International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 2 ǁ 2022 ǁ PP. 27-30

Playful educational software for learning and understanding first degree equations

Cinhtia González-Segura[1], Michel García-García[1], Neyfis Solís-Baas[1] & Sergio González-Segura[1]

[*1]*Factulty of Mathematics, University Autonomous of Yucatán, Yucatán, México*
Corresponding Author: michel.garcia@correo.uady.mx

Abstract
The aim of this paper is to describe the methodology for developing a playful educational software oriented towards learning and understanding first-degree equations, set with elements of the Mayan culture. The methodology is cascading and consists of three phases, which allow the completion of the first level of the software. The tests were carried out under a quantitative approach with high school students, considered potential users of the software. The results indicate that the software has a positive acceptance among users, who consider that the application contributes to a better understanding and learning of first-degree equations.

Keywords: *Mobile devices, educational software, mathematics learning, first degree equations.*

Date of Submission: 09-02-2022 Date of acceptance: 23-02-2022

I. INTRODUCTION

Since ancient times, education has been conceived as an important ally to improve the quality of life and, in turn, educational quality has been driven by technological innovations. In this sense, educational software constitutes an important didactic tool that can be used as a resource to reinforce teaching practice or to support students' self-learning. Didactic video games are a special type of educational software and have become an important element to motivate learning, mainly due to the interactive and multimedia elements that come together in an environment oriented towards goal achievement and improvement. of various kinds of challenges.

If we add to the above the great proliferation of mobile devices whose functionality has increased in tandem with the decrease in size and have been widely used during the COVID-19 pandemic, it is attractive to be able to have educational video games that favor the learning of certain abstract topics, especially mathematical topics, historically classified as difficult, both in their understanding and in their application to solve real problems.

Although there are various applications created to support certain mathematical topics, the vast majority are oriented to basic level learning [1], with high school and higher-level topics being less approached, even though the benefits of their implementation have been proven [2]. One of the topics whose understanding is extremely useful are the first-degree equations, which allow various problems to be represented in a mathematical language called equation, whose algebraic resolution allows obtaining answers that, when extrapolated to everyday language, manage to solve the real situations that arise. they originated.

Worldwide and particularly in the schools of the municipality of Tizimín, Yucatán, Mexico, it has been observed that there is a deficiency in mathematics [3] and the topic of solving first degree equations is no exception. Therefore, it would be desirable for students to have a tool that, in addition to helping them solve the equations, also helps them understand and carry out the exercises, to reinforce their mastery and understanding of the subject. One of the subjects in which students commonly have difficulties is algebra where high school students have certain difficulties, such as the conceptualization and understanding of linear equations, because they have not developed certain skills and abilities so that they can have the logic and algebraic thinking [4]. Segura [5] suggests the use of graphs to understand linear equations, to help understand the relationship between each point of the straight line and the linear equation, in this way you can see graphically and algebraically how the equations work. equations.

On the other hand, the Mayan culture has historically excelled in matters related to mathematics [6]; The Mayans were ahead of their time predicting various astronomical events, making architectural innovations that favor the comfort of the inhabitants of the Mayan house, discovering natural methods to preserve health, among others.

Considering the above, in this work it is proposed to develop a mobile application that promotes the Mayan culture and addresses the issue of first-degree equations. The application will revolve around the development of an educational video game with a Mayan setting, that is, it will incorporate elements such as objects, characters, legends, and sounds belonging to the Mayan culture. Thus, we will work with the inclusion of five important elements that are: video games, education, mathematics, mobile devices, and the Mayan culture, aimed at learning first-degree equations.

1.1.1 Methodological Section

The type of research presented is applied, aimed at contributing to the resolution of problems related to learning and understanding of first-degree equations. The approach is descriptive, approaching the development phases of the mobile application, playful and with a setting based on elements of the Mayan culture to solve and visualize first degree equations.

The developed software is based on the so-called waterfall software development methodology, which consists of several development phases. The Appinventor 2 environment has a graphical programming interface that works based on the concept of block assembly, allowing you to design and program the desired functionalities. The programming language used in App Inventor [7] is clearly inspired by and takes many graphical elements from Scratch 3 [8], which has been developed by MIT itself for more than eight years.

In the first phase of analysis, it was decided to use the AppInventor 2 interface [7], which allows developing software for mobile devices from an online graphical interface. App Inventor was developed by Google, but in August 2011 it was released as Free Software under the Apache 2.0 license and its development was transferred to the Massachusetts Institute of Technology (MIT). Figure 1 show App inventor development environment.

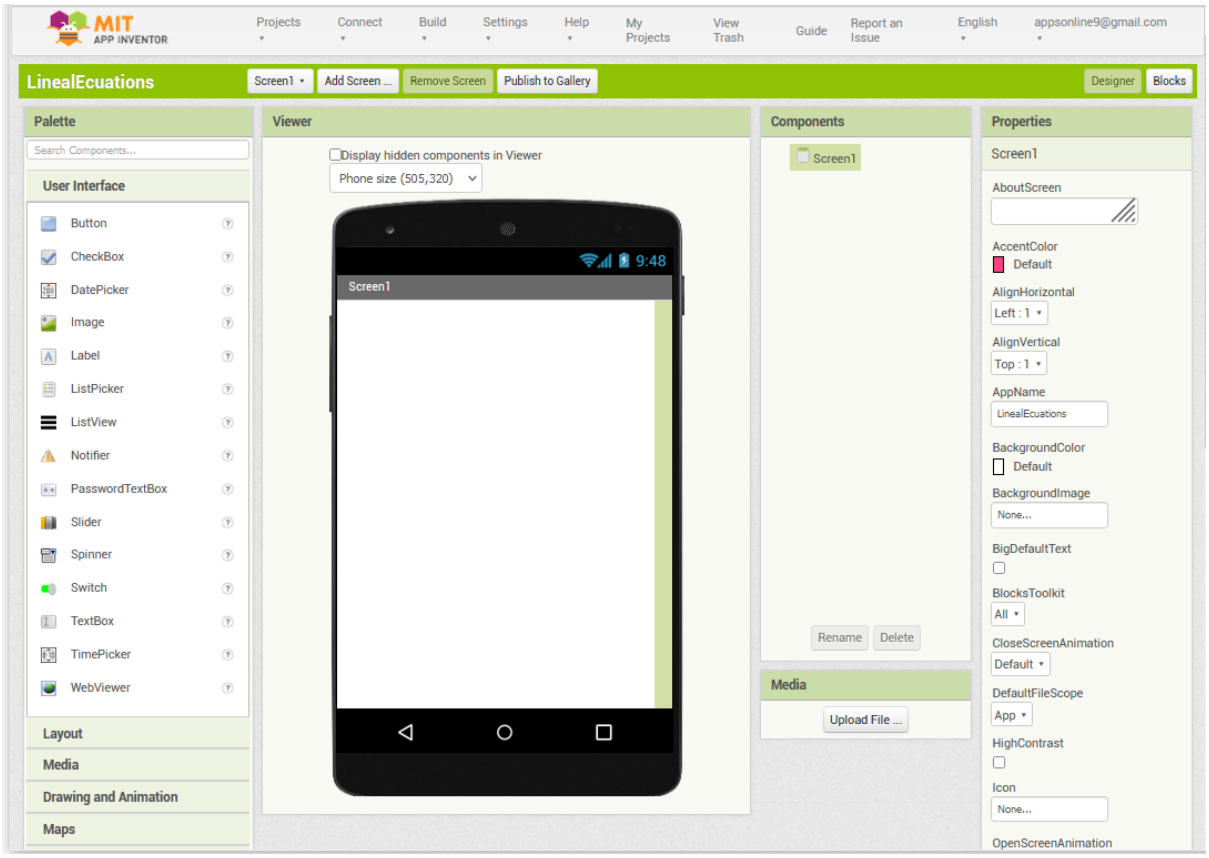

Figure 2: App inventor development environment.

The second phase of the methodology consists of the design of the software, from which a prototype of the application is generated. The images that are included are in vector and bitmap format since editing will allow the generation of animations in either of the two formats. Subsequently, the implementation of the video game is carried out in the development phase, which is implemented from the design document and the prototypes designed considering everything related to the requirements phase and the documentation collected and finally the development phase is carried out. maintenance. The game is related to the equations of the first degree, in AppInventor. The application tests are performed from an Android emulator installed on the computer

as well as a mobile phone and tablet with Android operating system, directly installing the MIT ai2 COMPANION application.

1.1.2 Development Interface

The application was developed with the tools available in AppInventor, creating a main menu with several levels, whose complexity increases as the game progresses. In order to test the application, the MIT ai2 COMPANION application was installed on an Android emulator and on a mobile phone, although it was also possible to perform the tests more quickly using an emulator that can be found on the same AppInventor software download page [7].

The video game has a graphic interface set with the pyramid of Chichen Itza and the column of a thousand warriors. When you start, the name of the application is shown and some images designed for the Mayan setting, with Mayan symbols and numerology. Items related to the Mayan ball game are also included. After the start screen, the continue button leads to another window that contains the same setting, but with the options: instructions, game, and exit, in instructions a brief explanation of the game is given, in the game option 3 levels are shown with which the game has. Figure 2 shows the main interface of the application.

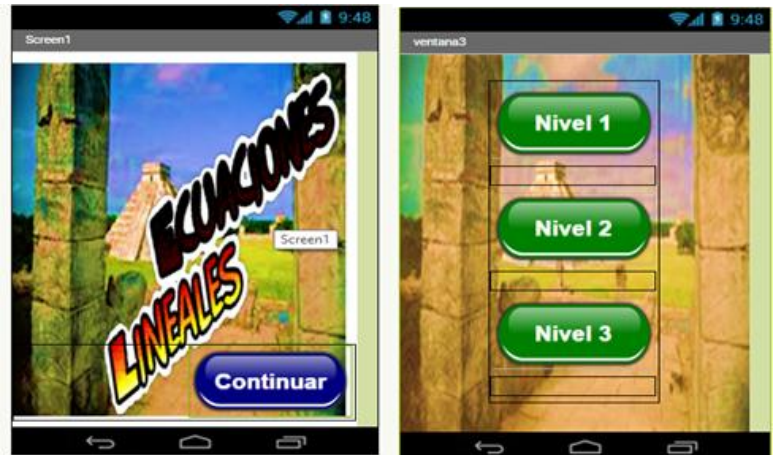

Figure 2: Main App interface.

1.2 Testing and analysis of the application

The application has been developed to the end of the first level, from which the evaluation was carried out through a usability and usefulness survey in which the opinion of potential users was also obtained, in order to have an idea of the tastes of the people who It is aimed. The sample consisted of 10 students from a high school located in the interior of the state of Yucatan, the ages of the participants range between 11 and 15 years. The instrument consisted of 9 items, oriented to structure, navigability, interactivity, accessibility, consistency, appearance, content organization, reliability, and content understanding. The structure of the application refers to the structural organization of the elements of the application, in terms of the operation of the application the elements were included: navigability, interactivity, accessibility and the consistency of the operation, which refers to the fact that the buttons that make up the game follow the same pattern, the appearance refers to the presentation of the content, the reliability of the content refers to the fact that the information presented does not contain errors and finally the comprehension of the content that is presented if it is easy to understand and memorize . Each item was scored by the students considering the options totally agree, agree, neutral, disagree and totally disagree with the application.

II. RESULT AND DISCUSSION

The results obtained when evaluating the first level of the developed application are as discussed below and are shown in Figure 3.

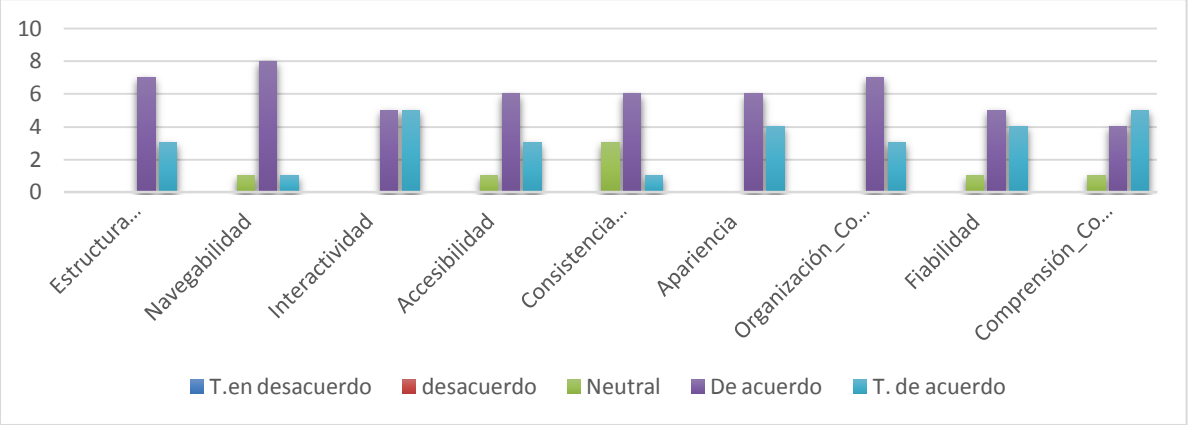

Figure 3: Evaluation of the developed application

In the graph shown in figure 2 the scores given by the students were positive, with only the categories appearing: neutral, agree and totally agree, while the options disagree or totally disagree were not used. The percentages of students who Strongly agree with respect to all the parameters mentioned above are 32% and the students who agree are 60% and 7.8% neutral, those who Strongly disagree and disagree are 0 % of students. The complexity of the proposed equation depends on how much they have learned the equations, which is already the initial work of teachers, the game will be a complement for them to learn and develop the ability to reason.

III. CONCLUSION

With the software developed, it is intended to help the understanding of systems of equations, providing the student with competitive techniques and tools that contribute to reinforcing the ability to reason and detail a problem, that is, it is sought that the student can use the application, generating their interest in solving the exercises by graphically visualizing the abstract information, or part of it.

Thus, a starting point is promoted to solve them with a more advanced degree of difficulty and strengthen their knowledge in an effective way, thus allowing schools far from our region the opportunity to use efficient technology that helps students with scarce resources obtain a level of study that competes with the high schools of the municipality of Tizimín, to promote a decent secondary education for the preparation and benefit of them.

As future work, it is planned that the application will also be evaluated by teachers to strengthen the student's knowledge in this way, creating a security that develops the skills of each one of those who make up the group. Likewise, the techniques presented in class will be tested, generating results that will help you differentiate which of the two teaching methods allow the student to advance better, according to their own possibilities and learning rhythms.

ACKNOWLEDGMENT

We thank the Autonomous University of Yucatán and the Faculty of Mathematics from all facilities in the accomplishment of this work.

REFERENCES

[1]. Castejón Mochón JF, Ríos Carrillo J, Sánchez Jiménez E, Maurandi López A. Didáctica de las matemáticas, software libre y desarrollo de recursos mediante Learnr y Shiny. EDUCATECONCIENCIA 2021;29:101–21.
[2]. Velastegui- López LE, Rodríguez Revelo E, Henríquez Antepara EJ, Campoverde Méndez MR, Ortiz Aguilar W. Softwares matemáticos en las carreras de ingeniería: una estrategia para su implementación. Rev Univ Soc 2021;13:320–7.
[3]. Africano Mejía BA. Estudio de los factores que influyen en el desinterés y la apatía de los estudiantes de básica primaria hacia las matemáticas. Tesis de licenciatura. Universidad Nacional Abierta y a Distancia UNAD, 2021.
[4]. Ramos Palacios LA, Guifarro M, Casas García LM. Dificultades en el aprendizaje del álgebra, un estudio con pruebas estandarizadas. Bol Educ Matemática 2021;35:1016–33.
[5]. Segura de Herrero SM. Sistemas de ecuaciones lineales: una secuencia didáctica. Rev Latinoam Investig En Matemática Educ RELIME 2004;7:49–78.
[6]. Galdámez M, Navas-López E. EL LEGADO DE LAS MATEMÁTICAS MAYAS Y LA ENSEÑANZA DE LA MATEMÁTICA 2018;31:1062.
[7]. Massachusetts Institute of Technology. MIT App Inventor. App Invent 2021. http://appinventor.mit.edu/.
[8]. Massachusetts Institute of Technology. Sitio web oficial de Scratch. Scratch 2022. https://scratch.mit.edu/.