A Proposed Framework for the Adoption of Mobile Learning in Namibian High Schools

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Abstract

The aim of this study is to develop a sustainable framework which will guide the adoption and implementation of mobile learning in Namibian High Schools. This study analysed the usage pattern of mobile devices among teachers and learners in Namibian high schools. Qualitative and quantitative techniques were used. The sample of the study is participants from three (3) high schools in six (6) out of the fourteen (14) regions of Namibia. 144 teachers and 720 students were sampled. The sample was collected through the use of purposive sampling procedure. Data was collected from this sample using questionnaires and interviews. The primary objective is to come up with a framework that mitigates students’ and teachers’ perceptions on mobile learning. The data was analysed using descriptive statistics with the aid of SPSS. At the end of the study a framework for mobile learning in Namibian High schools was developed.

Keywords: Mobile Learning; ICT; Mobile Devices; Adoption; Education

Introduction

Mobile learning technology is a type of learning that uses wireless handheld devices like PDA, iPod, smart phone, palmtop, and laptop in the pedagogy. It facilitates the provision of educational content like digital learning resources which can be accessed on mobile or a personal device. The definition of mobile learning has been argued in many areas. This is because of its vast and varying usage capacities such as its mobility, learning experiences and other methods it can be applied. Some researchers and educational experts view mobile learning technology as the immediate offspring of e-learning. Pinkwart, Hoppe, Milrad, and Perez (2003) for example, defines e-learning as “learning facilitated by digital “automated” tools and media’, and by comparison, mobile learning technology is ‘e-learning which utilizes mobile devices and wireless transmission’.

Despite all stated above, the mobile learning concept is still evolving and still vague. How it is ultimately conceptualized will determine perceptions and anticipations, and will determine its progress and future. There are evidently definitions and conceptualizations of mobile learning that define it mainly with regard to its technologies and its hardware, which is that learning is provided or supported mainly by mobile technologies. These definitions, conversely, are limiting and tied to existing technological innovation.
Furthermore, studies have explored the use of mobile technologies to support pedagogy in school settings (Hung, Hwang, Lin, Wu, & Su 2013). Some studies pointed out that mobile devices can support children in learning English (Chang and Hsu, 2011; Hsu, Hwang, Chang, & Chang, 2013). Other studies (Hung et al., 2013; Hwang, Wu, Zhuang, & Huang, 2013) adapted inquiry-based mobile learning technique to assist elementary school students to learn and collect data about ecology and temples observations. The results showed that a mix of real life experience and the digital world is achievable through mobile learning technology which will ultimately lead to better academic achievement on the part of the learners.

**Review of Literature**

Coupled with the increasing volume of studies, efforts are on ground to develop models and frameworks that will guide mobile learning usage and implementation in the education sector (e.g., Barker, Krull & Mallinson, 2005; Laurillard 2002; Park, 2011; Koole, 2006, 2009; Ng and Nicholas, 2012). These frameworks define the conceptual relationships among various components which draws it foundations from analysis of empirical evidence. These experts noted that in as much as models and frameworks in mobile learning are on the increase, more study is required due to the fact that conceptual and theoretical direction can assist in supporting design and research in mobile learning. Literature supports the fact that mobile learning is still in its growth state (Motiwalla, 2007); Liaw, Hatala and Hung, 2010). Much attention has been given to it since 2007 (Ng and Nicholas, 2012). There is an indication that for a conceptual framework for mobile learning to be successful, there is every need to look at the learner’s creativity, collaboration, communication and critical engagement. In the same vein, there are few frameworks that have been adapted for mobile learning. Some of them include (i) Pedagogical framework for mobile learning (Park, 2011), (ii) A Model for Framing Mobile Learning by (Koole, 2006, 2009), (iii) A Proposed Theoretical Model for Mobile Learning Adoption in Developing Countries by (Barker et al., 2005), (iv) A Conversational Framework for the Effective use of Learning Technologies by Laurillard (2002), and (v) A Framework for Sustainable Mobile Learning in Schools by (Ng and Nicholas (2012). In as much as there are varieties of mobile learning frameworks guiding different learning experiences, none has been developed to guide the adoption of mobile learning in Namibian High Schools. The purpose of this current paper is to develop a sustainable framework that will act as a guide towards the adoption of mobile learning in Namibian High schools.

**Theoretical Perspectives of Mobile Learning**

A distinct definition of mobile learning is difficult due to a variety of the research that has made it challenging (Frohberg, Göth, & Schwabe, 2009; Sharples, Arnedillo-Sánchez, Milrad, & Vavoula, 2009). In as much as there are varied definitions due to varying researches, literature has constantly talked about inadequate conceptual frameworks and theories (Peng, H., Su, Y., Chou, C. & Tsai, C. 2009). Explanations of mobile learning lay emphasis on its mobile nature (Sharples et al., 2009), accessibility (Parsons & Ryu, 2006), immediate in use (Kynäslahti, 2003), convinience (Cheon, Lee, Crooks, & Song, 2012), anywhere any time usage (Kukulska-Hulme et al., 2009), handiness (Kynäslahti, 2003), and contextual nature (Kearney, Schuck, Burden, & Aubusson, 2012).

Sharples et al. (2009,p.233) noted that “attributes of mobile learning its physical mobility, conceptual, and social spaces it covers”. There is uniqueness in connection between the learning and teaching frameworks in mobile learning, as learning may occur independently,
in a formal setting, or socialized models and frameworks (Frohberg et al., 2009). Mobile learning also has a great value when PC learning goes beyond the classroom to other academic and non-academic locations using communication networks. Latest innovations like, cameras, motion, location awareness, social networks, web surfing, together with augmented reality, show the prospects to engender pedagogy and collaboration across several teaching and learning spaces, both within and outside.

There is an unbroken and uninterrupted flow of information that can be gained through the use of mobile learning technology (Kukulska-Hulme et al., 2009; Seppälä & Alamiäki, 2003). Teachers can also enjoy the convenience and immediacy that mobile learning brings which consequently boosts students’ learning (Kynäslahti, 2003). These features limit the classroom context and enhance personalized, situated, combined, and informal learning (Cheon et al., 2012). While handiness and flexibility have made mobile devices attractive tools, innovations like geospatial technologies, proficiencies in searching (or surfing), video and image capture and other innovative technologies have increased their flexibility by encouraging situated learning capabilities and sanctioning exploration within realistic settings, especially being in support of inquiry-based learning (Martin & Ertzberger, 2013).

Considering the fact that a lot research on mobile learning dedicated so much on students, and lately teachers, researchers have started looking at the possibilities of mobile learning and devices within pedagogy. By blending the literature on mobile learning, this research tried to address the trends, overlaps, and gaps observed in order to determine current implementation practices in Namibian High Schools in order to develop a sustainable framework.
Table 1: M-learning Models/Frameworks Comparison

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Used Learning theories and teaching experiences to design the educational environment.</td>
<td>M-learning as result of convergence of mobile technologies, human learning capacities, and social interaction.</td>
<td>Teaching and Learning experiences.</td>
<td>-Person-centred model -Project spanned 3 years at a Secondary School adopting M-learning programme using PDAs. -Data collected using mixed-methods (questionnaires, focus groups and observations).</td>
<td>Literature review (results of M-learning projects)</td>
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<tr>
<td>Discussion, Adaptation, interaction and reflection</td>
<td>Aspects: -Device Aspect, -Learner Aspect, -Social Aspect Mobile learning is the intersection between all the three aspects.</td>
<td>-High transactional distance -Low transactional distance Traditional experience of learner</td>
<td>-Interrelationships between the stakeholders and their interaction with devices. -Support and trust between stakeholders. -Wider community in M-learning -Financial issues -Roles of leadership and institutional policy. -Technical support, pedagogical elements.</td>
<td>-Traditional learning and E-learning system -M-learning guidelines -Communication infrastructure -Critical success factors (mobility, coordination, materials, motivation, communication, interactivity collaboration, negotiation)</td>
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<td>Device Aspect, Learner Aspect, Social Aspect Mobile learning is the intersection between all the three aspects.</td>
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<tr>
<td><strong>Model Evaluation and Validation</strong></td>
<td>No evidence</td>
<td>No evaluation</td>
<td>No evidence</td>
<td>Model was tested</td>
<td>No evaluation</td>
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<td></td>
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<td>of evaluation</td>
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<td>through the following:</td>
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<td>-Pre- and post-test</td>
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<td>questionnaire for</td>
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<td>both students and</td>
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<td>staff.</td>
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<td>-Focus group</td>
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<td>interview (students</td>
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<td>and teachers,</td>
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<td>interview with</td>
<td></td>
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<tr>
<td><strong>Is the Model Sustainable?</strong></td>
<td>No sustainability</td>
<td>No sustainability</td>
<td>Reflects</td>
<td>Reflects sustainability</td>
<td>No sustainability</td>
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<td>sustainability</td>
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<tr>
<td><strong>Does the Model Define Deployment Stages for M-Learning?</strong></td>
<td>No. It talks about conversational environment.</td>
<td>No, this framework is useful for guiding development of following: mobile devices, learning materials and design of M-learning, teaching strategies.</td>
<td>No. It encourages the enhancement of teaching and learning experiences</td>
<td>No, it clarifies the process of achieving effective integration of ICT into teaching and learning in M-learning.</td>
<td>No, It provides strategy for the adoption of wireless technologies</td>
</tr>
<tr>
<td><strong>Does the Model Relate to E-Learning System?</strong></td>
<td>Related to mobile learning system</td>
<td>No relation</td>
<td>Related to e-learning system</td>
<td>No relation</td>
<td>Related to E-learning</td>
</tr>
</tbody>
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Review and comparison of the previous Mobile learning models

A Review of literature in most of the frameworks indicates that there is no clear delineation of the pre deployment and deployment stages of mobile learning systems and how they will be continuously maintained after deployment. Though the models can guide research on the deployment of mobile learning, they are limited in practical applicability. This exposes the need to create a model that can be deployed in High Schools particularly in the Namibian context as the frameworks as outlined above will not be adaptable to the Namibian high school environment.

Investigating learners’ and teachers’ perceptions towards the adoption of mobile learning will give a better understanding of how to develop a mobile learning model that will enhance better learning capabilities and teaching skill for High Schools in Namibia. This so because the mobile learning models and frameworks discussed above cannot be generalized and used for the Namibian High School environment. This is due to the fact that some gaps exist in them and their conceptualization of mobile learning hampers their adaptation in some developing countries like Namibia. Furthermore, findings from these frameworks clearly show that the focus of the majority of the them contain only few mobile learning features such as usability, collaboration, flexibility and connectivity while completely ignoring the other essential features. ‘Some of the researchers focused only on one or two of the mobile learning features’ (Spikol et al., 2009, p.172). Characteristics such as context, control, engagement and the blending of mobile learning with other forms of learning have been used by only a few, while there is a limited study on other mobile learning characteristics such as user experience, motivation, evaluation, monitoring, technical support, cost, sustainability and environmental context in majority of the mobile learning models and frameworks. That is one of the major gaps in the existing mobile learning research literature which this research aims to address.

Methodology

The sample of the study is participants from three (3) high schools in six (6) out of the fourteen (14) regions of Namibia. The sample was collected through the use of purposive sampling procedure. Information was collected from this sample using questionnaires and interviews. The primary objective is to come up with a framework that mitigates students’ and teachers’ perceptions on mobile learning. An analysis of student and teachers’ perceptions was carried out using mixed method technique. Expert reviews on the framework were solicited as an evaluation measure. Secondly, discussions and focus group interviews (which consist of stakeholders in the education sector) was used. Recorders were used to conduct the interview which was later transcribed. Wagner, Kawulich and Garner (2012) assert that one the main source of data analysis is audiotapes and/or video tapes which will be taken from discussions of the focus group interviews. Another source of data is “the diary kept by the researcher containing observational notes” (Rabiee, 2004, P.98). In this study, audio recording of focus group interviews was used as a source for data analysis. According to Wagner, et al (2012) the settings and non-verbal communication of respondents are valuable input when data is being constructed and analysed.

A sample of high school teachers and learners will be drawn from eighteen (18) high schools that met the criteria explained above on sampling procedure. The students will be selected primarily from grades (11) and twelve (12). Twenty (20) students were randomly drawn from each grade giving a total of forty (40) students per school and one hundred and twenty (120) students per region. This will make a total of six hundred (720) students from all the
schools. Also eight teachers were carefully selected from each school giving a total of one hundred and twenty (144) teachers from all the selected schools in all regions. The quantitative data generated from the questionnaires were captured and then analysed for descriptive and inferential statistics using the latest version of a statistical software package called Statistical Package for the Social Sciences (SPSS).

Framework Validation
The components and processes of the proposed framework were presented to the target stakeholders for the purpose of empirical verification. Internal validation strategies as recommended by Richey and Klein (2007), which the focuses are on the components and processes of the framework were used to identify problems. These strategies are as follows:

- Does the framework include the necessary components?
- To what extent does the framework addresses relevant environmental factors?
- To what extent is the framework usable to a wide range of settings?
- Is the use of the framework cost effective?

Furthermore, expert reviews, usability documentation and component investigation, as identified by Richey and Klein (2007), are three potential techniques to conduct internal validation. Expert reviewers were selected for this study and Delphi techniques were used to complete the validation. The Delphi technique which is a commonly accepted technique for collecting data from survey participants within a specific domain and expertise was used. This technique is customarily used for generating consensus around a subject through the use of a series of survey questions, and other tools from a group individuals selected for a particular purpose (Hsu & Sanford, 2007).

Volunteers who formed part of a participant panel were recruited from each of the focus groups. The pane had the duty of reviewing and assessing the framework once it was developed, and to provide inputs for further development of the framework. For the purpose of the validation in this study, this panel was referred as the Mobile Framework Panel. It contained three (3) members from each of the focus groups. They are

- ICT Teachers
- Learners.

The administrator panel included a principal, and two staff each from the supervising ministries (Education and the ministry of ICT).

The study analyzed data collected from research instruments used and results were presented using multiple tables and detailed descriptive information based on the following sections: 1) descriptive characteristics of the learners, teachers; 2) analysis of the survey data for each of the participant groups (the various regions); 3) in depth explanation of the developed mobile learning framework and a diagram depicting the framework showing the relationship among all the components that were identified in the study as essential for supporting mobile technologies in an educational setting; and 5) summary of results of these data, and the proposed framework.

Results and Analysis
A population is defined as an assemblage of individuals/item who possess specific attributes and from which a sample is drawn to determine the parameters or characteristics (Creswell & Plano Clark, 2007; Maree & Pietersen, 2007). The population used for this study consists of learners is six (6) out of the fourteen regions of Namibia. Since it would not have been
feasible to study the entire population, there is evidence from various sources that supports the fact that a portion of the population known as a sample must be selected to participate in the study (Babbie & Mouton, 2010; Brynard & Hanekom, 2006; Maree & Pietersen, 2007; Strydom, 2011). The benefits of using a sample, according to Bergman (2008) as well as Mitchell and Jolley (2007), is to save costs and time. Furthermore, three schools were sampled from each region which give a total of eighteen (18) from the six (6) regions. The study sample also consists of 40 Grade 11 and 12 learners from each school. They all fall into the 15-19 age categories which is the average age of Grade 11 and 12 learners. In total therefore, there were 120 learners from each region and a total of seven hundred and twenty (720) learners from all the six regions. Just like the learners, the same number of schools and regions were sampled for the teachers. But eight (8) teachers were sampled from each school that participated in the study, making it a total one hundred and forty four (144) teachers from all the regions. For age variance, the teachers were between 25-29 age groups and 30-34 age groups. Their years of service also vary.

**Brand of device used by learner and teachers**

The cost of the mobile devices determines the brand of devices owned by teachers and learners. Another determinant of type of mobile devices owned by individuals is its features (Goh and Kinshuk 2006). This is a very big issue on mobile phone ownership and can be seen from the responses of the various respondents (both teachers and learners). On the side of the learners, a range of between 52.5% to 70% of the learners own Android phones in all the regions surveyed and on the side of the teachers, between 25% to 74.3% of the teachers have android phones. For instance in the six (6) regions, an average of 11.8% of the teachers own Apple pads, 7.6% own Apple phone, 65.4% own Android, 9.8% kindle and 4.85 own non internet enable phone. For teachers An average of 15.3% of them own Apple pad, 8.2% own Apple phone, 50.7% Android while 14.5% own kindle and 7.5% own non internet enabled phone. The learners and teachers that own the non-internet enabled phone are the teachers and learners that do not have smartphone and do not plan to own one. In essence, the cost of phones and the perception of the user go a long ways to determine the brand that will be more common (Goh and Kinshuk, 2006). This can be seen from the percentage of the teachers and learners that own Android phones which is seen as the cheapest smartphone for the time being.

**Table 3. Brand of Phone (Learners)**

| What tablet/smartphone brand/model do you own? | LEARNERS |  |  |  |  |  |  |
|---|---|---|---|---|---|---|
|  | Apple | Apple | Android | Kindle | Non internet enabled phone |  |
|  | Ipad | phone |  |  |  |  |
| ERONGO | 8.6 | 14.3 | 38.6 | 12.9 | 5.7 |  |
| HARDAP | 5.6 | 2.8 | 54.9 | 16.9 | 5.6 |  |
| KHAMAS | 26.0 | 4.1 | 42.5 | 9.6 | 4.1 |  |
| OTJOZONJUPA | 1.3 | 2.6 | 46.8 | 5.2 | 9.1 |  |
| OSHIKOTO | 8.7 | 8.7 | 69.6 | 4.3 | 4.3 |  |
| OSAHANA | 0 | 10.0 | 70.0 | 10.0 | 0 |  |
| TOTAL AVERAGE(%) | 11.8 | 7.6 | 65.4 | 9.8 | 4.8 |  |
Table 4. Brand of phone (Teachers)

<table>
<thead>
<tr>
<th>What tablet/smartphone brand/model do you own?</th>
<th>Apple</th>
<th>Apple phone</th>
<th>Android</th>
<th>Kindle</th>
<th>Non internet enabled phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACHERS</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ERONGO</td>
<td>13.3</td>
<td>6.7</td>
<td>60</td>
<td>13.3</td>
<td>5.7</td>
</tr>
<tr>
<td>HARDAP</td>
<td>21.4</td>
<td>7.1</td>
<td>64.3</td>
<td>7.1</td>
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</tr>
<tr>
<td>KHOMAS</td>
<td>21.1</td>
<td>10.5</td>
<td>31.6</td>
<td>15.8</td>
<td>10.5</td>
</tr>
<tr>
<td>OTJOZONJUPA</td>
<td>11.4</td>
<td>7.1</td>
<td>74.3</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>OSHIKOTO</td>
<td>0</td>
<td>0</td>
<td>50.0</td>
<td>33.3</td>
<td>16.7</td>
</tr>
<tr>
<td>OSAHANA</td>
<td>25.0</td>
<td>25.0</td>
<td>25.0</td>
<td>25.0</td>
<td>0</td>
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<tr>
<td>TOTAL</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AVERAGE(%)</td>
<td>15.3</td>
<td>8.2</td>
<td>50.7</td>
<td>14.5</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Usage pattern of Mobile devices

<table>
<thead>
<tr>
<th>Learners</th>
<th>YES (%)</th>
<th>YES (%)</th>
<th>YES (%)</th>
<th>YES (%)</th>
<th>YES (%)</th>
<th>YES (%)</th>
<th>YES (%)</th>
<th>YES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you use the device for academics purpose?</td>
<td>75.4</td>
<td>76.4</td>
<td>87.7</td>
<td>69.7</td>
<td>68.0</td>
<td>87.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have computer labs in your school?</td>
<td>91.7</td>
<td>93.3</td>
<td>82.2</td>
<td>92.2</td>
<td>100.0</td>
<td>95.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know how to access the internet from mobile device</td>
<td>90.3</td>
<td>96.0</td>
<td>100</td>
<td>95.9</td>
<td>88.0</td>
<td>100.0</td>
<td></td>
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<tr>
<td>I know how to download educational materials on a mobile device</td>
<td>78.6</td>
<td>82.4</td>
<td>86.5</td>
<td>85.3</td>
<td>92.0</td>
<td>95.7</td>
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<tr>
<td>I know how to download mobile educational applications on a mobile device</td>
<td>75.0</td>
<td>75.7</td>
<td>86.5</td>
<td>80</td>
<td>80.0</td>
<td>95.7</td>
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</tr>
<tr>
<td>I know how to find definitions of a word I don't know on a mobile device</td>
<td>94.3</td>
<td>98.6</td>
<td>95.9</td>
<td>96</td>
<td>80.0</td>
<td>95.7</td>
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</tr>
<tr>
<td>I know how to use a mobile device as a calculator</td>
<td>84.5</td>
<td>85.1</td>
<td>94.6</td>
<td>88</td>
<td>68.0</td>
<td>87.0</td>
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<tr>
<td>I know how to access social networking site on a mobile device</td>
<td>87.3</td>
<td>86.5</td>
<td>94.6</td>
<td>90.4</td>
<td>68.0</td>
<td>82.6</td>
<td></td>
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<tr>
<td>I know how to send e-mail on a mobile device</td>
<td>56.3</td>
<td>63.5</td>
<td>81.1</td>
<td>58.1</td>
<td>48.0</td>
<td>87.0</td>
<td></td>
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</table>
TEACHERS

<table>
<thead>
<tr>
<th></th>
<th>ERONGO (%)</th>
<th>HARDAP (%)</th>
<th>KHMAS (%)</th>
<th>OTJOZONJU (%)</th>
<th>OSHANA (%)</th>
<th>OSHIKOTO (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you use the device for academics purpose?</td>
<td>75</td>
<td>80</td>
<td>84.2</td>
<td>88.9</td>
<td>80.0</td>
<td>83.3</td>
</tr>
<tr>
<td>Do you have computer labs in your school?</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>I know how to access the internet from mobile device</td>
<td>93.8</td>
<td>100</td>
<td>94.7</td>
<td>100</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>I know how to download educational materials on a mobile device</td>
<td>93.8</td>
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<td>90</td>
<td>80.0</td>
<td>100.0</td>
</tr>
<tr>
<td>I know how to download mobile educational applications on a mobile device</td>
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<td>100.0</td>
<td>83.3</td>
</tr>
<tr>
<td>I know how to find definitions of a word I don't know on a mobile device</td>
<td>100</td>
<td>81.3</td>
<td>94.4</td>
<td>100</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>I know how to use a mobile device as a calculator</td>
<td>93.8</td>
<td>100</td>
<td>89.5</td>
<td>90</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>I know how to access social networking site on a mobile device</td>
<td>93.8</td>
<td>87.5</td>
<td>89.5</td>
<td>100</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>I know how to send e-mail on a mobile device</td>
<td>87.5</td>
<td>81.3</td>
<td>94.7</td>
<td>100</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Use of mobile device for academic purposes by learners and teachers

Research has validated prospects of mobile devices as they have been found to enable engagement (Rossing et. al, 2012). Usage of mobile devices for academic purposes is not only about being in a formal environment only but also about informal learning outside the classroom environment. Majority of the learners in all the regions indicated that they use mobile devices for academic purpose. For instance, in Erongo 75.4% were positive that they use mobile devices for academic purpose while 24.6% of the learners where negative. This is the same with Hardap where 76.4% of the learners use mobile devices for academic purposes and 19.4% do not. There is a sharp increase on the number of learners that use mobile devices for academics purposes in Khomas region. 97.7% of them indicated that they use it while 2.3% said they do not use it. The case of Khomas region may be unique in the sense that it is an urban area where there is likely to be more usage of these mobile devices because of the availability of more network infrastructure. Furthermore, in Otjozonjupa region, 69.7% of the learners use mobile devices for academic purposes while 28.9% do not. In Oshana 68% use it and 32% do not. And lastly, 87% of the learners in Oshikoto region indicated that they used mobile devices for academic purposes while 13% of the learners do not. On the whole, an average 79.03% of learners in the six (6) regions indicated that they use mobile devices for academic purposes while 20.03% do not.

There are similarities and differences between the level of usage of mobile devices for academic purposes among the teachers and the learners in the area. For example in Erongo, the percentage of teachers that affirm that they use mobile devices for academic purposes 75% which is similar to their learner where 75.4% of them agree to the usage of mobile devices for academic purposes. In Hardap 76.4% of the teachers use it for academic purpose while a higher number of their learners also use it (80%). This is different in the case of Oshana region where the number of teachers that use mobile devices for academic purses are
higher than that of the learners (80% and 68% respectively). Also in Otjozondjupa region, 88.9% of the teachers use mobile devices for academic purposes as against 69.7% of that of the learners. Though in Khomas region there is a difference in the trend (learners 97.7 and teachers 84.2); this could be due to age difference in the sense that youths are more exposed to this type of technology. There is not much difference in the Oshikoto region where the teachers that use mobile devices for academics purposes is 83.3% while that of the learners is 87%. The average percentage of teachers in the six (6) regions that use mobile devices for academic purposes is 81.9% while the average percentage of teachers that do not use it is 18.1%. It could be aptly said that with the large percentage of teachers and learners that use mobile devices for academic purposes, there is hope for that adoption of mobile learning in Namibian high schools. This is in agreement with (Schuler et. al, 2012) who noted that mobile learning facilitates teachers and learners ability to understand key concepts and personalize their learning experience.

Computer Labs in Schools
One positive discovery in this research is that all the schools visited have computer laboratories. (Kulik 1994; Butzin 2001; Mann, Shakeshaft, Becker, & Kottkamp, 1999) noted that if computers are available in schools learners can easily access and use them and it will in turn make a greater impact on their learning. This was affirmed by both the teachers and the learners in their responses. Although 2.6% of the teachers and 7.4% of the learner said they do not have computer labs in their schools. The affirmation by a total of 97.4% of the teachers and 92.6% of the learners in the six (6) regions is an indication that there are computer labs in the school. The teachers and learners that indicated that there are no labs may be unaware due to the fact that they may not have had access to the labs.

Learner and teachers access to the internet from a mobile device
The interest in harnessing their power for education and training through the internet increases as the use of mobile devices increases (Ally & Tsinakos, 2014). This means that Internet has a role to play in the area of mobile usage. 8.3% of the learners in Erongo region said that they do not know how to access the internet from a mobile device. This also goes for the Hardap, Otjozondjupa and Oshana regions, where 4%, 4.1% and 12% respectively of the learners are saying that they do not know how to access the internet. On the side of the teachers, 6.3% and 5.3% mainly from the Erongo and Hardap region respectively indicated that they do not know how to access the internet. This percentage could be part of the learners and teachers that do not own smartphone and as a result, no access to internet. Summarily, the percentage of learners and teachers in the 6 (six) regions that cannot access internet from their mobile devices is 2.7% and 1.9% respectively.

On the other hand majority of the learners and teachers in all the 6 (six) regions have access to the internet from their mobile devices. This can be seen from their responses. For instance, in Erongo 90.3% of the learners can have access to internet from their mobile devices while 93.8% of the teachers can also do the same. There is a similarity in the responses of teachers and learners in the Khomas and Oshikoto regions where they all affirmed that they can access internet from their mobile devices. This is also the case in Otjozondjupa. All the teachers indicated that they can access the internet from their mobile devices while 95.9% of the learners concurred. On the whole the average percentage of teachers that can access internet from their mobile devices in the 6 (six) regions is 98.1% while that of the learners is 95%. This means that the majority of the teachers and learners are mobile ICT literate. Therefore Increasing internet access through mobile Learning devices contributes to the advancement of
the mobile Learning (Ally & Tsinakos, 2014). This advantage explains that majority of teachers and learners have the potential to adopt mobile learning/teaching should it be in the schools’ or ministry’s ICT policies.

**Downloading educational materials and applications onto a mobile device**

One of the benefits of mobile learning devices is that learners can easily download on their mobile devices, while teachers can upload excerpts from texts as pdf files and sharing them with learners (Geist, 2011). From the responses below, 20% of the learners in the Erongo region cannot/have not downloaded educational materials onto a mobile device. This is the same with learners in Hardap, Khomas and Otjozondjupa Regions where 17.6%, 13.5% and 14.7% of the learners respectively cannot download educational material. The percentage is smaller in Oshana and Oshikoto which has 8% and 4.3% and the percentage of learners that do not know how to download educational materials onto a mobile device. This group of learners are not in a position to download educational materials from mobile devices should the need arise. In short, this means they are not doing any mobile learning. It is also possible that they use the phones to download other things besides educational material probably. The percentage of learners that can download educational materials onto a mobile device is higher. In Erongo the responses are 78.6%, Hardap is 82.4%, Khomas 86.5, Otjozondjupa 85.3%, Oshana 92% and Oshikoto 95.7% The total average percentage of Learners that cannot download educational material onto their mobile devices in all the six (6) regions is 13% while those that can download is 87%

The teachers and the learners have equal total average percentage in the 6 (six) regions it terms of their capability to download educational material onto their mobile devices. 13% of the learners indicated that they do not know how to download educational materials on a mobile device while 87% of the teachers can do it. In Erongo 6.3% of the learners cannot download educational material on a mobile device while 93.8% can. This also is the case with the Hardap region where 31.3% cannot download and 68.8% can. Similarly Khomas and Otjozondjupa regions have almost the same percentage. The teachers that cannot download educational material on mobile devices and 10.5% and 10% while the teachers that can download and 89.5% and 90% respectively. In contrast to other regions, all the teachers in Oshikoto indicated that they can download educational materials on a mobile device while 80% of teachers in Oshana region also affirmed with 20% saying that they cannot.

A high number of learners have the potential to learn and research with their devices based on the results above. This also includes the teachers as they have the potential to conduct mobile teaching in a formal environment if they can take advantage of the material they can download. Studies have found that mobile devices have applications that serve as study aides and productivity tools for learners. Not only were learners able to use “apps” to help create flashcards for studying, but they were also able to access and edit documents on Google docs for assignments (Miller, 2012)

**Searching for definitions of words**

Learners report that mobile devices facilitate their ability to understand key concepts and personalize their learning experience (Schuler et. al, 2012). This affirms that these devices have the capacity to broaden both the learners’ and the teachers’ knowledge. This can be seen from their responses. For instance, all the teachers in Erongo, Otjozondjupa, Oshana and Oshikoto regions indicated that they know how to search for definition of words using mobile devices while 81.3% and 94.4% of the teachers in Khomas and Hardarp respectively, also
affirmed to know how to use mobile devices for word search. On the side of the learners, the trend is almost the same. 94.3% in Erongo, 98.6% for Hardap, Khomas responses are 95.6% with Otjozonjupa 96% while Oshana has 80% responding affirmatively and Oshikoto 95%. In as much as there are some teachers and learners in most of these regions that still have problems of searching for word on mobile devices, they are minute. For example the total percentage of learners in the 6(six) regions that cannot find definitions on a mobile device is 6.5% while those that can search for words is 93.5%. For the teachers, 96% can search for words on mobile devices while 4% cannot. The responses above show that the teachers and leaners are already taking advantage of mobile technologies for the role of a dictionary.

Using a mobile device as a calculator
Mobile phone use in education, has moved from just sharing information to being used for mathematical problem solving (Aker, Ksoll, & Lybbert, 2012; Cowan & Butler, 2013; Lepp, Barkley, & Karpinski, 2015). The most widely used applications are graphic and symbolic calculators (known also as CAS – computer algebra systems), number calculators and some geometry applications. Along the trends of current education and the improved capabilities of hardware, calculator makers invest in making the personal tool to function also as a communication device in class. The responses from both the teachers and the learners show the importance of calculators in their lives.

The percentage difference of learners in the 6(six) regions who can conduct a word search and those that can use a calculator (93.5% and 84.5% respectively) is minimal because the learners have access to mobile devices. This is also the same with the teachers where 96% of them can search for words on mobile and 95.5% can use calculators. The question to ask is why the minority who are not using the calculator and word search are not encouraged like the majority. The calculator on a smartphone has more features. Hence, learners find it difficult to use mobile calculators which have more features. This explains the high percentage usage of calculators not minding the fact that 70.4% and 88.9% of the learners and teachers, respectively, use smartphones.

Access to social networking sites
“The collaborative web is rich in applications that can facilitate knowledge sharing, interaction, collaboration and communication, and the collaborative web therefore supports social networked learning in which learners use personal tools for self-directed and problem based learning” (Munguatosha, Muyinda and Lubega, 2011,p.308). Social networking media is very popular among youths the only thing that can keep them from such sites is if they do not have access to an internet enabled smartphones. This can be seen in the number of learners that do not have access to social networking sites. For instance in Erongo only 11.3% of the learners do not access social media but a total of 87.3% of the learners can. Also in Hardap, 13.5% of the learners cannot access social networking sites whereas 86.5% of them can access it. This is also the case with the Khomas region where only 5.3% of the learners indicated that they do not know how to access the social networking sites and 94.6% can. 90.4% of the learners in Otjozondjupa region can access social networking site while 9.6% of the learners cannot. Though there is a little reduction in the percentage of learners who indicated that they can access social networking site from a mobile device (68%) in Oshana region, the percentage is still more than the learners that cannot access it. There is also a significant number of leaners that can access social networking site from a mobile device in Oshikoto region (82.6%) where the percentage of those that cannot is 17.4% on the whole the average percentage of learners that can access social networking sites from a mobile devise in
the 6 (six) regions is 84.9% while those that cannot is 14.8%. Judging from the responses from the learners, it will not be out of place to say that mobile learning could be made interesting and appealing to young people if educators take advantage of social media in education dissemination. This is in agreement with Greenhow and Robelia (2009, p.1132) who stated that “there is a variety of choices to be made by young people over what, how, and with whom they learn in a wide range of settings: classrooms, after school programs, home-school, formal online learning programs, and web-enabled spaces that dominate popular culture”.

There is a little increase on the responses of the teachers on the access to social networking sites. Like that of the learners where the average percentage of learners in the 6 (six) regions that can and cannot access social networking site is 84.9% and 14.8% respectively, the teachers that can access the social networking site is 95.1% while the teachers that cannot it 4.9%. The age bracket of majority of the teachers is low, between 25 and 29 years, and is inclined towards media like most of the youth. This is an advantage because they can teach using social media. Therefore “since the social networked learning connects teachers and learners in the virtual space it will enable them to interact and collaborate as they execute teaching and learning activities, and through their participation they actively engage in the teaching and learning process and experience flexible environments for communication, global information sharing, personalized learning and independent learning in respect to time and place” (Munguatosha et al, 2011, p.309).

**Sending email**

One interesting aspect of mobile learning according to Joanne Gikas & Grant (2013) is that learners can used mobile devices, to interact with each other and share their knowledge and skills and also send email and get feedback through email from their teachers. There is a sharp drop in the percentage of learners that use their mobile devices to send emails compared previous responses. This is understandable because learners are more at home to using their devices for chatting and sending SMSs than sending email. For instance, In Erongo region, 43.2% of the learners said they do not know how to send emails on a mobile device while 56.3% of the learners do. Also in Hardap 63.5% of the learners indicated that they know how to send email on a mobile device while 36.5% of them do not. The Khomas and Oshikoto regions had a better response with 81.1% and 87% of the learners agreeing that they know how to send emails on a mobile device with 18.9% and 13% of them negative respectively. 58.1% of the learners in Otjozonjupa can send emails on a mobile device while 41.9 cannot. This region that has the highest number of learners that do not know how to send emails using a mobile device (52%) is Oshana while 48% can. On the average, 34.1% of the learners in the 6 (six) regions cannot send email while 65.5% can.

Conversely, while the percentage of learners that can send emails is not too high, the reserve is the case with the teachers. For in in Otjozonjupa, Oshana and Oshikoto regions, all the teachers affirmed that they can send emails on a mobile device while in Erongo, Hardap and Khomas regions, those the affirmed are 87.5%, 81.3% and 94.7% respectively. Looking at the 6 (six) regions as a whole, 6.1% of the learners in the 6(ix) regions indicated that they cannot send emails on a mobile while 93.9% can. The number of those that can access the internet is less than those that can send email. Social media is more important to young people than email. Therefore mobile learning should target social media if it is to appeal to the youths. Therefore it is advisable to use the social media as a form of communication
between teacher and learners than using the email system or much awareness can be carried out so as to make them aware of the benefits of using the email system.

**A Proposed Mobile Learning Framework for Namibian High Schools**

The Objective of this study is to develop a sustainable mobile learning framework for high schools in Namibia. It will also include all key issues and critical success factors that are essential to ensure successful deployment. In the end a mobile learning framework for Namibian High Schools was developed based on the stakeholders input from the surveys, focus groups, data analysis and literature review.

**Component of the mobile learning framework as a support for Namibian high Schools**

These component were put together after a thorough assessment and evaluation by the various stakeholders an also the expert review team. So many issues were put into consideration before these components were selected. Some of these issues include monitoring and evaluation in order to achieve a sustainable framework. The components are as follows:

- Budget
- Compatibility of mobile learning applications.
- Ease of use
- Training.
- Administrative support for mobile learning in Namibian High Schools.
- Awareness and motivation of teachers and learners.
- Continuous technical support.
- Usability and continuous assessment.
- Continuous mobile learning innovation.
- Quality of device.
- Confidence.
- Availability of suitable learning material/courseware.
- Mobile technology infrastructures
- Collaborative learning.
- Achievements and evaluation
- Communication
- Support for both traditional and mobile device users

**Phase 1** which is the preliminary stage is depicted in figure 1 and has the following components

i. Administrative Support
ii. Budget
iii. Awareness/motivation of teachers and learners
iv. Usability issues and ease of use
v. Compatibility issues
vi. Flexibility issues
vii. Issues of mobile learning content
viii. Quality device
ix. Confidence
PHASE 1
PRELIMINARY STAGE

ADMINISTRATIVE SUPPORT

BUDGET

AWARENESS/MOTIVATION

USABILITY ISSUES AND EASE OF USE

COMPATIBILITY ISSUES

FLEXIBILITY/PORTABILITY ISSUES

ISSUES OF MOBILE LEARNING CONTENT

QUALITY DEVICE

CONFIDENCE

(Devices and Internet Access) NAMIBIAN MOBILE LEARNING FRAMEWORK
Phase 2 which is the deployment stage is depicted in figure 2. It has the following components:

i. Mobile Infrastructure (Devices and Internet Access)
ii. Availability of Suitable teaching and learning materials/courseware
iii. Collaborative learning (Teacher and learners). Feedback. SMS, emails, social networks, etc
iv. Continuous technical support and usability assessment for both traditional and mobile devices
v. Continuous mobile learning innovation
vi. Monitoring, evaluation and achievement
vii. Regular power supply

Figure 9.2: Deployment Stage
The proposed framework above is based on the contributions from stakeholders, data from the surveys, focus groups, data analysis and from the reviewed literature as it is consistent with the existing literature. From result of the analysis carried out 15.3% of the teachers in the six regions own Apple Ipad, 8.2% own Apple Iphone, 50.7% of the teachers own Android phones while 14.5% own Kindle which means that a total 88.7% of the teachers own one type of mobile device or the other, with Android having the highest percentage (50.7%). On the other hand, 11.8% of the learners own Apple pad, 7.6% own Apple phone, 65.5% own Android while 9.8% own Kindle This also means the a total 94.6% of the learners in all six regions own one type of mobile device or the other with Andriod having the highest percentage of ownership (65.4%). This is a vast majority of the population showing that adoption is possible using mobile devices, as it is an infrastructure which is readily available. 94.8% of the learners in the six regions and 98.1% of the teachers also in the six regions use their mobile phones to access the internet which makes it possible to access materials over the internet. The framework will enable teachers and learners access to important information through the dedicated portals and through the internet with their mobile devices. Communication is an important aspect of learning. 84.9% of the learners can use social networking sites and 65.6% of them can also send emails through their mobile devices. Also 95.1% of the teachers can use the social networking sites while 93.9% can use emails. The framework envelops the users of the two media therefore it enables relaying of information to a majority of teachers and learners. Therefore, based on the specifications guided by the literature the framework was validated using context analysis. Also the framework, agrees with the existing literature and the objectives of the study.

Conclusion
The proposed framework highlights the important issues with respect to mobile learning. This it gives a broad overview of all the elements that need to be in place in a mobile learning environment, including the necessary stakeholders and key elements (communication infrastructure, mobile devices, learners and teachers), to ensure a seamless adoption of mobile learning in high schools. The framework has been structured in a way that there is continuity in the review of the components that required constant reviews in order maintain the sustainability. The components are separate entities but together they achieve sustainability. The quantitative and qualitative methods of data collection were used to develop and validate internally the mobile learning framework. In order to make mobile learning useful in education, mobile learning design needs to be streamlined by certain criteria such as usability of mobile devices for learning, enhanced collaboration among peers and teachers, learning in multiple contexts, teachers’ control over the learning process and independence of learners, costs involved in providing mobile learning for different stakeholders, and mobile learning content design which includes appropriate activities and applications in conjunction with the affordances of mobile devices. If these are put into consideration adoption and implementation of mobile learning will be an easy ride. It is hoped that with the proposed framework, the adoption and implementation of mobile learning technology in Namibian high schools will be easy, teachers and learners will be able to teach and learn collaboratively.
References


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