INITIAL DIAGNOSIS ON THE PERCEPTION AND THE LEVEL OF APPROPRIATION IN THE USE OF M-LEARNING ENVIRONMENTS OF STUDENTS OF THE AUTONOMOUS UNIVERSITY OF BAJA CALIFORNIA SUR, MEXICO

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Abstract

Currently there is a fairly widespread tendency to investigate the use of mobile devices in education, as this type of devices makes learning more flexible given the possibility of use anywhere and at any time. In recent years the use of mobile technology for educational purposes, known as m-Learning, has had a great development in higher education, since there are universities in Europe and America that have mobile education systems. The use of mobile devices requires and demands, like all human activity, a set of minimum or basic skills and abilities on the part of the student, that is, knowing how to do in a context, for which a certain theoretical and practical knowledge is required and of a digital competence that allows the student to develop his capacity of analysis and critical sense having as main base the technology. There are numerous projects that refer to the use of m-Learning and its incorporation in educational processes, however only some projects have been dedicated to know what are the necessary skills to learn using in m-Learning environments. This paper presents the results of a study that was applied with a simple probabilistic and random sample to students of the Information and Communication Technologies of the Autonomous University of Baja California Sur (UABCS) with the objective of analysing what is the practical appropriation of knowledge for the use of m-Learning environments. This study considered a descriptive-quantitative methodological approach, where data were collected on different aspects of the use of mobile devices. The development of research was a group of students at university level of Educational Programs (PE) of the DASC: Engineering in Development of Software (IDS, by its initials in Spanish), Engineering in Computational Technology (ITC, by its initials in Spanish) and Bachelor of computing (LC, by its initials in Spanish). Of the total number of students enrolled in the DASC (496) randomly selected a representative sample of 115 students. Factors related to the evaluation of mobile learning in higher education, were classified into three main categories: basic operations, management of information and communication and collaboration. The attitude of students about mobile learning is positive. The quantitative results of the research carried out reflect a heterogeneous population in terms of knowledge for the management of m-Learning environments. The work seeks to collaborate in the discussion about the results that have the application of knowledge for the use of m-Learning environments at this level of education.

Keywords: m-Learning, mobile devices, digital skills.

1 INTRODUCTION

Mobile devices are present in almost all areas, and are used to increase productivity in many sectors. The development of educational software is no longer limited to a personal computer, it has extended to the use of mobile devices to achieve greater reach and obtain the benefits that mobile computing offers the educational sector, resulting in the creation of a technological model called m-Learning or mobile learning [1].

Mobile learning emerges as an innovation in the area of educational technology generated by the great advances in the technological aspects of mobile devices and the rapid access they have had in a large part of the population, and on the other hand, in the developments pedagogies that have been adapted in the use of educational technology and that have found in the use of mobile devices an effective means to implement new pedagogical practices [2]. The United Nations Educational, Scientific and Cultural Organization (UNESCO) considers that mobile technologies can expand and enrich educational opportunities in different contexts [3].
According to several studies, in Mexico 85% of young people between 18 and 24 years old have a mobile device, who use them mainly to communicate, search for information and audiovisual content [4].

On the other hand, different authors and researchers propose a new profile of students who enter universities, called "digital natives", who present certain competences developed by "natural use" in their process of culturalization of ICT [5]. However, students do not reach higher education with an optimum level of digital competence and therefore it is essential to design and develop training and accreditation processes, which allow demonstrating the level of this competence [6].

2 METHODOLOGY

A study was designed in order to document the level of practical appropriation of the use of mobile devices for the use of m-Learning environments of the students of the Academic Department of Computational Systems (DASC, for its acronym in Spanish), of the Autonomous University of Baja California Sur (UABCS, for its acronym in Spanish). In Fig. 1 you can see the phases of the study.

Phase 1. An m-Learning environment was selected, whose competence was transversal, that is, a competence that covers most of the study disciplines. Due to the above, the Duolingo ™ application was chosen (http://www.duolingo.com), a language learning platform created by Carnegie Mellon University (CMU).

Phase 2. The skills that would be evaluated through the use of the m-Learning environment were defined: ability to send files by email, store files on the device, store files in the cloud, modify files on the device, modify files in the cloud, basic navigation in the device, basic device configurations, installing applications in the device, search for files in the device, search for files in the cloud, participate and interact in social networks, use browsers in the device. From the classification of dimensions in [7] skills were classified into three dimensions, basic operation, communication and collaboration, and information management.

Phase 3. The instruments used in the experiment were designed: The activity that was presented to the students was designed, which was carried out in groups of 10 students, on the heuristic evaluation and to explore usability in mobile devices.

A questionnaire was designed to evaluate the student's perception in relation to the activity developed, which consists of a set of questions regarding one or more dimensions to be measured [7]. The questionnaire was elaborated using reagents that were evaluated with a Likert scale. It had 10 statements in which students were asked to express their opinion by choosing one of the four points or categories of the scale (almost never, 4, rarely, 3, sometimes, 2, and almost always, 1). For the design of the questionnaire reagents, three dimensions were considered: basic operations (reactive 1, 6 and 7), communication and collaboration (reactents 5, 9 and 10), information management (reactents 2, 3, 4 and 8) [8].

Phase 4. The designed activity was executed. In each session the students were asked to perform the assigned tasks in relation to each of the dimensions: Basic Operations, Communication and Collaboration, and Information Management.

The assigned tasks consisted of: 1. Configure the device to access the internet, 2. Download the DUOLINGO app, and install it on the mobile device, 3. Configure the device for the use of the downloaded application, 4. Run the application, 5 Select the English language, as well as the daily goal, 6. Perform the recognition exam, 7. Create a profile for the use of the tool, 8. Send by email the screenshot of the completed activity. Additionally, they were told that they should generate evidence.
for each of the activities developed, and store them on the device. The estimated time for the development of the activity was 40 minutes.

At the end of each session the questionnaire was applied collectively to the participating students, the data was codified and analyzed through descriptive statistical analysis. A descriptive-quantitative methodological approach was considered, using the survey as an instrument to collect the assessments and perceptions of the students analyzed.

For the development of the research, a group of university students participated in the DASC educational programs: Software Development Engineering (IDS, for its acronym in Spanish), Computational Technology Engineering (ITC, for its acronym in Spanish) and Computer Science (LC, for its acronym in Spanish). Of the total number of students enrolled in the DASC educational programs (496), a representative sample of size (n) was randomly selected according to the algorithm described in [9], in a study conducted by the Autonomous University of Baja California (UABC) to know the appropriation and the educational uses of the cell phone by university students and professors.

We used (1) to perform the sample size calculation, because it considers a finite population, and the study population is known (496 students).

\[
n = \frac{N \cdot Z^2 P(1 - P)}{(N - 1) e^2 + Z^2 \alpha/2 P(1 - P)}
\]

Where:
- \( n \): Estimated sample size
- \( N \): Size of the population
- \( Z \): The value of \( z \) corresponding to the chosen level of confidence
- \( P \): Frequency / probability of the factor to be studied
- \( e \): maximum error estimate

The estimated sample size was 115 based on the following values: \( N = 496; Z = 1.96; P = 0.5; e = 0.08 \). Said sample size represents 23.18% of the total enrollment of the Academic Department of Computational Systems (DASC). The members of this population have as main characteristic to have a professional profile focused on the use of technology, that is, Engineers in Software Development and Computational Technology, and Graduates in Computing.

Based on the above, we used a random selection criterion of the participants, considering complying with the estimated minimum sampling percentage in each of the DASC careers.

3 RESULTS

During the experiment the mobile devices of the mobile laboratory were used, none of the participants used their personal device. The questionnaire was designed and administered, which measured the competence in each item on a scale of one to four. The products of the three particular competences or dimensions considered were analyzed: basic operations, communication and collaboration, information management.

3.1 Basic Operations

In the basic operations dimension, the following information was obtained: the global average in the ratings of the 115 students reflected a high intermediate competition, this is shown by the result obtained of 3.67 (Table 1), considering as a reference that 4 is the highest rating what can be obtained.
Table 1. Basic operations task. Source: Authors.

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Average</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In general, the navigation on the mobile device, during all the activity was without problems</td>
<td>3.91043478</td>
<td>0.33938069</td>
</tr>
<tr>
<td>6. The activation and use of speaker and speaker functions was carried out without problems</td>
<td>3.566521739</td>
<td>0.580249558</td>
</tr>
<tr>
<td>7. The screenshot of the activity was made without problems</td>
<td>3.556521739</td>
<td>0.56492981</td>
</tr>
<tr>
<td></td>
<td>3.675362319</td>
<td>0.494853353</td>
</tr>
</tbody>
</table>

Also, it was observed that the particular competence that most students dominate is the basic navigation ability, with an average of 3.91 (Table 1). While, the population of the research was highly heterogeneous in terms of knowledge for the management of basic operations, this was warned by the global index of 0.49 (Table 1), which shows that the further away from zero the result, the more diverse is the population studied. In Fig. 2 we can see the average level in the domain of particular skills for the basic operations dimension.

3.2 Communication and Collaboration

In the communication and collaboration dimension, the following information was obtained: the global average in the scores of the 115 students reflected a low intermediate competition, this is shown by the result obtained of 2.22 (Table 2), considering as a reference that 4 is the highest rating what can be obtained.

Table 2. Communication and collaboration tasks. Source: Authors.

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Average</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. The internet connection was made without problems</td>
<td>2.582608696</td>
<td>0.688025508</td>
</tr>
<tr>
<td>9. The file location of the application download was carried out without problems</td>
<td>2.113043478</td>
<td>0.588861783</td>
</tr>
<tr>
<td>10. Sending the email was carried out without problems</td>
<td>1.973913043</td>
<td>0.742930064</td>
</tr>
<tr>
<td></td>
<td>2.223188406</td>
<td>0.673272452</td>
</tr>
</tbody>
</table>

Also, it was observed that the particular competence that students dominate the least is the sending of emails, with an average of 1.97 (Table 2). While, the population of the research was highly heterogeneous in terms of knowledge for the management of communication and collaboration tasks,
this was warned by the global index of 0.67 (Table 2), which shows that the further away from zero is the result, the population studied is more diverse. In Fig. 3 we can see the average level in the domain of particular skills for the dimension of communication and collaboration.

![Communication and Collaboration](image)

*Figure 3. Communication and Collaboration dimension skills. Source: Authors.*

### 3.3 Information Management

In the information management dimension, the following information was obtained: the global average in the scores of the 115 students reflected an intermediate competition, this is shown by the result obtained of 2.81 (Table 3), considering as a reference that 4 is the highest rating what can be obtained.

![Information management](image)

*Figure 4. Information management dimension skills. Source: Authors.*

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Average</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. The download of the App on the mobile device was without problems</td>
<td>2.904347826</td>
<td>0.737158045</td>
</tr>
<tr>
<td>3. The installation of the m-Learning App on the mobile device was carried out without problems</td>
<td>2.8</td>
<td>0.703375321</td>
</tr>
<tr>
<td>4. The development of the recognition test in the App was without problems</td>
<td>2.765217391</td>
<td>0.705000122</td>
</tr>
<tr>
<td>8. The location of image files was made without problems</td>
<td>2.8</td>
<td>0.727890487</td>
</tr>
</tbody>
</table>

*Table 3. Information management tasks. Source: Authors.*
The results obtained in the perception survey shown that only 28.7% of students have an optimum level of competencies; this is because the score reached in the survey was greater than 30 points. The majority of students, 67.8% have an acceptable level of competence, with a range of 20 to 30 points. While only 3.5% of students show a level of poor competition, with less than 20 points. This can be seen in Fig. 5, which shows the number of students who reached each of the levels of competence in the tests.

Figure 5. Distribution of the level of knowledge per student in the use of m-Learning environments. Source: Authors.

4 CONCLUSIONS

The quantitative results of the research carried out reflect a heterogeneous population in terms of knowledge for the management of m-Learning environments.

The particular competence that most students dominate is the basic navigation ability, with an average of 3.91. The screenshots, the activation and use of speakers is the second most dominated competition with an average of 3.55. This is because the student mainly uses the mobile device to listen to music, and sends screenshots through social networks.

While the competitions in which there were more problems are: the sending of emails with an average of 1.97 and the location of files downloaded in the mobile device with 2.11. This is because most students do not use email applications, mainly using social networks.

In [10] it is stated that "digital natives" possess the basic digital skills. However, according to the results, it is assumed that a significant percentage of students, despite being "digital natives", reach their university studies without the necessary level to obtain the highest performance in the use of mobile devices in environments m-Learning; This can be seen since only 28.7% of the students have an optimal level of competence for the three dimensions analyzed; therefore it is essential to design and develop training programs to provide the necessary competencies for the use of m-Learning environments.

REFERENCES


