

Mobile application as a learning object in the teaching of a programming language

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ABSTRACT

The development of this prototype consists of a mobile application (app) under the Android operating system platform that aims to teach the essential bases of the structure of a programming language and promote programming logic in students, this app is oriented to engineering students in the area of computational sciences, since today most students who study these technologies use smartphones on a daily basis and necessary for their training, so the idea is to create an educational app that allows greater interaction between the user and the thematic content that promotes greater dynamism in the teaching-learning process, the app offers practical programming exercises based on the connectivist educational model to generate the knowledge and skills to program in Python for being an accessible and easy to learn language.

Keywords: e-learning, learning object, mobile applications.

1 INTRODUCTION

The teaching-learning-learning process is constantly changing dictated by the evolution of individuals and the society that houses them, in an effort to understand the phenomena that surround the human being, philosophical currents and sciences are generated that try to explain these phenomena, and therefore also theories in the process of teaching this knowledge, skills and attitudes that are appropriate at the time to satisfy human needs.

There have been different philosophical currents or paradigms in the teaching-learning process that dictates the education that is normalized in most societies or countries. Constructivism is still a current teaching pedagogy in our country (Mexico), but economic, human and cultural changes demand training members of a society in a relevant way with current needs. The connectivist current has gained strength as an emerging alternative in the digital age 3.0 (by Stephen Downes and George Siemens, 2003)

The teaching process is enriched by the use of technological tools that, when used well and ethically, can achieve better results. In this case, we can see that we cannot separate ourselves from technology as a means to achieve efficiency in various activities of being. Human do, and of course in teaching. Web 3.0 already offers content and knowledge that are efficiently related and serves as a widely used platform to offer e-learning education at different levels, although this is already a reality today, web 4.0 as an alternative for evolution that appears in the technological world offers capabilities such as artificial intelligence that plays an important role in solving intractable problems, and of course in the development of intelligent technologies in the teaching-learning process.

In connectivism as a complement to constructivism, it is a reality where the ideal link can be found to link complex thinking with computational thinking. The signification that connectivism performs around chaos is striking. Chaos is considered as the interruption of the possibility of predicting, that which defies order. Unlike constructivism that encourages students to perform meaningful tasks, chaos indicates

that meaning exists, and that the challenge of learning is to recognize patterns that seem to be hidden, such as the connections between different elements (Siemens, 2014).

Today, there are efforts to incorporate computational thinking in educational settings. One of the ones with the greatest impact due to the number of people involved and the time it has been running is CODE, a proposal developed in the United States, whose intention is to promote the teaching of programming by motivating students to study higher-level careers related to the subject (CODE, 2015).

This country faces problems caused by the exclusion in the school curriculum of knowledge related to computational sciences.

Finally, computational thinking should not be limited to the implementation of a certain subject within the curriculum, when the same computational thinking contributes to the construction of citizenship in complex and hyperconnected societies (Valverde, Fernández, & Garrido, 2015). Therefore, the tendency of education to incorporate ICT in its processes must consider that these technologies also can generate learning and knowledge: moving from ICT (Information and Communication Technologies) to TAC (Learning and Knowledge Technologies) (Moya, 2013).

2 METHOD DESCRIPTION

2.1 UX/IX

UX (User experience), is what a person perceives when interacting with a product or service

- Among the activities carried out by a UX Designer, are:
 - Research (with stakeholders, ethnographic, 1 to 1 interviews...)
 - Evaluation (heuristic evaluations, benchmarks, usability tests)
 - Data analysis (KPI's, metrics)
 - Information architecture

UI (User Interface), is the view that allows a user to interact effectively with a system. A UI Designer is responsible for visually creating the product interface so that it is consistent with the user experience. In addition, he creates interactive elements and makes sure they look good on all platforms (mobile, tablet, web). A UI Designer works closely with the product development or design team, providing style guides and usage patterns.

- Among the activities carried out by a UI Designer, are:
 - Interaction design (how the system responds)
 - Interaction guides (system states)
 - Design of elements (buttons, forms)
 - Visual design (icons, images)

- □ Style guides (color palettes, fonts)

2.2 SCRUM

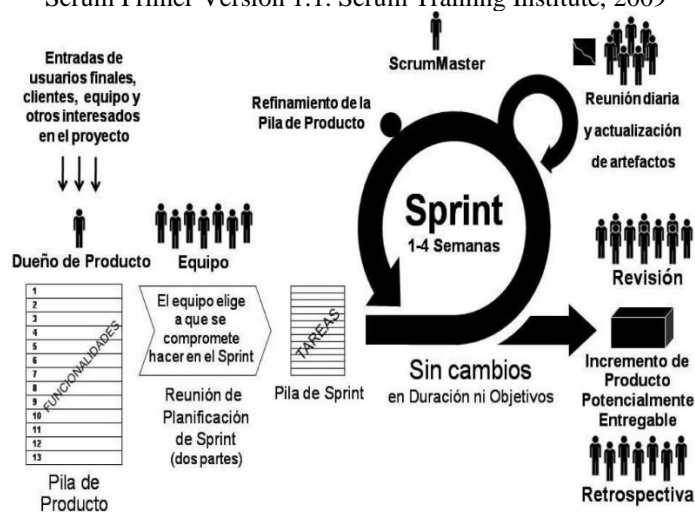
Marino, Sonia I.; Alfonzo, Pedro L. , 2014) SCRUM is an iterative and incremental framework for project development and is structured in work cycles called Sprints. These are iterations of 1 to 4 weeks, and they happen one after the other. At the beginning of each Sprint, the cross-functional team selects items (customer requirements) from a prioritized list. They commit to finishing the items at the end of the Sprint. During the Sprint you cannot change the chosen items. At the end of the Sprint, the team reviews it with the project stakeholders, showing them what they've built.

The team gets feedback and observations that can be incorporated into the next Sprint. Scrum puts the emphasis on products that work at the end of the Sprint, that is, they are done. As an agile method: It is an adaptive development mode, rather than predictive. It is people-oriented, rather than process-oriented. It uses the incremental build model based on iterations and revisions. The practices used by SCRUM to maintain agile control in the project are:

- i. Review of the iterations
- ii. Incremental development
- iii. Evolutionary development
- iv. Self-organization of the team
- v. Collaboration.

The main roles, artifacts, and events are summarized in Figure 1.

Figure 1. SCRUM Roles, Artifacts, and Major Events, P. Deemer, G. Benefield, C. Larman, and B. Vodde, Scrum Basics the Scrum Primer Version 1.1. Scrum Training Institute, 2009



Web Services

The Volley library or repository offers the following benefits:

- Automatic scheduling of network requests.
- Multiple simultaneous network connections.
- Transparent memory and disk caching with standard HTTP cache consistency.
- Support for request prioritization.
- API cancellation request. You can cancel a single request, or you can set blocks or scopes of requests to cancel.
- Ease of customization, eg for retry and rewind.
- A robust ordering that makes it easy to correctly populate your UI with data obtained asynchronously from the network.
- Debugging and tracing tools.

Volley excels at RPC (remote procedure calls) type operations used to populate a user interface, such as retrieving a search results page as structured data. It easily integrates with any protocol and comes out of the box with support for raw strings, images, and JSON. By providing built-in support for the functions you need, Volley frees you from writing boilerplate code and allows you to focus on your application-specific logic.

In order to work with Volley, the `build.gradle (Module.app)` dependency of Android Studio (development IDE) is added to the Gradle. The following lines of code are selected in blue as shown in figure 1. the library.(Android Developer, 2019)

3 FINAL COMMENTS

3.1 SUMMARY OF RESULTS

3.1.1 Drawer Navigation

The app contains a drop-down menu that allows access to all the thematic content and services in the process of teaching the Python programming language. In this menu you will find the "start" Figure 3 a) and welcome to the course with GNU licensing, this is important because by belonging to the free software category, professionals from different areas of knowledge can be included to contribute and make this app robust, Therefore, this speech is an invitation to join efforts in the construction and improvement of it. In the "course" section Figure 3 subsection b) we can find three levels of learning: easy, intermediate and advanced in order to classify and simplify the contents. The idea is to offer the user the experience of accessing a learning object in a locatable, accessible and available way so that the user is not limited by the time, place and people who can access the content. In the same idea, when a user

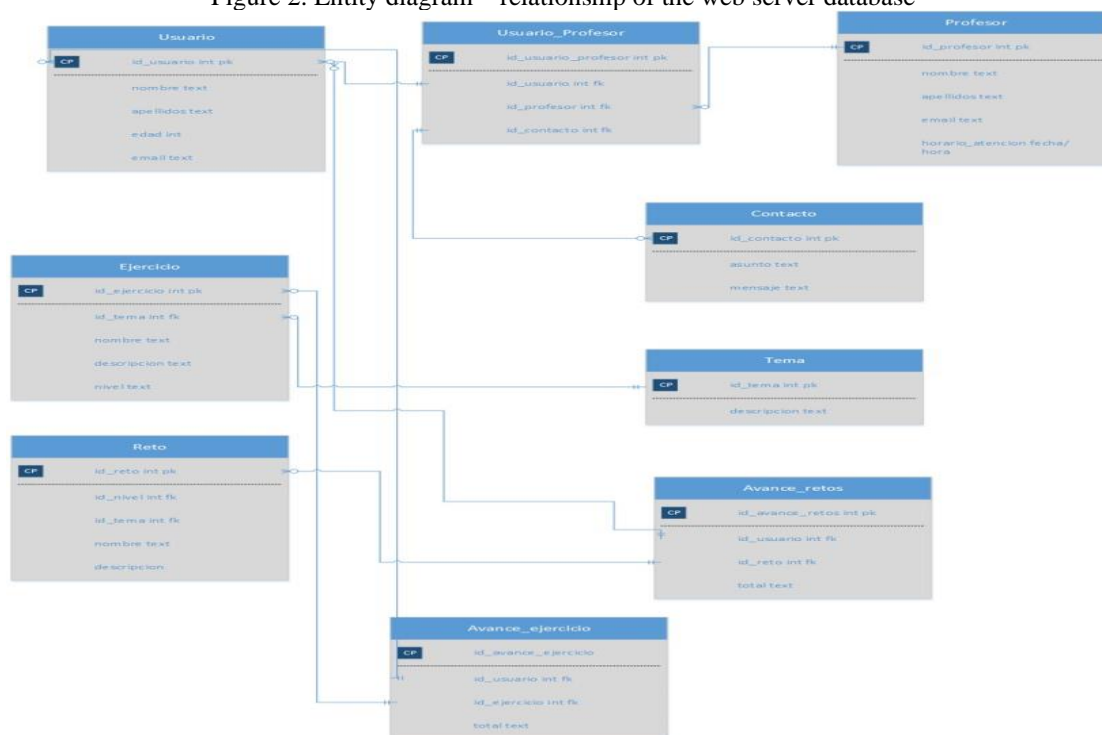
accesses a learning object repository, the app is capable of remembering the last lesson pending and automatically locating it in that sección.

3.1.2 Database Management Systems

SQLite is the default database management system in Android, and it is used in this project to store the user's profile records, the progress achieved for each lesson and their grade record for the exercises completed. Some thematic content is stored in a backup table to ensure visibility in situations with lack of server data access connectivity.

On the part of the server, Maria DB is used, a GNU license that allows the administration of the contents, the scheme is visualized in Figure 2.

Figure 2. Entity diagram – relationship of the web server database



3.1.3 Thematic Content

The course is designed in the philosophy of the pitch elevator with the idea that it is good to classify in maximum sections of "three" to offer simplicity of the application as seen in Figure 3 c).

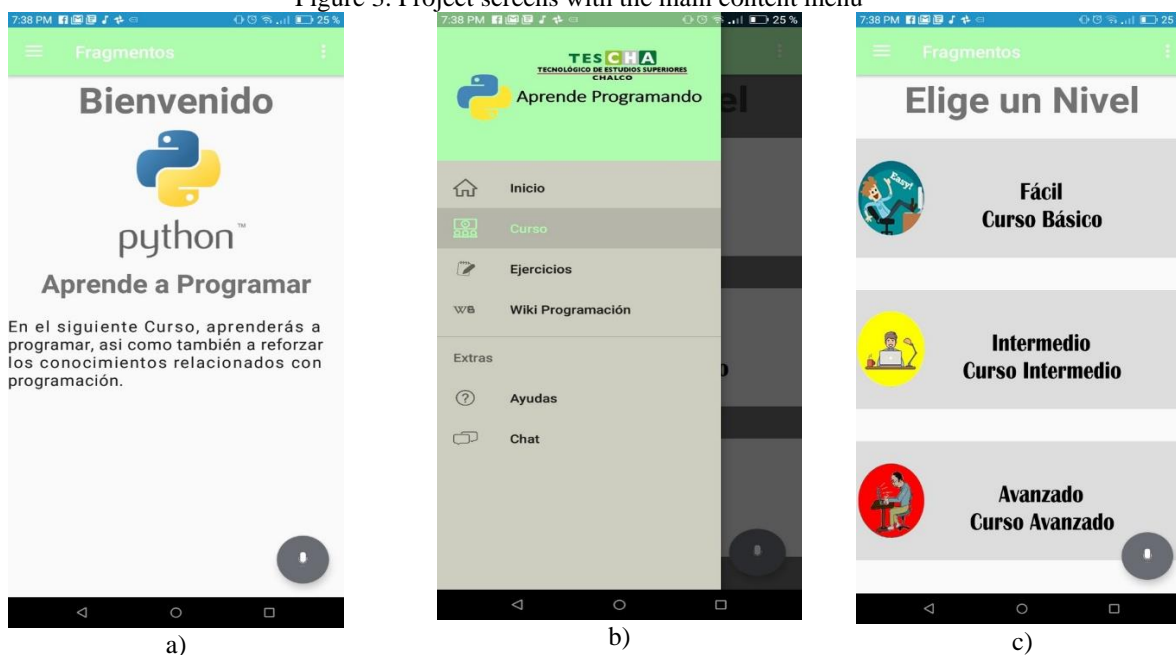
The app has a login on Google or Facebook social networks, which allows the user access and share their achievements on social networks, this is important since it allows the dissemination of the app, you can also get feedback from the comments made by the users. communities and carry out plans for the constant improvement of user experiences.

The application has lessons for different learning levels, offers programming examples and theoretical concepts of the Python programming language, where the self-taught student can review the lessons at any time. It is important to mention that the content of this learning object is manageable, which means that it can be changed by the instructor if desired, in order to update the content; This is very common in learning technologies, since programming languages regularly update the syntax of instructions, which causes confusion in students, so having a manageable system offers real-time updating of content. and keep the contents that the user observes up to date, for this it is important to use the aforementioned webservices, since through this technique of cross-platform data exchange between the Android app and a web system the information of the thematic content dynamically from the server to the mobile device. You can see an example of the contents in Figure 3 subsections d), e) and f).

3.1.4 Learning Test

En In Figure 4, in sections a) and b), the screens of the test are observed as an example of the evaluation carried out by the student to certify the theoretical knowledge in the process of learning the programming language in Python. The tests store the user data in the local SQLite database and when there is remote connectivity to the server in MariaDB, which allows the instructor to observe the student's performance and be able to provide feedback to the user in the learning objects such as chat and wiki for the benefit of the student by modifying the content by the instructors.

Figure 3. Project screens with the main content menu



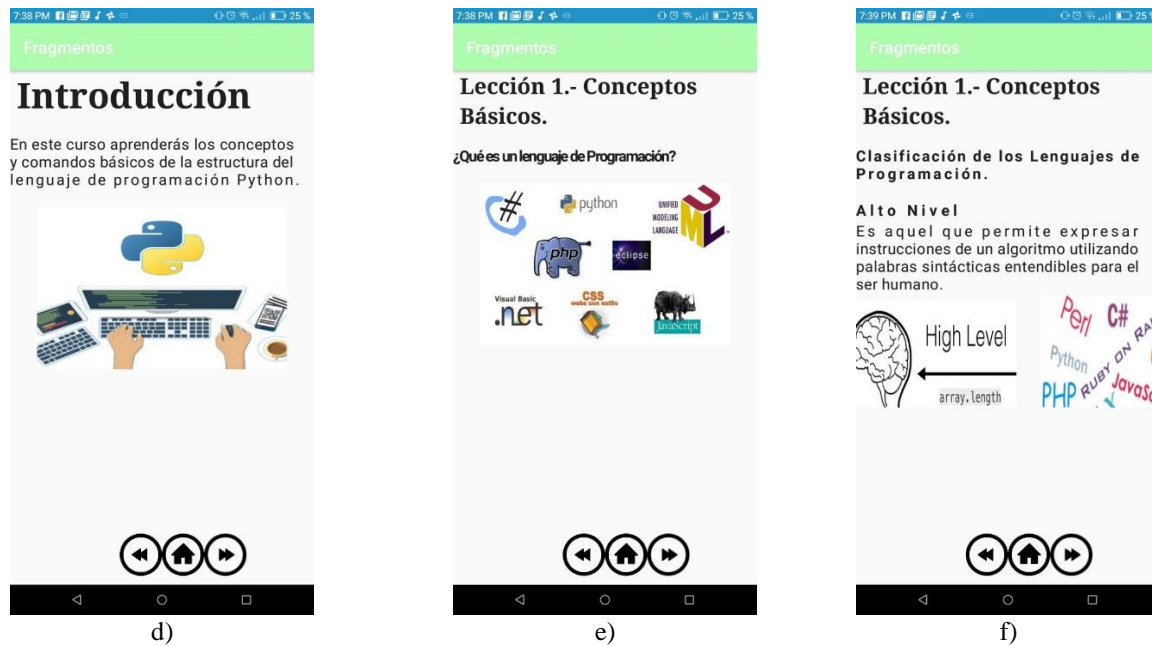
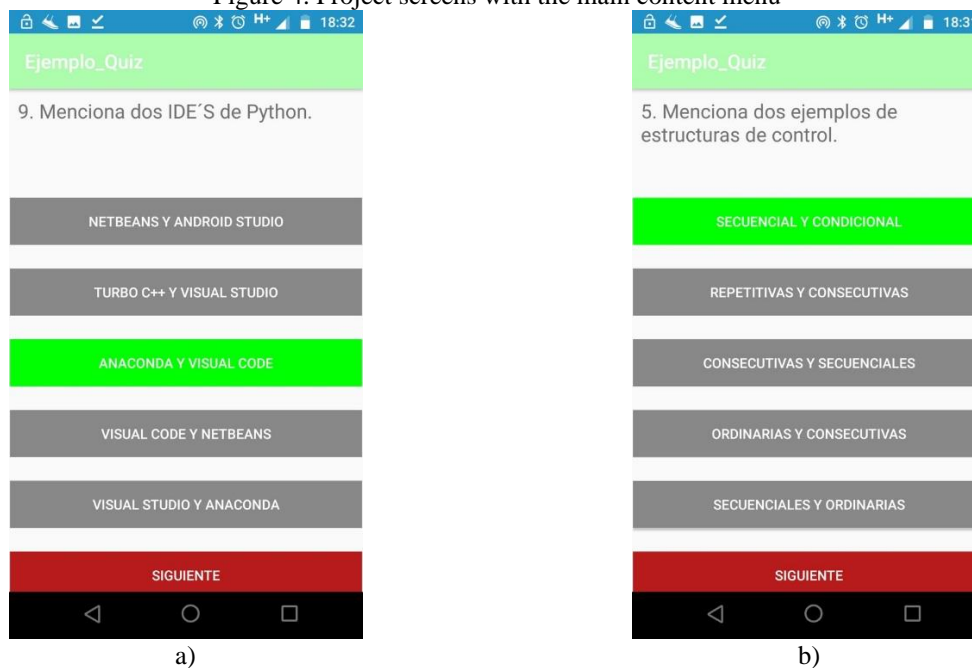


Figure 4. Project screens with the main content menu



4 CONCLUSIONS

The app is currently available and teaches the basic concepts of a programming structure in Python, it is currently in the process of implementation where the students of the 2019 school year will use the app and with the help of descriptive statistics the use in the process will be observed. of learning and to be able to evaluate its effectiveness. In accordance with the connectivist pedagogical process and Web 4.0, it is planned to continue with the project for the construction of an intelligent chat boot. Finally, the app was developed with the best software engineering practices with the idea of betting on new pedagogical currents such as the connectivist one.

RECOMMENDATIONS

This project was only developed for the Android operating system for reasons of saving the cost of licensing, although it is planned to develop it for the IOS platform to include most of the mobile devices that users occupy. The intention of this project is to extend it to other platforms, since its strength lies in its ability to adapt, since the information content of the content is manageable from the web server and loaded on the smartPhone.

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