Article title: A Lack of Psychological and Disability Perspectives in the Framework for the Rational Analysis of Mobile Education: A Literature Review Analysis

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A Lack of Psychological and Disability Perspectives in the Framework for the Rational Analysis of Mobile Education: A Literature Review Analysis

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Abstract

The purpose of this literature-based study was to investigate the way in which psychological and disability perspectives, in a South African context, can be accommodated in the Framework for the Rational Analysis of Mobile Education model to promote inclusive approaches in mobile learning. This model aims to guide the way in which learning materials are designed to facilitate mobile learning effectively. This is important because mobile learning can enhance interaction in teaching and learning. The literature suggests that since psychological and disability perspectives have not been adequately dealt with in the model, two components should be added so that inclusivity, particularly in relation to students with different abilities, can be accommodated. Further research regarding disabilities and the use of mobile learning will help educators and higher education institutions to expand their capacity towards adopting these technologies.

Keywords: activity theory, anxiety, disability, mobile learning, mastery, inclusive learning

Introduction

The Framework for the Rational Analysis of Mobile Education (FRAME) aims to guide the design of learning materials that facilitate mobile learning. In that regard, this paper attempts to share the findings of a literature review on the FRAME model in search of the incorporation of psychological and disability issues in the model. According to Koole (2009), the FRAME model allows learners the flexibility of learning while in physical and virtual locations; thus, facilitating their interaction with other individuals and systems. The main benefits of these interactions are access to available information and creation of new information to contribute towards personal and other kinds of development. The literature review of this paper focuses on articles written on the FRAME by Koole and only on the FRAME.

The FRAME model describes mobile learning as a process resulting from the convergence of mobile technologies, human learning capacities, and social interaction. It posits the interaction between the device (mobile phone), the human (student) and social interaction (context) in which mobile learning takes place. According to Koole (2009), this model would be applicable for informing the development of future mobile devices, teaching and learning materials, and the design of teaching and learning strategies for mobile education. The “learner aspect” of the model adopts the assumption that all students can learn and manipulate mobile phones for optimal academic success. However, the learners’ psychological variables such as anxiety, fear, competency, confidence and mastery are not adequately dealt with. This is even more acute in open and distance learning (ODL) institutions where students are already physically separated from the institution. Various theoretical approaches such as medical, bio-social and social and human rights models posit important multidimensional considerations towards understanding people with disabilities.

ODL institutions tend to attract more people with disabilities, hence it is important that these institutions are inclusive and accommodative of the already marginalised student populations. The context in which students find themselves in South Africa and especially in an open and distance e-learning (ODEL) environment poses several considerable questions regarding inclusion considerations in the FRAME model.

Inclusive learning is not an easy concept to unpack, because there is no one understanding of what it means to be inclusive. Mutanga (2015, 2) confirms, “the concept of inclusion is not straightforward.” Equally, the White Paper for Post-School Education and Training (DHET 2013, 45) states that regardless of “strong legislative and policy framework for addressing disability in the education sector, access and support for people with disabilities remains limited”. Considering the paucity of a clear definition, the authors of this paper understand inclusive learning to be flexible, responsive and accessible to all students. Students with disabilities, in particular, should be able to learn in their preferred styles, receive study materials in their chosen formats and have their learning and assessment facilitated in accessible formats. To this end, Slater et al. (2015) argue that inclusive learning is supposed to enhance accessibility and improve the learning experiences of students.

In this regard, Ainscow (2005) identifies key elements for inclusion in education. First, inclusion is a never-ending process of finding better ways to respond to diversity. Second, inclusion aims at identifying and removing barriers. Third, it is concerned about teaching presence, participation and achievement of learning objectives for all students. Last, inclusion is about ways in which groups of learners who may be at risk of marginalisation, exclusion or underachievement can be supported to succeed. According to Czerniewicz and Brown (2009), inclusion requires a deeper conception of access, one that incorporates the full range of resources which inform required understanding of access and value in learning. It also means informed understanding of the factors which enable and constrain mobile learning or general ICT take-up within

higher education. There is a need, therefore, for a deeper understanding of what access entails towards understanding the challenges that students encounter.

It appears that e-learning and mobile learning are the fastest-growing drivers of formal and informal education, training and immersive learning environments. Students are expected to adapt to these changing learning environments and especially in open distance contexts. This requires detailed planning and implementation of the learning activity, which can be rightly guided by the activity theory. Amory (2014) opines that the activity theory should guide the careful process of thinking how technology links with the object to user-friendly learning experiences. The use of mobile learning, for example, requires understanding of learners' specific needs, knowledge and skills set so that learning could be mediated efficiently. It is worth noting, though, that Brown and Mbatl (2015) caution that mobile learning is not about the use of mobile devices for teaching and learning, but that it requires effective pedagogical practices. Ng'ambi (2013) also stresses the importance of using mobile learning with the requisite teaching practices to effect meaningful learning. Furthermore, Brown and Mbatl (2015) point to the significance of (re)designing teaching and learning to mediate effective learning through mobile learning.

Inclusive mobile learning, therefore, requires that the learning content be designed and presented through the guidance of appropriate pedagogy, including the use of the universal design for learning (UDL). UDL forms an important approach and implementation of the rules that guide the provision of accessible learning to students with disabilities. UDL does what Engeström (2001) advocates, which is that it "bridges between imagined, simulated and real situations that require personal engagement with material objects and artefacts that follow the logic of an anticipated or designed future model of the activity". UDL provides three principles that ensure that all learners can access learning content and platforms equitably, namely, various means of representation, means of action and expression, and means of engagement (Rabalate 2011). Various means of representation involve providing information in different formats, definition of complicated vocabulary and symbols used and clarification of key concepts. Various means of action and expression ensures that the learning environment and learning tool are navigable, the students understand the means of communication used and can solve their own problems as part of learning. Various means of engagement avail the student different ways of engaging to achieve their set learning outcomes. Successful inclusion takes place through accepting, understanding, and attending to student differences and diversity. This could include physical, cognitive, academic, social, and emotional factors. Evidence supports that to be effective, teachers need an understanding of best practices in teaching and of adapted instruction for students with disability, but positive attitudes towards inclusion are also among the most important for creating functional inclusive classrooms (Savage and Erten 2015).

The purpose of this study is to present the findings of an investigation of the way in which psychological and disability perspectives, in a South African context, can be

accommodated in the FRAME model to promote inclusive mobile learning. This is done through the analysis and critique of the three essential aspects of mobile learning: the device, the learner, and social dimensions.

Theoretical Background

Activity Theory

Although mobile learning has found expression in teaching and learning as well as research spaces, there seems to be under-theorisation about the nature, processes and outcomes of mobile learning (Sharples, Taylor, and Vavoula 2005; 2006). Many studies have grounded and conceptualised mobile learning applications to learning in the framework of activity theory (Gedera and Williams 2016; Liaw, Hatala, and Huang 2010). The activity theory is a cross-disciplinary framework for studying different forms of human practices for developing individuals and social levels at the same time (Kuutti 1996). Accordingly, the basic unit of analysis is an activity which is defined as a form of doing by a subject directed at an object using tools to transform it into an outcome. Kaptelinin (1995) views the activity theory in terms of human computer interaction in context. This view is considered pertinent for this paper as it speaks directly to students interacting with technology, of whatever make and type, in the context of student support and counselling. According to Frederickson, Reed, and Clifford (2005) and Engeström (2001), the activity theory represents the activity systems in terms of the relationships between an individual (subject) and the object in the environment and the community. It is imperative to acknowledge that these relationships are mediated in different ways.

Cultural artefacts or tools, as espoused by the theory, mediate the relationship between the subject and object. Frederickson, Reed, and Clifford (2005) posit that these cultural artefacts can be material objects or symbol systems or procedures – anything that is used in the transformation process. The relationship between a subject and a community is mediated by rules such as norms and conventions whereas the relationship between an object and a community is mediated by the division of labour. The division of labour describes formal and informal ways in which the community is organised in relation to the transformation process. However, activity systems are typically in flux as contradictions result from the operation of external influences (Engeström 2001).

Figure 1 is adopted to climax the similarities in the theory and practice-based counselling (psychological) process. The basic assumptions are that, just as a student follows the learning in a learning situation, so does a client in a therapeutic situation. The learning process is similar to the manipulation of a tool to reach a desired outcome.

Figure 1: Structure of human activity system (Engeström 2001)

The roles within this therapeutic (student support) coalition are regarded as similar to those of an instructor, as the therapist works according to the pace and presenting information mastery of the interaction online. The mobile language speaks to the rules of communication and the counsellor's (therapist) steering of appropriate language usage for the client's benefit and understanding the AC-C-BC according to the FRAME model (see Figure 2), such as the symbolic representations of communication by the student. Networked learning is therefore active and social with an aim of mediating technologies such as mobile learning provides an infrastructure for social activity. The visual images we choose to signify ourselves, the style of language we use, and the degree to which we open ourselves within these spaces, give a collective picture of how we are perceived.

The envisioned outcome by all stakeholders is a positive resolution or empowerment of the student in the counselling process. The counsellor's sensitivity to the client's culture and social or community aspects informs the pace and language complexity used for different clients at different levels of any therapeutic alliance (A-B-AB) in line with the FRAME model. Accordingly, the FRAME model assumes that the pace at which the client engages in the process determines how, what and when the counsellor can intervene; thus, always ensuring that the client eventually develops a sense of agency in the whole process. In accordance with the FRAME model, this would speak to the advantages of online or mobile counselling as espoused by many researchers (Marks, Cavanagh, and Gega 2007; Ng'ambi, Bozalek, and Gachago 2013; Speyer and Zach 2011).

The methodology aims to shift teacher practice from an inherent and belief-based approach to one that is explicit and design-based. The aspiration is that such an approach will guide teacher design practice and help to make the learning design process more explicit and hence inclusive. Accordingly, as reiterated by Chun, Kern, and Smith (2016), methodology includes a range of conceptual visual design tools, and approaches for fostering the sharing and discussing of learning and teaching design, through structured real events and via specialised social networking tools.

The FRAME Model

The FRAME model (Figure 2) describes mobile learning as the convergence of mobile technologies, human learning capacities, and social interaction. It posits the interaction between the device (mobile phone), the human (student) and social interaction (context) in which mobile learning takes place. The model is the focus of this current investigation. The authors have made an in-depth literature analysis of the key proponents of the FRAME contextualised to the South African mobile learning context, considering psychological and disability perspectives. The findings are envisaged to assist those involved in mobile learning when identifying devices and learning designs which could be beneficial for the section of learners presenting with psychological and disability characteristics.

Figure 2: The FRAME model (Koole and Ally 2006)

Research Methodology

This paper derives from a document analysis that was conducted through the literature review of articles that were written and published by Koole (2006; 2009; 2017), Koole and Ally (2006), Koole et al. (2018), and Koole and Morrison (2018) on the FRAME model. The aim was to explore ways of incorporating psychological and disability perspectives into the FRAME model. The study uses the activity theory to determine the way in which psychological and disability perspectives can be better accommodated in the FRAME model to promote inclusive mobile learning. The paper examined the following questions:

- How does the FRAME model promote psychological perspectives in mobile learning?
- How does the FRAME model promote disability perspectives through mobile learning?
- Does the FRAME model support the inclusive learning agenda?
- What are the barriers and opportunities for advancing inclusivity using the FRAME model for psychological and disability issues?

Data Analysis

Table 1 presents the readings analysed and reviewed in this paper.

Table 1: Literature analysed and reviewed

Year	Author	Publication Title
2006	Koole	Framework for the Rational Analysis of Mobile Education (FRAME) Model: An Evaluation of Mobile Devices for Distance Education
2009	Koole	A Model for Framing Mobile Learning
2010	Koole, McQuilkin, and Ally	Mobile Learning in Distance Education: Utility or Futility?
2017	Koole review of Bower (2017)	Design of Technology-Enhanced Learning: Integrating Research and Practice
2018	Koole et al.	A Comparison of the Uptake of Two Research Models in Mobile Learning: The FRAME Model and the 3-Level Evaluation Framework
2018	Morrison and Koole	Learning On-The-Go: Older Adults' Use of Mobile Devices to Enhance Self-Directed, Informal Learning

Review of Literature

Psychological Factors

The FRAME model has used mobile learning devices to reinforce stimulated motivation and enhance engagement, as well as a content-delivery tool (Sung, Chang, and Liu 2016). The unique features of mobile devices can enhance the essential functionalities of certain teaching methods and, thus, promote educational outcomes. Other features that empower the teaching and learning process are the portability and context awareness of mobile devices. The FRAME assumes that mobile learning is effective because the learners can manipulate and engage with educational activities at their own pace and space. However, according to Sung, Chang, and Liu (2015), few projects have used mobile devices to assist with constructive thinking or reflection.

Although the FRAME postulates learner–tool–social aspects, it falls short in redressing pertinent psychological attributes of the learner in the learning space. Mobile learning devices, according to the theory, are designed to meet the learning needs of acquisition of knowledge and performance support. Acquisition of knowledge presupposes “when wanting to learn” given the requisite and “holistic” support is not adequately dealt with (Akayoglu et al. 2020). The model supposes that once a student has been given training in manipulating the device, that student has “acquired” the requisite skills to learn through the device.

The model does not seem to accommodate aspects of “community-based learning” which differs from the “social aspect” in that is at the individual level. The psychological situatedness or agency and the psychological factors involved in the interaction between student and device are missing. The FRAME model positions the integration of mobile technology to learning environments to achieve more effective learning, however, it does not present the way in which these technologies become beneficial for the learner (Sharples 2000). The factors below are pertinent psychological factors for consideration in the FRAME model.

Power of multimodality mastery of the digital world

The FRAME model presupposes that once a student has been exposed to the mobile device and oriented to its use ($A + B = AB$), then the student has been given the ability to master same. The psychological impact of students who experience difficulty in manipulating the device is not holistically dealt with. From the activity theory perspective, Engeström (2001) depicts the importance of the interplay between the “subject” here student and the “object” here device to meet learning “transformation” outcomes. This is reiterated by Owston, York, and Malhotra (2019). The FRAME model fails to highlight this pertinent psychological aspect in mobile learning by seemingly undermining (not acknowledging) the framework of attributes of learning that students grapple with or bring into the learning space.

Concept of discomfort in the learning experience – “psychological digital story”

Anxiety, irritability, excessive worry, competency, confidence and mastery or fear as psychological concepts and behavioural outcomes are important for practitioners to consider in a learning space. Students exhibit reactions or responses to anxiety provoking situations in various ways. Some may withdraw from the activity while others may perform dismally in a given activity. These exhibited behavioural outcomes may be missed or misinterpreted by an unknowing educator. The said discomfort may also be articulated by learners in terms of the incompatibility of the device for learning experiences. In a sense, their “psychological digital stories” may be misdiagnosed as an indication of a learning disorder, digital illiteracy or cultural variables, for example, first-world versus third-world exposure.

Psychological catharsis in a digital space – “socially constructed narrative”

The concept of psychological catharsis is considered clinically significant in the learning space of students. As much as the learning outcomes are objectively structured, in most academic instances said module construction misses the “socially constructed narratives” that students bring into the learning space. Mobile learning is constructed in such a way that students are expected to manipulate the device for expected learning outcomes devoid of the background. According to Anderson (2008), online (mobile) learning should display learner-centeredness, which includes an awareness of the unique cognitive structures and understanding that learners bring into the learning context. The FRAME model articulates the social aspect in mobile learning and misses the community fabric (co-construction) that weaves contextual understanding in the learning space. This is an important psychological perspective that demands unpacking for contextual knowledge creation.

Trauma (psychological)

The negative digital experiences of students may be severe enough to be considered psychological trauma. The FRAME model (Koole 2006; 2009; 2017) seems to normalise this aspect of psychological trauma. According to the FRAME model, the learner aspects (B), interaction learning (BC) and social aspect (C) do not seem to effectively deal with this psychological aspect in the learning space. The assumption from the FRAME analysis suggests that the instructional and learning theories are adequate for learner assimilation and mastery. Social constructivism suggests that learning processes are interpreted and understood from a similar social framework or meaning. This similar social framework alleviates possible and plausible underlying psychological trauma, not articulated in the FRAME, symptomatic of anxiety and withdrawal in the learning space. ODL students, by their presenting cultural and generational disparities, bring to the learning space disparate cognitive meanings and understandings as experienced in the South African context.

Obstacles

In terms of psychology, within the FRAME, mobile learning poses obstacles as discussed below.

The teacher, with minimal learner centred projects in existence (Sung, Chang, and Liu 2015), has control over most learning activities using mobile devices. Students need time to familiarise themselves with the mobile learning activities to enhance intellectual elaboration processes and outcomes. Mobile learning may also pose obstacles in relation to mastery of anxieties regarding effective manipulation and mastery of mobile device applications and processes. For example, this might adversely affect students from rural-based schools, some presenting with disabilities, and with no prior exposure to technologies such as computers and other devices such as iPads. Such anxiety provoking situations may have an adverse outcome in the learning space. Since higher education students vary in age and experience, mobile learning may pose unintended exclusionary processes or outcomes. Self-directed learning and self-efficacy in mobile learning environments depend on several psychological variables to be effective. These variables include confidence in the use and manipulation of the device, belief in the envisaged teacher and environment support, and the ability to learn in a collaborative approach that is conducive to learning. Therefore, elaborate design of learning scenarios, such as mechanisms for prompting questioning and explanatory strategies specifically related to the learning content, may need to be incorporated into the mobile device-based activities to enhance students' intellectual elaboration processes and outcomes. Further, mobile-based cooperative learning programmes need to be long enough to produce positive effects (Byun, Lee, and Cerreto 2014).

Disability Perspectives

All students need the opportunity to have learning experiences in line with the same learning goals. This necessitates thinking about what support each student with disabilities need, but overall strategies are making sure all students hear instructions, that they do indeed start activities, that all students participate in large group instruction, and that students transition in and out of the classroom at the same time. According to Savage and Erten (2015), these include numerous ways of representing content to students and for students to represent learning back, such as modelling, images, objectives and manipulatives, graphic organisers, oral and written responses, and technology. These can also be adapted as modifications for students with disabilities where they can adapt the learning content to large print, text-to-speech, are allowed to have a peer write their dictated response, draw a picture instead, use calculators, or have extra time within which to complete their tasks. The literature review reveals that the FRAME model guides the use of mobile devices, usability, learner characteristics and interactivity; yet, in the case of students with disabilities, the model can be enhanced by embracing elements of inclusion.

It is the assertion of the authors that important disability issues need to be acknowledged in this regard as these also have a negative impact on the student's academic success, especially when learning institutions have inaccessible learning platforms (Mokiwa and Phasha 2012; Ngubane-Mokiwa 2013). These inaccessible platforms also exclude students with disabilities whose assistive technologies are not always compatible with the mainstream information and emerging communication technological tools. This stresses the importance of having a beneficial interplay between the "subject" and the "object" (Engeström 2001) for the mobile device to effectively enable inclusive learning.

Obstacles

In terms of disability, within the FRAME, mobile learning poses obstacles such as financial challenges, a limited range of accessible mobile learning tools, the available m-learning approaches do not fulfil holistic learning experiences, and the unavailability of relevant mobile learning tools for certain courses. In South Africa, there are some financial provisions made by the Department of Labour in the form of disability bursaries, which are administered by the National Student Financial Aid Scheme. Research by Ngubane-Mokiwa (2013) and Rajohane Matshediso (2007) reveals that most students with disabilities expressed their frustration when accessing the already available funding owing to exclusionary administrative systems. Chataika et al. (2012) also attest to the presence of financial constraints in the provision of support to people with disabilities in Africa.

Another obstacle illuminated by the literature is the limited range of accessible mobile learning tools. A study conducted by Ngubane-Mokiwa (2013) on ICT as a learning tool indicates that although students with disabilities relied on different ICT tools, these tools did not provide adequate academic support owing to the tools not matching their learning needs. This difficulty is also present in the use of mobile learning. As Elias (2011) points out, mobile learning can be exclusionary because of slow download and limited internet access, small screen sizes with poor resolution, colour and contrast, awkward text input and limited memory. These limitations can further exclude the already excluded students with disabilities. The FRAME model aspect of looking at the social aspect of mobile learning is missing in that the current mobile design does not allow for students with disabilities to co-construct knowledge in order to enhance contextual and authentic learning. The learner (B), interaction learning (BC) and social aspect (C) in the FRAME model need to take cognisance of the competencies of students with disabilities so as to enhance the inclusive and collaborative mobile learning.

Conducting the literature review assisted the researchers in identifying the potential that mobile learning provides for enhancement of teaching and learning in ODL contexts.

Opportunities

Individualised Learning Provision

Corresponding to the FRAME, the gradual introduction of mobile learning in the educational context over the past two decades has led to people carrying their individual devices that contain exceptional computing powers in these learning spaces. In addition to promoting innovation in education via technology, mobile learning seems to provide both traditional face-to-face teaching and sharing through promoting innovative technology teaching methods. According to Lan (2009), Lan et al. (2010), and Rochelle et al. (2010), mobile learning facilitates individual exploratory learning and game-based learning outside the traditional classroom. The FRAME model suggests that because each student has their own mobile device, this “individuality” combined with wireless communication enables more accessible self-paced and self-directed study. Therefore, the researchers aver that mobile technologies have great potential for facilitating innovative educational methods. However, despite these proposed advantages of mobile learning and accessibility, and diverse teaching styles, current researchers found mixed results regarding the effects of mobile learning (Zheng, Warschauer, and Farkas 2013).

Flexibility and Spontaneity

As Traxler (2007; 2010; 2013) and Looi and Toh (2014) suggest, the proper use of mobile learning can make learning more flexible, accessible and spontaneous. As much as both studies did not refer to students with disabilities and psychological barriers, the flexibility and spontaneity have the potential of equally benefitting them. For this to happen the learning should be designed and delivered in an accessible manner. Mobile learning designers should take caution and understand the students’ emotional and social needs, so they design learning that responds to them. Hsu and Ching (2012) argue that mobile learning heightens the chances of learning anytime and anywhere. They term this seamless and ubiquitous learning (Hsu and Ching 2015) in mobile and e-learning environments, which, according to the current study, also relate to the FRAME model.

Collaborative Learning

Motiwalla (2007) highlighted the potential of mobile learning for improving communication and enhancing collaborative learning. In the case of students with disabilities and those with psychological barriers, appropriate use of mobile learning could encourage them to participate in learning at the time and formats that are suitable to them.

Conclusion

Although there are several models that are related to mobile learning, this paper only examined the FRAME model. The authors, who are both researchers and practitioners, engaged in an extensive literature reviews exercise, which involved the FRAME model.

Relating to the FRAME, the gradual introduction of mobile learning in the educational context over the past two decades has led to people carrying their individual devices that contain exceptional computing powers in these learning spaces. In as much as mobile learning provides opportunity for accessible “anytime, anywhere” learning, there is a need to consider the learning needs of marginalised students during the design process. The FRAME model was analysed and found to be lacking in accommodating psychological and disability needs. This necessitates thinking about what kind of support individual students with disabilities need. Overall strategies ensure that all students understand instructions, and that they do indeed begin their learning activities in their chosen format. Inclusive mobile learning will also ensure that students participate in collaborative group learning, and that they transition in and out of the learning environment at the same time. This paper, therefore, proposes the consideration of the above-mentioned learner needs in the FRAME model to ensure inclusive mobile learning. The authors further propose that these critical global and pervasive concerns in mobile learning environments be considered for further research.

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