

The use of educational software in the development of logic skills in higher education.



El uso de software educativo en el desarrollo de las destrezas lógicas en la educación superior

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Abstract

In certain occasions we wonder why students fail to solve certain types of logic problems and not in others, one of the causes of this fact is due to the lack of knowledge of some learning technique or because they have poor logical reasoning, which is reflected in the low academic performance of students. The population considered is the Information Technology Career of the Peninsula Santa Elena State University and as a sample two parallels are taken from the population that are linked to this study. The investigated topic is of vital importance in subjects where analysis and logical reasoning of problems are required, in addition, it directly influences the practice of basic thought processes.

Keywords: logical skills, higher education, problem solving.

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Resumen

En determinadas ocasiones nos preguntamos por qué los estudiantes fracasan al resolver cierto tipo de problemas de lógica y en otros no, una de las causas de este hecho se da por el desconocimiento de alguna técnica de aprendizaje o porque poseen escaso razonamiento lógico, lo que se refleja en el bajo rendimiento académico de los estudiantes. La población que se considera es la Carrera de Tecnologías de la Información de la Universidad Estatal Península de Santa Elena y como muestra se toman dos paralelos de la población que están vinculados a este estudio. El tema investigado es de vital importancia en asignaturas donde se requiere el análisis y el razonamiento lógico de problemas, además influye directamente en la práctica de los procesos básicos del pensamiento.

Palabras clave: destrezas lógicas, educación superior, resolución de problemas.

Introduction

Research in the field of education is considered of vital importance, a deeper approach to students' answers. We ask why students fail in solving certain types of logic problems and fail in others, what are the factors that play an important role in this area. We also reflected on the types of problems, their unknowns and the way students understand them. While the students were solving some logic problems, we observed different factors that can favor or hinder the solving process, among which I can cite the fact that some questions were not fully understood, because there is not an adequate analysis. Based on this concern, the main objective of this work is to rethink the logical skills of students in the teaching-learning process, and by ramification, the development of problems. In order to improve the limited logical skills, the use of educational software is proposed, which will allow in a certain way to improve this existing weakness in the students. This software includes one of the factors considered key in the development of current competencies, the ability to solve the proposed problems.

(M.Edgar, 2014) states that "The underlying assumption is that the ability to solve problems is a special type of engineering education, which results from developing logical-interpretative and abstractive

ability in students. On the other hand, there are different ways to solve problems and each requires different types of skills and abilities in logic and abstraction.". In the framework of the project on Definition and Selection of Key Competencies, they place them in the corresponding category of "Key Competencies". (Cooperation, 2005) In the framework of the project on Definition and Selection of Key Competencies, they are placed in the category corresponding to the use of interactive tools, which refers to the effective use of spoken and written language, computer skills and mathematical skills in multiple situations. Finally, logical skills are part of the essential tools for the future professional to perform well in society, in the workplace, and to be able to participate in an effective dialogue with others.

The method to be used adopts different methodological alignments, ranging from specific processes to the use of some statistical techniques.

The present work contemplates the existing difficulties in the context where the research is developed, the formulation of the problem, the objectives and the justification of the research; besides considering the theory that sustains this research project, the same that provides a deepening of the different representations and explanatory guidelines of the logical skills, the process of problem solving seen from many theoretical perspectives, and what is an educational software.

It also includes the methodology to be used in the research, which includes the modality and types of research, the population and the sample, tools and procedures of the research that are an essential part and will provide a solution to each of the inadequacies found in this research. It also contains analysis and interpretation of results, with discussion of these, ending with the conclusions reached with this study and recommendations.

The Peninsula Santa Elena State University is a Public Institution of Higher Education, whose purpose is focused on four functions: professional training in the different branches of knowledge, scientific research that seeks knowledge and solutions to the problems of the province and the country, the link with its community for the dissemination and development of projects that transfer the university work in its extension and participates in increasing its social responsibility, and administrative management

that allows the optimal use of its resources to carry out its training work.

This career is based on the study of the contexts of the exact, natural and applied sciences from a theoretical-methodological, epistemological, holistic and systemic vision, for the transformation of the productive matrix within the framework of organizational management, with the use and application of algorithmic techniques, numerical modeling and the general theory of systems, which generate technological solutions.

In the mentioned career, subjects related to logic problems are taught; in the development of this one, students find the content complicated, which hinders their learning and subsequent approval of the subject. While it is true that the subject is based on programming processes in languages according to each academic year, it is affected by some factors among which predominates the lack of any didactic resource to improve the logical skills of students. In the labor field of an educator, regardless of the area in which he/she works, some problems arise that are subject to his/her profession, which usually are not frequent and become routine, and are not considered with the seriousness of the case, for example, the low level of development of logical skills in students, this aspect is totally neglected and leads to many students of various educational levels.

The student in many occasions finds himself in a series of problems such as absences to classes, shortage of reference books, insensitive teachers, old teaching methods, lack of resources in the classroom for learning, inappropriate classrooms for teaching-learning; In addition to this, there are also personal problems, for example, lack of motivation in their family environment, failures that make them feel frustrated, low academic performance, which causes them to get bad grades and other situations that induce the person to indiscipline, which hinders their intellectual and academic progress.

These factors mentioned above influence the students of the Information Technology Career of the Peninsula Santa Elena State University, so we see the need to propose the use and development of computer didactic resources for the subject Fundamentals of Programming, since students have insufficient logical skills in the aforementioned subject, and this would be a methodological help for them to improve some aspects of their daily life, such as feeling self-

confident, motivated, eager to work and above all seeing that the subject is not difficult to cope with, emphasizing that to improve logical skills, many other variables external to the student intervene, such as the quality of teaching by the teacher, the classroom environment, family, educational program, etc.

This research is important because it will help in the problem of insufficient logical skills of students in the subject of logical reasoning, taking as a resource an educational software that will allow to improve the analysis in the students of the Information Technology Career of the Peninsula State University of Santa Elena and thus improve their academic performance and at the same time guarantee a quality education to new students.

Through the analysis of the theoretical approaches that will facilitate the descriptions of assumptions and explanation of the variables, the present work contributes to a great extent to improve the logical skills in the resolution of the problems posed.

The research is based on several theoretical foundations, which are essential for the understanding of this research article and are detailed below.

(Castaño, 2004) defines skills as "The ability of a person to perform an activity, to develop in his or her family and social environment, or to solve problems autonomously" (p. 37).

The Encyclopedic Dictionary of Education defines skills as "the ability of an individual to execute a perceptual, motor, manual, intellectual, or social activity, among others." (p. 127)

Skills are understood as practices, arising from the individual's capacity that, converted into competencies, have achieved an immediate level of development with efficiency and effectiveness. Basically, the skill is where a series of elements or a solid set guided by what the mind imagines, everything that unfolds in us through sensations and their definition, is revealed.

(González, 2011) mentions that "Logical skills are: the ability to reason adequately and effectively. This includes sensitivity to logical schemes and relationships, statements and propositions (if-then, cause-effect), functions and abstractions. The types of processes used in the service of this skill include: categorization, classification, inference, generalization, computation, and hypothesis demonstration." (p,1)

Logical skills are capabilities developed by the human being and their main function is to make inferences from a given situation and reach a logical conclusion, for this it is required to carry out a sequential process such as setting an objective, identify the premises, analyze them and reach a solution, this solution must be contrasted with the correct output of information. Some authors who give their point of view about logical skills, and indicate:

According to Dr. C. L. Pérez, logical or thinking ability is understood as the content of those actions of the intellect that are developed in the process of knowledge, which are carried out through logical operations and must be mastered throughout the teaching-educational process.

According to S. L. Rubinstein, logical abilities are the content of the actions of cognitive activity determined by the logical relations that exist between the starting point of the cognitive process and its result.

According to the considerations made by H. Fuentes and others, based on the classification given by N. F. Talízina and C. Álvarez, these are expressed in three groups:

- 1- Specific skills, specific to the sciences, professions or technologies that are the object of study or work.
- 2- Logical or intellectual skills, which contribute to the assimilation of the content of the disciplines and support logical thinking, both in learning and in life.
- 3- Communication skills inherent to the teaching process, which are essential for its development.

The use of logical reasoning contains mathematical calculations, ability to solve mathematical problems and find a correct solution, ability to understand relationships between mathematics and real life, to handle concrete and abstract concepts and to be able to propose hypotheses.

Logical skills are skills that the subject has to use digits, basic operations, symbols, signs and ways of their inferences, in order to be able to understand and express their reasoning and solve problems that arise in their daily life, as well as in the school environment.

(Gagné,1991), states that "a problem consists of a goal state, an initial state and the set of all possible resolution paths leading to the goal from the initial state".(p. 45).

Hayes, cited by (Hardy and Jackson, 2001), "defined a problem as the empty space that separates us from the initial state and the goal state".

(Puente, 2003), states that "a problem exists when a person is faced with a situation that requires a plan and action to change the existing, undesired state to another, ideal state". (p. 35)

(Ministry of Education, 2006), a problem is a situation that hinders the achievement of some goal, so it is necessary to find the means to solve it, mitigating or canceling its effects.

With the aforementioned definitions, I define a problem as the situation that hinders the progress of a reality and that it is necessary to develop a plan and an action to reach the desired goal in order to change the state from problem to solution.

(Sanchez,1999) defines: "The concept of Educational Software as any computer program whose structural and functional characteristics support the process of teaching, learning and administration".

(Lamas, 2000) defines: "As a computer application that, supported by a well-defined pedagogical strategy, directly supports the teaching-learning process, constituting an effective instrument for the educational development of the man of the next century" (Lamas, 2000).

Educational software is considered as the set of useful computer resources in the teaching-learning process, which implies that technology is incorporated into the academic process of students to motivate learning in problem solving.

(Ricardo A. Baeza Yates, 1993) expresses in his book that if "We examine visual and collaborative tools that can be useful in the understanding of software engineering (SE). We analyze the experience of the use and impact of these tools in education, proposing new ways of using them and future research directions."

The use of educational software by teachers: Enriches the field of Pedagogy by incorporating technology that revolutionizes teaching - learning, also allows to control the tasks individually or collectively, allows to raise the educational quality.

The use given by the student to the educational software is of vital importance since nowadays they require interactive resources that facilitate and motivate learning, especially in subjects related to problem solving.

When we decide to incorporate software in our classroom to develop teaching-learning activities, we are choosing different strategies directly or indirectly. That is, we can intend, for example, that students exercise and practice, develop problem-solving activities, which in turn can be planned individually or in groups.

The production of educational software involves a certain degree of complexity since decisions must be made regarding content, teaching strategies and the appropriate design to facilitate the learning process for the user or student.

The use of educational software for the improvement of logical skills is based on one of the learning theories which is the constructivist one, emphasizing also Jean Piaget's and Educational Technology.

They specify the learning environment necessary for the construction of educational software. Constructivism emphasizes the learning process rather than the acquisition of the products. This theory is further expanded below, as it has been used in the research. (Morin, 2021) "The education of the future will have to be a first and universal education, centered on the human condition, with a re-linking of knowledge resulting from integrating the invaluable contribution of the humanities, not only philosophy and history, but also literature, poetry, the arts..." (p, 23). Unity in the different humanities is very important; for quality education to exist, it is necessary to integrate scholarship and for students and teachers to feel committed to completing their knowledge.

(P. Hernández, 1998), explains that "constructivism starts from the student's reality, previous knowledge and beliefs". Constructivism promotes more open learning strategies, where the results vary depending on each individual, and the designer of constructivist environments must design materials and strategies that facilitate learning.

These theories establish that students are active agents who seek and construct knowledge with a purpose, within a representative context, which generates changes in the role of the teacher as a transmitter of knowledge, who is considered the main source of information, expert in content and source of all the answers, who controls and directs all aspects of learning, in the same way the student is a collaborator, a participant responsible for his own learning, shares knowledge and sometimes participates as an expert.

(Piaget, 1982) has a basic vision about how people perceive the external nature through the senses, taking into account the evolutionary aspect up to the adaptation to the place where it develops. Then for the progress of logical skills it is necessary to use the senses, this process will serve for the individual to go through the part of adaptation to the workplace and the organization of knowledge.

Piaget affirms that the development of intelligence is achieved by the adaptation of the person to the environment, considering adaptation as an instance in which information enters and another of organization in which this information is structured.

Although Piaget was not in favor of the use of computers in education, his ideas influenced future work of other authors related to the incorporation of computers in education, which will be applied to the development of educational software for the improvement of logical skills in problem solving.

Another contemporary pedagogical trend is Educational Technology, which is the process of incorporating technology in the classroom, this helps teachers to reinforce their didactics and educational practice or transform it. The creation of Educational Technology is attributed to Skinner, a Harvard professor, in 1954, in his context this pedagogical trend follows a stimulus-response scheme, which is nothing more than the consequence of the incessant search for finding in the teaching-learning process; a scientific support that makes possible the starting point of the use of technical resources - suitable materials for learning, with the help of elements of biological nature, characterized by the central nervous subsystem of the human being, with which the mentioned resources can interact giving as a result a new knowledge acquired in the most efficient way possible.

The approach of this trend proposes as an objective that the student feels motivated and internalizes already established contents, which will then have to be verified in the application of educational software. In this theory, educational software serves as an aid in the teaching-learning process, as it helps the student to expand the information, perform practical activities, exchange information with the environment, perform exercises or establish an interactive relationship.

Materials and methods

In this sense, the research presented here is of a Diagnostic, Field, Descriptive-Explanatory type.

It is diagnostic because although there are studies of this type, there are not many findings on this subject in the educational field; therefore, it was necessary to seek relevant information through a study, detailing the problems that gave rise to this research.

It is field research because the information was obtained directly from the people involved in this research, that is to say, it reached the place of the facts, thus evidencing the reciprocity between cause and effect. Within the field research is the observation stage, which was used to locate the problem, the decline in terms of logical skills in the teaching-learning process, which hinders the progress of the contents.

It is descriptive since it allows comparisons to be made between two or more phenomena, which implies being aware of situations on the use of logical skills in the academic performance of students, promoting an accurate description of the activities. The variables and the relationship between them are identified by means of a qualitative-quantitative analysis in which the results are analyzed with the purpose of elaborating generalizations that contribute to understanding.

It is Explanatory since the characteristics of this type of study emanate from an abundant theoretical body; they identify the causal relationships, in addition to using knowledge from other studies such as: books, graduate theses, publications on the Internet.

The universe or population of the present investigation will be constituted by teachers, students and directors of the Information Technology Career, of the Faculty of Systems and Telecommunications of the UPSE. Undoubtedly, the selection of the population is a fundamental pillar within the research process since it leads to delimit the scope of the study by specifying a population and selecting a sample.

The number of students that attend this career, attend the university from different parts of the province of Santa Elena, most of them are of medium-low social status, between the ages of 18 to 35 years, who participate in the virtual and face-to-face mode. The population to be taken into account in the study is detailed below:

Table 1. Research *population*

POPULATION	Number
Management	1
Teaching Staff	
Students	
Total	283

(Alvarez, 2011) defines the sample as "a set of objects and subjects from a population, i.e. a subgroup of the population, when this is defined as a set of elements that meet certain specifications" (p. 124). According to the author I say that the sample is a part of the population that is selected to carry out the study. A sample must be representative, that is, it must reflect the essential characteristics of the population to be studied.

As mentioned by the author, the sample is a small part of the research population and to establish the needs of students and teachers, a sample will be taken by applying the total population of students, teachers and management.

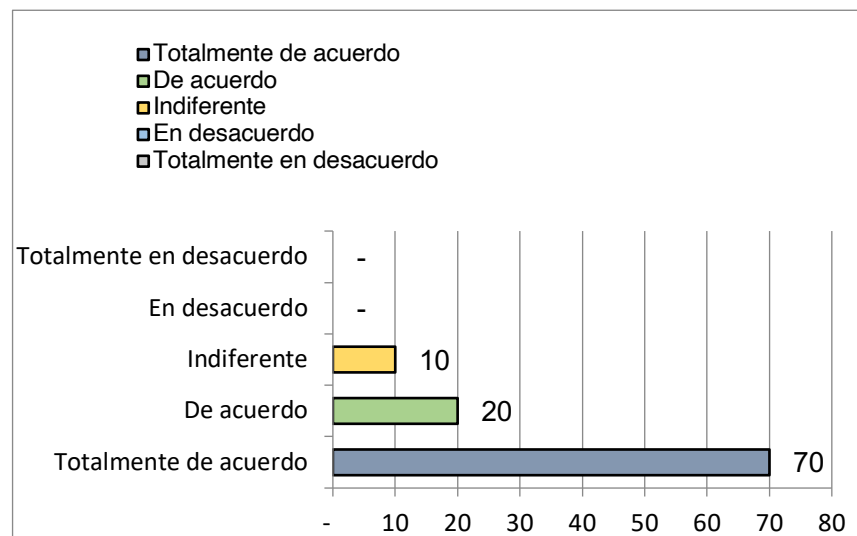
Among the research instruments used were questionnaires for students and teachers, which made it possible to diagnose and obtain information objectively from the group of people to be considered in the research. Another instrument used was the survey, where the Likert scale was used.

Results

After completing the data processing stage in this study, the data were coded and transformed into numerical symbols using a technological application.

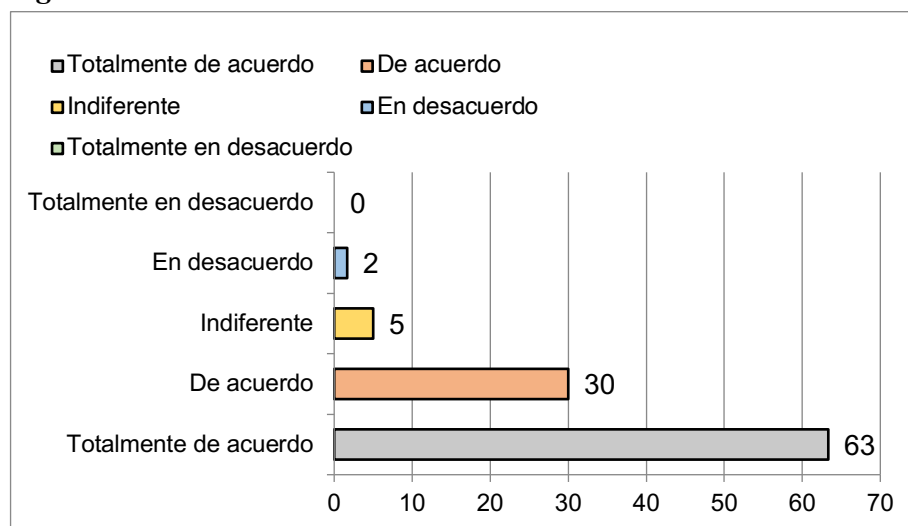
The surveys in this research allowed the collection of the necessary information for the data to be tabulated and thus verify the questions posed, the sample satisfies the validity and reliability of the research.

Figure 1. Creation and use of educational software teachers



The teachers surveyed stated that 90% agreed with the creation and use of educational software, as they consider it important for students to improve their logical skills, which allows them to manage daily classes in a friendly and interactive way.

Figure 2. Creation and use of educational software students



93% of the respondents stated that the creation and use of educational software will help to improve their logical skills, because through user-computer interaction, learning will become interesting and attractive. Students will have the interest to learn more and will be provided with the right techniques to get the desired results.

The results that are triggered based on the research are the following: The teaching-learning process would be complemented with the use of an educational software to improve the logical skills in the students of the Information Technologies Career of the Peninsula State University of Santa Elena, in the subject of Fundamentals of Programming Telecommunications, this indicates obtaining 90% in the survey to teachers and 93% in the survey to students, who state that they agree with the proposal made.

90% of the teachers expressed that they strongly agree with the use of educational software that serves as a support tool in the professional training of students and at the same time improves the quality of learning through access to didactic resources that allow the exchange of information.

Discussion

Nowadays the new information and communication technologies are the alternative to cohesive an optimal learning of the sciences of knowledge and are the tools that students use in their daily life, but

without a correct application, for such reason the modern teacher must direct in a coherent way the use of these tools to get to change the mentality of the student on the use of these wonderful applications.

The application of educational software will have a highly positive impact on education, specifically in the area of computer science, since it will strengthen the teacher's work at all times and will help the student with a much more attractive, interactive and dynamic class that will motivate him/her 100% to learn.

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