ASSESSING THE POTENTIAL OF LEVELUP AS A PERSUASIVE TECHNOLOGY FOR SOUTH AFRICAN LEARNERS

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ABSTRACT

Good study behaviour after school hours is an important way of improving learners' chances of success. Learners, once they reach high school, particularly require support that will assist them to study effectively outside the classroom. South African schools are under pressure to improve results in mathematics but besides the homework that schools set, it is difficult for them to motivate the learner to do any additional study of mathematics after school. This suggests that schools could take advantage of technology to create good study behaviour by introducing mobile phones as a persuasive technology. The ubiquity of mobile phones has raised interest in their usage as educational tools and how best to leverage them both during school hours and outside the classroom. However, research in mobile learning argues that mobile phones might enhance learning but might easily distract learners unless there is some control and structure. This paper is based on preliminary research done for a PhD thesis and does not include all the results of the data already collected. The paper conceptualises the first phase of research to assess a specific initiative incorporating the LevelUp application to motivate good studying behaviour outside the classroom for grade 11 learners studying mathematics using their mobile phones or tablets.

KEYWORDS

Persuasive technology, Mathematics, Mobile phones, Motivation.

1. INTRODUCTION

South Africa performance has consistently been rated amongst the worst in mathematics teaching on the world, and the learners' performance was the lowest of all 21 middle-income countries that were compared. This was reported in the Third International Mathematics and Science Study (TIMMSS) when South Africa participated in years 1995, 1999 and 2011 studies (Howie 2003; McCarthy & Oliphant 2013). The teaching of mathematics and numeracy is however key to South Africa achieving its goal of developing a knowledge economy (Howie 2003). Another challenge that South Africa is facing involves providing equally good mathematics teaching to all members of its multicultural society (total population estimated at 55 million in 2016). The extent of the mathematics performance problem has been found to vary in different schools and regions of South Africa (Basic Education 2016).

In response to these challenges, a 10 Key Pillars strategy was developed in 2014 in one of the South African provinces and targets lower income and rural schools as part of intervention to support the development of quality basic education. Information Communication and Technology (ICT) in Education was identified as one of the key pillars and identifies connectivity, content, ICT infrastructure and equipment, teacher development, and efficient technical support and management as being needed (Lesufi 2014).

Various educational applications that were used in a school setting have raised considerable interest in the past; however more recently educators and developers have become interested in educational applications that bridge the gap between the school environment and outside-the-classroom environments. In support of this, learners in the schools participating in a 2014 pilot study were provided with free Wi-Fi and tablets (Lesufi 2014). This provides an opportunity for educational application developers to evaluate and improve their applications. Several promising educational applications developed by South Africans, such as Dr Math and LevelUp, are being introduced to schools. Hence further empirical research is required to assess the

effectiveness of these applications. Dr Math was a project that used Mxit, an instant messenger application that ran on non-smartphones to enable participants to send instant messages to each other. Dr Math used the popular and very affordable Mxit application because teenagers were already using Mxit to communicate to friends. It is a platform that enables high school learners to obtain Mathematics homework assistance on their mobile phones from tutors based at a South African University (Butgereit 2007). LevelUp is described in Section 4.1.

The aim of the full study is to draw attention to persuasive technology, using Fogg Behaviour Model (FBM) and take into consideration intrinsic and extrinsic motivation to encourage good study behaviour for secondary level schools learner outside the classroom. This paper is based on preliminary research done for a PhD thesis and does not include all the results of the data already collected. The paper conceptualises the first phase of the research to assess the potential of a specific initiative incorporating the LevelUp application is effective to motivate good studying behaviour outside the classroom for grade 11 learners studying mathematics using their mobile phones or tables.

2. METHODOLOGY

This research uses a case study methodology using mixed methods. LevelUp is the application being used to encourage learners to put in an additional effort to study Mathematics after school hours; Data is being collected from one school and this combination forms the case being studied. Data has already been collected by interviewing developers. This paper concentrates on observations in the form of demonstrations of the app. Feedback from learners will in the coming months be obtained in the school environment using observations, focus groups and questionnaires. Hence this paper reports on motivational theory and its application in persuasive technology.

3. LITERATURE REVIEW

3.1 Mobile learning

The literature review shows that there are a number of studies relating to mobile learning in Mathematics with studies that are concerned with learners outside the classroom as the subjects (Cheung & Slavin 2013; Crompton & Burke 2014) and others that focus on device and software as primary topics (Pereira & Rodrigues 2013). The main purpose of these studies was to provide user friendly applications and to focus on various technology-related areas of research such as wireless mobile, pervasive computing for learning and ubiquitous computing in learning (Crompton & Burke 2014; Chiang et al. 2016).

A recent development is the provision of learner support in school and outside the classroom facilitated by games embedded in mobile technology to provide motivational effects (Koutromanos & Avraamidou 2014; Su & Cheng 2015). We live in a mobile society, where learners are continuously on the move; hence, the focus of ICT in education should be on learner mobility and learning (Sharples, Taylor, & Vavoula 2006). Sharples, Corlett and Westmancott (2002) claim that learning also needs to take place whenever there is a break in the formal education routine with its pre-specified times and places. Formal education cannot provide people with all the knowledge and skills they require throughout their lifetimes. Examples of these extra-curricular learning needs are: addressing immediate problems outside the school boundaries, sharing ideas with peers, participating in continuing vocational and professional development. Mobile technology makes this learning feasible and tools, such as mobile phones, can support learning anytime, anywhere. The use of mobile technology for ubiquitous study has been found to be valued by learners and provides them with a sense of freedom (Su & Cheng 2015; Marçal, Andrade, & Viana 2016).

3.2 Persuasive technology

Many children and adults, regardless of their social strata or culture origin, are apathetic, feel alienated or are irresponsible (Ryan & Deci 2000). This results in a passive attitude or lack of engagement in certain aspects of life. This study focuses on addressing this lack of engagement specifically in terms of learner activity outside the classroom and after school hours. It studies only learners who have to wait for hours for their parents to fetch them at school and learners who walk home (in other words learners who probably spend an extended period after school with very little adult supervision or structured activities). In a school setting learners are expected, and at times pressured to regard studying activities as being meaningful and rewarding. Although studying can be presented as interesting and enjoyable, it is difficult to ensure that the learners view these activities in the same way as leisure activities - as fun. This is because studying requires sustained effort and motivation may be small (Brophy 2004).

Studies of persuasive technology focus on how technology can be used to influence people's attitudes and motivate behaviour. Examples are: motivating people to exercise according to a schedule; motivating a driver to listen to the news; mobile phone applications to remind friends to keep contact with their peers (Oinas-kukkonen & Harjumaa, 2008). Nakajima and Lehdonvirta (2013) argue that it is difficult to change a habit even when you are aware of the benefits of making and acting on the ideal choice as, for example, sticking to a diet.

Professor BJ Fogg founded the persuasive tech lab at Stanford University, where he still directs research into the design of computer technology to change people's behaviour (Laja 2013; Fogg 2016). The Fogg Behaviour Model (FBM) shown in Figure 1 proposes that for a behaviour to occur three elements, namely, motivation, ability and a trigger, must come together simultaneously (Fogg 2009).
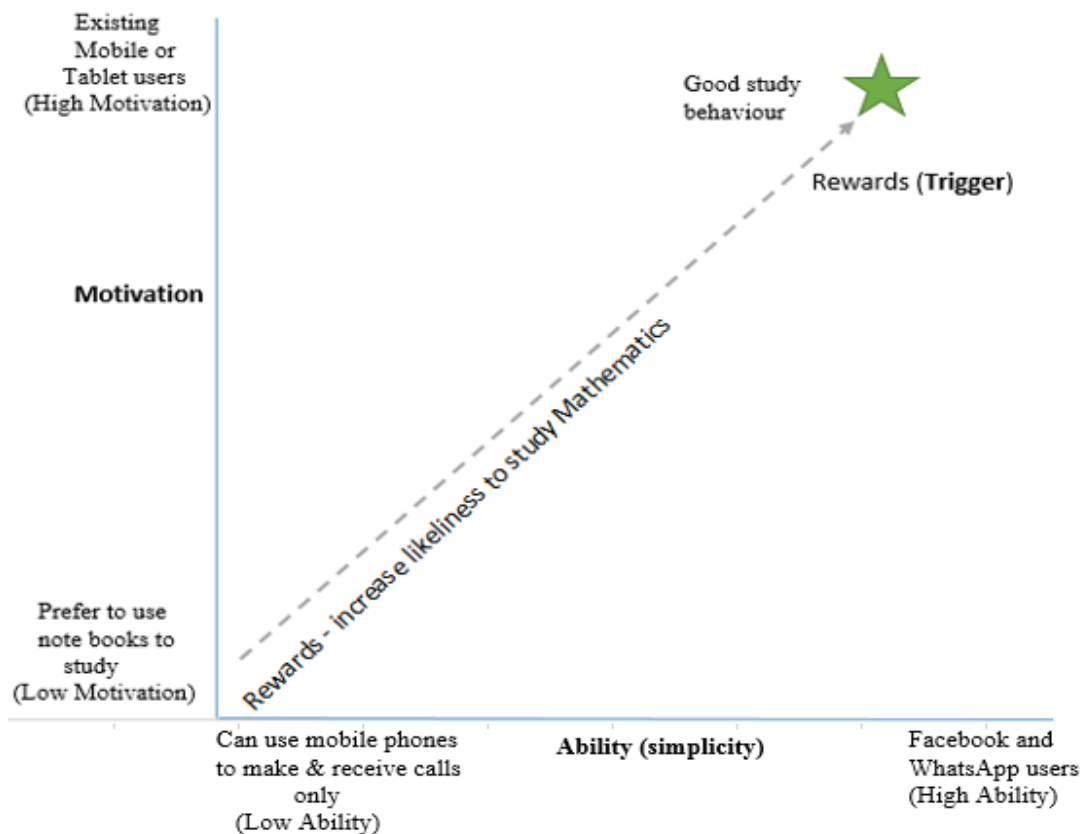

Figure 1. The fogg behaviour model (Fogg 2009).

4. DISCUSSION

4.1 Example of Level as a persuasive technology

The developers of the LevelUp application aim to bring learner study behaviour in Mathematics outside the classroom to the top right of Figure 1. Since the learners are already motivated to use mobile phones or tablets or computers, it is assumed that they will find it easy to use the LevelUp app for studying Mathematics on their mobile devices (ability). By rewarding the learners for using LevelUp for Mathematics with airtime and data (trigger), the developers expect to influence them to prefer to spend time using LevelUp instead of on other apps such as Facebook or WhatsApp. However, it is important to note that there are learners who are already highly motivated, but who cannot use mobile phones (possibly because they are difficult to use, unaffordable or not easy to access). As shown in Figure 1 these learners are likely to give up easily. On the other hand the FMB model predicts that learners who are not interested in studying mathematics using mobile devices, for example those who prefer to use paper or note books, will have low motivation, even though they can use mobile phones or tablets easily when making and receiving calls and accessing Facebook or WhatsApp (easy to use). It is expected that such learners will be irritated when requested to study Mathematics using LevelUp.

4.2 Motivation

To be motivated means to be moved to perform a behaviour; motivation is a reason for our behaviour or action (Spanias, Photini & Middleton 1999; "Oxford University Press" 2015). A person who feels energized or stimulated toward a behaviour or action is deemed be motivated (Ryan & Deci 2000).

Ryan and Deci (2000) explain that motivation has two types, namely, intrinsic and extrinsic motivation. Both of these sources of motivation can shape the development and practice of education in an individual.

Intrinsic motivation refers to an action or behaviour that is performed because it is inherently interesting, satisfying or enjoyable. A person who is intrinsically motivated voluntarily acts for the fun or challenge (Ryan & Deci 2000). For example, learners with intrinsic motivation have the determination or aspiration to participate in learning "for its own sake", and their learning goals tend to focus on understanding and mastery of concepts (Middleton 1995). Thus, learners who are motivated intrinsically engage in tasks using learning methods that differ from those of other learners because they are achieving an understanding of their own learning potential. This motives them to increase time on task, perform more difficult tasks, increase creativity, be self-monitoring, find different ways of processing information and do all of this without an extrinsic motivator (Middleton 1995; Spanias & Middleton 1999).

Extrinsic motivation relates to achievement that is motivated by external factors. In other words, the person performs a task to obtain tangible rewards or due to pressure from someone else. Extrinsic motivation can manifest itself in different ways; for example a learner who does his homework fearing parental sanctions does so in order to achieve the separable outcome of avoiding sanctions. Similarly, a learner who does homework because it will lead to a particular career path is not doing it because she finds it interesting but for its instrumental value (Ryan & Deci 2000).

In a study conducted by Gonzalez-Dehass et al. (2005), teachers rated learners whose parents monitored, enforced, or helped with homework as showing less initiative, autonomy, persistence and satisfaction in doing their schoolwork. The study also discovered that learners reported being extrinsically motivated and dependent on external sources for academic guidance and evaluation when their parents were involved in monitoring, enforcing, or helping with homework. The study suggests that parents who are involved with their children's schoolwork should be less controlling and that better ways of parental involvement should be sought.

4.3 LevelUp application

The reward system is the heart of LevelUp app, as it is intended to encourage learners to test their knowledge through daily challenges in exchange for rewards (The Reach Trust 2016). The LevelUp reward system works similarly to leading South African loyalty programmes, such as Discovery Vitality (Discovery 2016). The app encourages learner engagement by immediately awarding 500 tokens just for signing up, and by welcoming the learner with positive messages such as "Congratulations and AWESOME, let's go!" The initial screen explains to the learner on how to earn more tokens. Each level tells the learner how many tokens are needed to move to the next level, the tokens rewarded thus far and the number of daily challenges. Challenges include solving Mathematics problems and answering questions on politics, health and entertainment as part of a quiz. Once the learner submits a correct answer she or he earns points.

The learner needs to accumulate enough tokens to redeem them for coupons for products (these are basic household items like toiletries) or for airtime at a large supermarket chain. Hence virtual rewards are converted into concrete rewards. The process to redeem the coupons, where they can be redeemed and the number of tokens required per product or for airtime is explained in order to enable a quick coupon cash-in time. The type of reward and indeed the monetary value has in the case of LevelUp been chosen bearing in mind the fact that the learners are in greatest need of Maths motivation in SA are those from families where money is extremely tight. In fact the award of air time is essential to facilitate further use of LevelUp.

5. RESULTS

How does persuasive technology facilitate learners study behavior after school, that's where level up comes in?

Developer 1: We have strong belief that the South African school system is not perfect, we feel that learners are not always given the chance that they deserve, while it is good to address the school system it's not the only way we can do this. There is an opportunity to provide extra support for learners outside of the traditional school system. That's what we try to do, we are based on the assumption that learners are eager to learn they just needed to be given the opportunities. We were trying to use technology and trying to distribute our solutions, so they can so this at home with the phone that they already own.

Do you think it is working as it should?

Developer 2: Not completely, I think we were a little overly optimistic about the enthusiasm that the learners show. We did realize that a lot of them are just very jaded and they don't quite take the opportunity that we give them in the way that we hoped. It turns out they look at the tool and they like ah this is still work. Part of it is also our short coming where we feel we can make the app more interesting. There's the saying that you can lead a horse to water but you can't make it drink. We did inspire quite a few people, we have a few people that follow along and do their challenges every day and see the opportunity that this presents to them but a lot of people also play for a few days and then quit

Developer 3: I think at a technical level it's working as it should, so we don't' have any technical issues with the way the product works. We haven't had the take up of the product that we'd have like to have, so technically we've done fine but we spent quite a lot of money on marketing and we've visited a lot of schools, while the feedback has been very good from the people using the product we haven't had the scale that we'd have like to have seen and that's been disappointing. It seems clear that we still haven't solved the demand problem even though we have incentives there. The majority of learners are not demanding the product that we are offering so that has been frustrating.

How does level up rewards system encourage learner's self-study?

Developer 4: It's not tied to the classroom it's completely self-study, they have to get motivated on their own account, they have to sign up, they have to start doing the challenges on a regular bases. The challenges are fairly short and fairly simple in a way, some of them used to be really hard, we found that too many people were getting frustrated that way so we made the challenges easier.

Even if there were rewards?

Developer 5: Yes, I think there's only so much you can do on a relatively small device where you don't have your computer nearby. The way the challenges are now the learners get something out of it, first of all they practice their reading comprehension, which alone is a practice I think is good for them. Then we add some follow up links like if you wanna know more about this, we used to have classroom content in the app and we removed that recently because it was quite expensive for us and we felt that wasn't so popular with the learners. Mostly it was because that content was from a third party and it was that terribly well proof read, it wasn't good quality and we had to pay for it, as a business it didn't make sense anymore. I think learners had the opportunity of drilling deeper and understanding more about a topic, I'm not sure how many learners used that opportunity.

6. CONCLUSION

Using the FBM, LevelUp app designers should first define the desired behaviour that the learners should achieve. In this study, learners should use LevelUp. This will help LevelUp developers to identify what discourages learners from studying Mathematics using their mobile phones or tablets. For example, it will be instructive if learners are found not to be using the app but are using their mobile phones or tablets for social purposes.

The advantage of using FBM is to gain insight into the psychological element that is lacking, that is whether motivation, ability or a trigger is missing. The disadvantage of using this model without considering the intrinsic or extrinsic motivation, is that learners' intrinsic motivation could be undermined. For example, if rewards are not available learners might lose interest in using LevelUp as they have developed a habit of expecting to be rewarded for doing any task.

The results from the interview with the developers show that the developers are not sure why the learners are not really motivated to use LevelUp on their mobile phones or tablets. The importance of the full study whose first concepts are explained in this paper is to help developers to understand motivation and thereafter to build persuasive educational apps that are sensitive to learner's intrinsic and extrinsic motivation. An example is apps that can reinforce intrinsic motivation and hence help to increase learners' creativity. However the theory recommends that tasks should not be too easy and adults should not help too much by providing answers or by trying to increase ability or extrinsic motivation too actively (too many reminder messages).

The next part of the empirical research of this study will be based on observation and feedback from learners in a single class regarding an existing mobile app (LevelUp). For future research, design science research studies should be conducted with more diverse sample data using FBM in conjunction with intrinsic and extrinsic motivation.

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