requires bringing together stakeholders including beneficiaries, content developers, technology specialists and discipline specialists. This will allow the development of relevant apps that can promote mobile mentoring. Apps need to be tested for compatibility online and offline and to take into account the lowest version of the mobile operating systems, issues of content display consistence regardless of the phone screen size also need to be considered. Use of Koole's FRAME model has provided guidance on the analysis and development of the makmentor.

Conclusion

It is possible to develop mobile mentoring applications and tools on multi-varied generation mobile phones. Makmentor provides mentoring tools that can be used to strengthen the mentoring process by providing a platform for teacher trainees and mentors to access, share, create and collaborate to form teacher learning communities of practice that are necessary for providing mentoring support. Further, the makmentor app is a cost-effective and manageable mentoring application that can potentially

leverage provision of formal and informal mentoring support, just in time and in place, enabling collaboration, interaction and support. The possible challenges to using makmentor app are likely to stem from negative attitudes towards use of mobile devices to support learning, slow process of digitizing subject content, the makmentor app also lacks the tools for low basic feature phones and has been developed for android operating system. The Makmentor app needs to be updated and edited to include vodcast and podcast, camera and voice recording tools to enable recording of pre and post–observation conferencing mentoring sessions.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Informed Consent

Informed consent was obtained from all individual participants included in the study. No identifying participant information is included in the study.

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