

Transforming learning through technology: the case of using SMSs to support distance students in South Africa

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Abstract:

The rate of adoption of mobile technologies in Africa's developing countries is amongst the highest in the world and by 2005 there may be almost 100 billion mobile users in Africa (Keegan: 2002, Brown: 2005). This is just one of the reasons why servicing distance students in this country through m-learning¹ support tools should enjoy consideration.

At the Unit for Distance Education at the University of Pretoria most of our students are from remote rural areas in South Africa where there is very little infrastructure for access, yet most have mobile phones. We started using Short Message Services (SMSs) for basic administrative support during 2002 in three existing teacher training programmes for in-service teachers offered by this unit.

Recently we have begun preliminary² research into the use of SMSs for academic learning support purposes. We are currently running a second exploratory pilot project in one of our modules where four asynchronous academic SMS learning support tools, have been introduced. The purpose of this research is to explore how adult learners, registered at UP's Unit for Distance Education, experience the academic short message service as a learning support tool, for a specific module. The first pilot ran from October 2004 and ended in April 2005 and the second runs from April 2005 to October 2005. This paper aims to describe our experiences with SMS technologies in the hope that we can contribute towards delivering quality m-learning interventions to student populations previously excluded from the e-learning environment.

Keywords:

m-learning, SMS, Interactive Voice Response (IVR), distance education, accessibility, academic learning support, administrative learning support, interactive, constructivist learning.

¹ For the purposes of our work, the authors define m-learning as the use of mobile devices (Personal Digital Assistants – PDAs - and mobile phones) in teaching and learning (Hayes, Pathak, Rovcanin & Joyce 2003). Quin (2001) maintains that in essence, m-learning is e-learning through mobile computational devices.

² No theory yet seemed to cover this application area at the time of the study.

Introduction: m-learning and distance education rurally-based students

A constructivist perspective of learning incorporates the notion of “social negotiation” which recognises that learners learn by challenging their thoughts, beliefs, perceptions and existing knowledge through interacting with other learners and with the course presenters (Hedberg 2003:176). Quality learning environments should therefore give learners opportunities to interact and engage with other learners and with the course presenters. We therefore designed SMS interventions to provide students studying at a distance with such opportunities.

The Unit for Distance Education at the University of Pretoria offers three in-service teacher training programmes to 9 200 students. While only 0.8%³ of these students have access to e-mail; 97% have an entry-level cell phones. This begs the question: How can we support our students to utilise the resources that they already have to support them in their learning process?

In addition to limited access to email, our students live in geographical areas with limited access to landlines. As the CEO of Telkom, recently pointed out:

... we should remember that Sub-Saharan Africa, has the least developed infrastructure in the world, with only 0,4% of the world's telephone lines (Nxasana , 2003: 4) .

This is in contrast to Vodacom's claim that Telkom's mobile networks could provide cell phone coverage to more than 95% of all South Africans (Knott-Craig: 2003: 21).

By 2006, almost half of the world's mobile users will be in emerging markets (http://www.cellular.co.za/news_2002/061102-half_of_all_mobile_handsets_sold.htm). Mobile subscribers in Africa are increasing at a rapid rate. Between 2004 and 2006 the number of users in South Africa alone would have grown from 18.7 to 19 million. In South Africa more that 9 000 users sign up every day (http://www.cellular.co.za/stats/statistics_south_africa.htm).

The students on our programmes are virtually all employed full time (98% work as teachers, mostly in primary schools); and they are mostly older students (87% are between the ages of

³ According to regular in-house statistical analyses of student biographical data reported on in student profile reports compiled by L Adams and J Hendrikz, *Application statistics Report October 2003*, from the Unit for Distance Education at the University of Pretoria.

31 and 49). This academic SMS intervention has been taking place with approximately 300 students (including students who took part in pilot 1 and pilot 2) who have studying for the advanced certificate in special needs education. The course operates within a customised open learning academic model. This means that the certificate programme must be completed within eighteen months to four years. Students receive their learning materials in a staggered manner; that is, they receive a portion of their learning materials every six months. Students also receive carefully designed and regularly timed modular tutorial letters, administrative letters and administrative SMSs during each six-month cycle. They are invited to attend five day contact sessions offered throughout the country, per module, for every sixth monthly cycle.

Since November 2002, we have used bulk SMS types to provide basic administrative support. SMS types of 160 characters are sent to each student's cell phone. These messages focus on reminders about important dates, for example for activities such as contact sessions. In our experience these administrative SMSs have proved to be beneficial from a quality, time management and financial point of view.

The intervention: SMSs for academic support:

Our experience in teaching and learning has led us to believe that educational institutions should not focus exclusively on providing content to students. Rather, they should focus more on how to enable students to find, identify, manipulate and evaluate existing knowledge, to integrate this knowledge in their world of work and life, to solve problems, and to communicate this knowledge to others. In this project we never intended to deliver great chunks of content to our students via 160 character or 30 second pre-recorded messages. Rather we set out to support the existing printed learning resources by introducing carefully crafted and strategically applied aspects of m-learning into the student learning environment.

The pilot project⁴, consisting of four asynchronous academic SMS interventions,⁵ was completed during the six-month cycle from October 2004 to April 2005. During December 2004, 324 students in the *Practical Experience in Special Education* (LPO 402) module of our advanced certificate in education received the first in a series of four carefully designed and choreographed academic SMSs. A second pilot project, in the same module, but with a new group of students, ran from May to September 2005.

Students registered for the LPO 402 module were sent a letter informing them of our intention to send them four SMS learning support tools. In addition to the training section in this letter, all students attending the contact sessions were exposed to the four different types of SMSs via their tutors. On average 65% of students attended these contact sessions.

Our data was generated in three ways. First, we had access to the students'⁶ usage of the different types of SMSs. Second, we sent a structured questionnaire to all students with their third Tutorial Letter, and asked for these to be returned with their final assessments. Finally, telephonic interviews were conducted with a random sample of 12 students.

The following table indicates the sequence of the five academic SMS learning support tools as well the student ranking of each tool. Please note that tool five was used in the second Pilot project only and not in the first. This tool entailed an instructional SMS summarising the most frequently asked questions from SMS type 3. This was sent to all students taking part in the second pilot irrespective of whether they had sent in any questions or not.

Table 1: Structured orientation of the SMSs used for academic support

SMS type	SMS name	Sequence	Sequence	Ranking*
		Pilot 1	Pilot 2	
SMS type 1	Academic - instructional	1	1	1
SMS type 2	Quiz - interactive	2	3	3
SMS type 3	Student questions -	3	4	4

⁴ We have used the term pilot to mean preliminary. Our research design and indeed our questions and means of measurement only emerged during the first (and to a lesser degree also the second) pilot project Which we view as a strength. Since we had few pre-conceived ideas in our design, we were able to follow the data's lead and made valuable mistakes as we did so. We have endeavoured to report these here as part of our exploratory method.

⁵ Our choice of which academic tools to use was born from our considerable experience designing print based learning support tools and is in this sense pragmatic. The study is exploratory in the sense that we found no other similar applications within the m-learning environment. Some of our ideas came out of discussions with e-learning specialists (especially, Steinbeck R) at the Stanford learning laboratory, despite the fact they that were not directly related to this project.

3	interactive			
SMS type	IVR – mini-lectures	4	2	2
4				
SMS type	Lecturer response - instructional	Not used	5	
5				

* 1 indicates that the students liked this most and 4 indicates that they liked this least, according to data gleaned in the first pilot project

First SMS learning support tool

The first SMS learning support tool was sent to students in both pilot projects.⁷ It read:

LPO 402 student,⁸ work through Assets on p43-44 in Tutorial letters 1 booklet before answering 1.4 of Assign⁹ 1. This is also important for Assign 2 & Project. UP¹⁰

This message was sent in order to verify the academic instruction type of message, based on the same format of messages used for administration purposes. This tool was not interactive, so we could not measure direct student responses. However, at the January 2005 contact sessions, students were asked to write about their responses to this tool specifically. These written responses and informal verbal exchanges at a wide range of contact session venues indicated that the students were positive about the idea of using SMS technology to support their learning.

Since this message had been designed to assist students in building up certain concepts specifically assessed in all three assessments in this module, it was particularly important that students received it in time for the first assessment and then that they were reminded of it before each subsequent assessment. This message formed part of the holistic design of the total learning environment of the students. It was therefore important that contact session presenters and staff answering enquiries at the call centre were fully briefed about this project and the rationale behind the desired learning effects of each SMS learning support tool.

⁷ We had chosen to send out all of our academic SMSs on Friday afternoons since our students are working people and weekends are peak periods of study for them. Also for students sharing phones among family members, weekends are a time when most family members are together. Initially we tried to send all the messages at noon, but there were too many to send in an hour and so throttles were built into the software system. Later, SMSs were sent out in a staggered fashion throughout a given Friday afternoon.

⁸ We have found that it is best to address students specifically, especially since some of our students share phones with other family members. It has also come to our attention that it is important to distinguish between administrative SMSs and academic SMSs, because of the relatively large number of administrative replies received from students when academic SMSs were sent.

⁹ The training letter includes lists of acceptable abbreviations used in SMSs. "Assign" is listed and is the abbreviation for Assignment.

¹⁰ Our experience with administrative SMSs has taught us that it is important to indicate clearly who is sending the message, in order to minimise unthinking deletion. Furthermore, signing off in this way, clearly and consistently indicates the end point of a response sequence. This is important so that students know when to stop interacting.

Of the questionnaires received from 20% of students who received this SMS type, 93% found this academic instruction message via SMS helpful for assignments, with 57% indicating that it was helpful for all assignments. A large number of students (40%) found this SMS type the most helpful of all four SMS types. In our experience we have found that it is best to create a learning environment that provides specific instructions to students. This approach still seems to be most effective, particularly with our undergraduate students.

We agree with Hayes, Pathak, Ravcanin and Joyce (2003) who argue that handheld devices help to make information easily available and thus help to enable students to manipulate the information in their learning environment. We found that students gave a positive appraisal of this tool for four reasons: that the SMS tool helped create better understanding, that it provided help with assignments, that it provided guidance and that it motivated them. The only negative issue was the issue that the message were not always received in time to help students with the assignments.

Second SMS learning support tool

Students received the second SMS learning support tool in both pilot projects. It read:

LPO 402 student, SMS your student number via reply SMS to start take part in a quiz on the asset-based approach. Quiz is 2 questions long. UP

The same type of SMS was sent out as the third tool in the second pilot project's sequence. The quiz tool has the obvious advantage of providing students with immediate feedback.

It was the first in a sequence of between five and seven SMSs (depending on the correctness or incorrectness of the responses received from students), consisting of two multiple-choice questions.

The second SMS Tool 2 about the quiz is graphically depicted below.



LPO 402 student, SMS your student number via reply SMS to start take part in a quiz on the asset-based approach. Quiz is 2 questions long. UP

SMS 1: Invitation



Reply to this SMS by pressing a, b, or c & sending it. Asset-based initiatives are discussed on
 a) p 14 of learning guide
 b) p 14 of *Assets* textbook
 c) both a) and c)

SMS 2: quiz question 1



Correct! The asset-based approach is eco-systemic. Eco-systemic approaches emphasize:
 a) interrelatedness
 b) individuality

SMS 3: quiz question 2, after correct answer to q 1 is received



No. Turn to p14 of *Assets* textbook & read entry on Asset-based initiatives. Then press A & send.

SMS 3: quiz question 2, after incorrect answer to q 1 is received



Correct! You are on your way to reaching the 2nd and 3rd outcomes of this unit. Now read p 15-18 in learning guide. Bye.

SMS 4: quiz question 3, after correct answer to q 2 is received. END



No! Needs-based approach emphasizes individuality. Asset-based approach emphasizes interrelatedness. Press A & send.

SMS 4: quiz question 3, after incorrect answer to q 2 is received



Correct! You are on your way to reaching the 2nd and 3rd outcomes of this unit. Now read p 15-18 in learning guide. Bye.

SMS 5: quiz question 3 repeated, after correct answer to q 2 is received. END

These questions carefully guided the student through the most important concept in this module, one that requires students to recall a schematic summary of these concepts that they have built for themselves. This message, and the rest of the sequence of quiz messages, is designed to be sent as a summarising tool just after the contact sessions, during which students would have engaged with some of the complexities of this approach. This message was intended to aid students to construct their own summary of the approach before their second assignment was due.

Although this SMS was intended to be an invitation to take part in the quiz, 23% of students who received it responded with administrative enquiries. However, 22% of students who received the SMS in this pilot project took part in the quiz, with 13% responding inappropriately by attempting to engage in a dialogue. Only 8% of the students who took part in the quiz worked through it to the end. The reason for this seems to be that this particular SMS type was unclear and confusing with regard to language and message instructions. In addition, some students said that they had had problems with their phones.

Third SMS learning support tool

Students received the third SMS learning support tool as part of each pilot project. It read:

LPO 402 student, see section C, no 2, page 20 in your Assignment Workbook. SMS any questions you have about these guidelines for educators via reply SMS. UP

This date had been chosen to come after the two formative assessments, but still well before the third summative assessment. The intention was to provide students with an opportunity to identify and work on problems with specific concepts before the final assessment took place.

In the first pilot project the module co-ordinator and tutors organised the questions received in response to this SMS in such a way that they were able to respond to the majority (80%) of student questions with the same answer. Additionally, only three individual responses were required. However, during the first pilot only 3.8 % of students who took part in the SMS project responded with questions. In the second pilot only 8% of students who took part in the SMS project responded with questions.

It is therefore unsurprising that 13% of students who responded to the question in the questionnaire about which tool was the least helpful said that they found this tool the least helpful of all. Nevertheless it is of note that that 61% of those who did respond stated that they were confused by the concept about which they could ask questions. For example, 6% did not

know how many questions they could ask; an issue which has been addressed in the second pilot project.

It was apparent from the questions which were received that 80% of those who sent in questions did not understand the content that they were asking the questions about. Students' understanding of the topic proved to be so minimal that they could not even begin to ask for help in this area. Their responses therefore highlighted the widespread nature of the problem in understanding this particular concept, and enabled academics and instructional designers to design a fifth instructional SMS learning support tool to be used in the second pilot project.

Fourth SMS learning support tool

The fourth SMS learning support tool was sent to students in both pilots. It read:

LPO 402 student, phone 012-420 3111 to hear more about most important concepts in the asset-based approach Have your student number at hand when you phone. UP

When students phoned this number, they heard a pre-recorded mini-lecture tool with a general summary of answers to frequently asked questions in the field. This tool was intended to assist with a basic summary of major concepts. The SMS was sent just after the first formative assessment had been handed in and about a fortnight before the contact sessions where students were expected to present their questions about concepts that they did not understand.

In the training letter, it is explained to students how to access the distance education menu when they call and how to listen to one of the three mini-lectures¹¹. The lectures are recorded by the module co-ordinator, who is the same person who writes the tutorial letters to the students and who is responsible for the academic content of the module. The intention is to reduce the "distance" between the students and their lecturer. During the telephonic interviews respondents indicated that distance learning was difficult in terms of not having contact with other learners and/or lecturers. They said that the SMS gave them the opportunity to achieve such contact.

Perhaps the most significant result is that by the end of the first pilot project at least 63% of all students who received SMSs phoned in to hear these mini-lectures, despite the extra cost they incurred. Of the 20% of students who responded to the questionnaires, 84% found that pre-recorded mini-lectures aided their understanding of major concepts in the module. This tool was the second most popular among our students. We are however concerned that our findings may be unreliable as during the telephonic interviews about this tool, some

¹¹ Term coined by the Manager of the Unit for Distance Education, J Hendrikz, 2005.

respondents recorded by the IVR data capturing system claimed that they did not phone in at all.

Fifth SMS learning support tool

The fifth academic SMS learning support tool was subsequently built into the second pilot projects based upon the responses received from students in the first pilot. As already mentioned this SMS entails an instructional SMS format consolidating the most frequently asked question from SMS type 3 (refer to Table 1). This was sent to all students taking part in the second pilot irrespective if they sent in any student questions. This aimed to address specific academic problems that appeared to be widespread. This SMS tool took the form of an academic instruction message. The form and content of the message only emerged after student questions, that had been sent in response to the earlier SMS tool, were carefully analysed. The SMS that was sent out in the second pilot read:

LPO 402 student, answer the question on p20 in your assignment workbook by using the learner's assets to guide educators in uplifting the learner's barriers. UP

Conclusion

Respondents to the questionnaire were asked to comment on the SMS service and to provide suggestions for improvement. The responses were as follows:

- 29.5% of the students said that they would not make any changes to the service;
- 6% of students commented that the language of the SMSs was too confusing;
- 6% of students complained that there was no cellular network coverage in their rural areas;
- 5% of students emphasized the importance of precisely timed SMSs;
- 3 % of students would like to receive more SMSs.

In conclusion we would do well to keep in mind that the success and impact of m-learning does not depend solely on the technological developments and the possibilities they provide. While cell phones have provided an opportunity which did not previously exist, their successful use supporting student learning depends equally and critically on the ability of educationists to design and develop didactically sound m-learning opportunities and environments.

References

Adams L and Hendrikz, J (2003) *Application statistics Report October 2003*, Unit for Distance Education, University of Pretoria, Pretoria.

Brown, T.H. (2005 in press). Towards a Model for m-learning in Africa. *International Journal of E-Learning*.

Brown T.H. & Viljoen J.M. (2003). Use of SMS Technology to Communicate Effectively with Students. Paper presented at the *NADEOSA Conference*, St John's College Johannesburg.

Brown T.H. & Viljoen J.M. (2003). Sound Financial Management and Effective Communication to Students are Critical in Delivering Successful Distance Education Programmes: The Case of the University of Pretoria's Unit for Distance Education (unpublished).

Hayes, P, Pathak, R, Rovcanin, L & Joyce, D. (2004) *Mobile Technology in Education-A Multimedia Application*. *EdTech*, Tralee, Ireland.

Hedberg, J.G. (2003). Ensuring Quality E-Learning: Creating Engaging Tasks, *Educational Media International*, 40 (3/4), 175-186.

Hendrikz, J., (2005). Personal communication, April 2005.

Keegan, D. (2002). *The Future of Learning: From eLearning to mLearning*. Hagen : Fernstudienforschung.

Knott-Craig, A. (2003) *Telkom Group Overview 2003* : 21.

<http://www.telkom.co.za/pls/portal/docs/page/contents/minisites/ir/docs/Instit.%20Pres%2007-02-03%20Showfile.pdf>

Nxasana, S. 2003. *Address by Sizwe Nxasana*, CEO of Telkom, at the International Communications Forum's Cape Town Conference: 7 April 2003.

Pyramid Research, accessed on 1 November 2005, *Half of All Mobile Handsets Sold In 2002 Will Be Sold In Emerging Markets*

http://www.cellular.co.za/news_2002/061102-half_of_all_mobile_handsets_sold.htm

Statistics of Cellular in South Africa, accessed on 1 November 2005, Latest Mobile, GSM, Global, Handset, Base Station, & Regional Cellular Statistics
http://www.cellular.co.za/stats/statistics_south_africa.htm

Steinbeck, R., (2005, personal communication). E-learning specialist at the Stanford Learning Laboratory, Stanford University.