

Didactic situations mediated by tic for the representation of numerical sets

Situaciones didácticas mediadas por tic para la representación de conjuntos numéricos

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Abstract

The present research seeks to determine the importance of the use of ICT in the representation of numerical sets, for which a sample of eighth grade students in parallel A and B of the Minerva School of Basic Education was considered, in order to verify the proposed objectives, a test was applied to both groups of students and it was possible to conclude that: within the Control Group, to whom a traditional class was given, more than 50% did not master the subject in its entirety; while the Experimental Group with a class mediated by ICT and didactic situations, was able to prove that this tool allows learners to master the content, specifically in rational numbers. Therefore, the design of the guide was carried out, which will benefit students and in turn will be a working tool for teachers in the area of mathematics.

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Keywords: Didactic Situations, ICT, Numerical Sets, Didactic Guide.

Resumen

En la presente investigación se trata de determinar la importancia del uso de las TIC en la representación de conjuntos numéricos, para lo cual se consideró como muestra a Octavo año de básico paralelos A y B de la Escuela de Educación Básica Minerva, en busca de verificar los objetivos planteados se aplicó un test a ambos grupos de estudiantes y con ellos se pudo concluir que: dentro del Grupo de Control, a quienes se les impartió una clase tradicional, más del 50% no dominaban el tema en su totalidad; mientras que el Grupo experimental con una clase mediada por TIC y situaciones didácticas, logró comprobar que esta herramienta permite a los aprendices dominar el contenido, específicamente en números racionales. Por ello, se llevó a cabo el diseño de la guía, misma que beneficiará a los estudiantes y a su vez será una herramienta de trabajo para los docentes del área de matemáticas.

Palabras clave: Situaciones didácticas, TIC, Conjuntos Numéricos, Guía Didáctica.

Introduction

The different online methodological strategies applied by teachers have varied during this time. The teaching of didactics in Mathematics has been in constant innovation, as well as its learning methodology, which at the same time suggests a series of rules for the resolution or representation of exercises, such as numerical sets. Undoubtedly, during the last five years we have been able to appreciate a great amount of technological advances worldwide in the educational field, although they are little used in our country; because in these 18 months of pandemic, the whole planet has been forced to adopt and implement the online modality in the educational classrooms, but not all educators were prepared for it.

According to reports of the United Nations Children's Fund (UNICEF, 2021), one year after the health emergency, progress in education has unfortunately regressed in most of the world and this is also evident in Ecuador, since a survey conducted by the same entity reveals that 7 out of 10 students in seventh grade of basic education had an unsatisfactory or elementary level in the subjects

of Language and Literature and Mathematics; while, since the beginning of the pandemic, 6 out of 10 students consider that they are learning less. Meanwhile, around 15% of students stated that they have not had regular contact with their teachers.

For this reason, it is relevant that educators, as main guides, can use different methodological strategies in the teaching/learning process of mathematics and that they are closely related to ICT. In addition, educational curriculum strategies such as problem-based learning, collaborative learning and project-based learning should be taken into account, since they pursue a single objective, that is, that students build knowledge with the help of a mediator.

For his part Cabanillas, 2017, in his thesis mentions that: "The student learns by adapting to an environment that is a factor of contradictions, difficulties and imbalances, a bit like human society does. This knowledge, the fruit of the student's adaptation, manifests itself through new responses, which are the mark of learning".

Then, seeing each of the characteristics and surprising factors that the teacher must present in his activities, a wide range of cognitivist theories of mathematics opens up, such as the one proposed by Guy Brousseau, who postulates the Didactic Situations as a means to be raised within the methodology and that consequently will produce that students achieve meaningful learning.

Thus, the following question arises: How do ICT-mediated didactic situations affect the representation of numerical sets in students in the eighth year of higher basic education at the Minerva School of Basic Education, school year 2021 - 2022?


In view of the above, we propose to analyze the application of didactic situations mediated by ICT for the representation of numerical sets.

Materials and methods

Within this work we made use of bibliographic research, since through it we were able to analyze the variables, on the one hand we obtained the characteristics of Guy Brousseau's theory and on the other hand each one of the sets of numbers that we intended to represent; because once the information was registered and understood, we would proceed to the elaboration of the didactic situations.

The didactic situations are presented below with reference to their phases:

Table 1. Didactic Situations

DIDACTIC SITUATION
<p>Integers</p> <p>Imagine that you are traveling in space and suddenly in the galaxy you see floating a series of positive and negative major numbers.</p> <ul style="list-style-type: none"> - These numbers do not know where to be located and just float and float all over the galaxy. - In the following table we are asked to order them from smallest to largest, and then represent them in the Geogebra program by plotting them on a number line. - Use the numbers shown in the images and proceed to solve, as mentioned in the previous item above. <p>Link to access the Geogebra program: https://www.geogebra.org/classic?lang=es</p> <div style="display: flex; align-items: center;">  <div style="border: 1px solid black; width: 200px; height: 150px; margin-left: 20px;"></div> </div>
<p>Natural Numbers</p> <p>Open the following link, in which you will find a liveworksheets tab of integers: https://es.liveworksheets.com/worksheets/es/Matem%C3%A1ticas/N%C3%BAmoros naturales/N%C3%BAmoros de cinco cifras sz1237318kb</p>

1. Now we are asked to represent all the ordered numbers of the third activity of the liveworksheets sheet, using the Geogebra program. <https://www.geogebra.org/classic?lang=es>

2. And if we now use our imagination... Imagine you want to reach the top floor of a large building and you are standing on step 1 of the stairs, about to climb to the top floor, first you climbed 20 steps, rested a few seconds and continued climbing 25 more steps, you rested again and continued climbing 50 more steps, you rested again and finally you climbed 35 more steps. How many steps did you manage to climb in the end?

- Use Paint and then paste the screenshot here:



Rational Numbers

1. Download the file provided in the following link: https://docs.google.com/presentation/d/1D3KkefNBDkPbGrWko9_3DlEoi5apmkGg/edit?usp=sharing&oid=105244651347006951304&rtpof=true&sd=true

2. You are asked to solve the following problems and point out the alternative you consider correct, for them work on the slides using the equation tool.

3. Take a screenshot when you solve the whole exercise and come up with the result and paste it here.



4. And if once the problems have been solved, we order the fractions of the income used in the two problems, how will we order from smallest to largest?

Orden de menor a mayor del ítem 1:



Orden de menor a mayor del ítem 2:

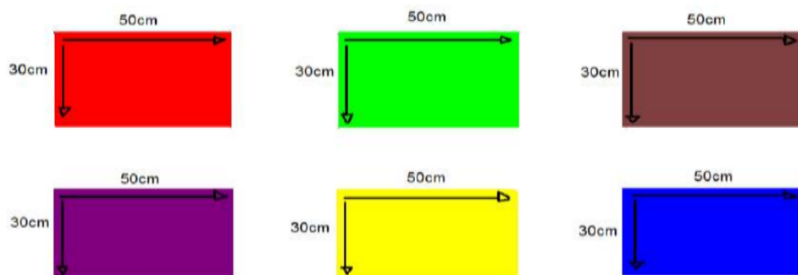


5. Using the Geogebra program: <https://www.geogebra.org/classic?lang=es> represent the fractions of the two problems, and then take a screenshot of the program and paste it here.



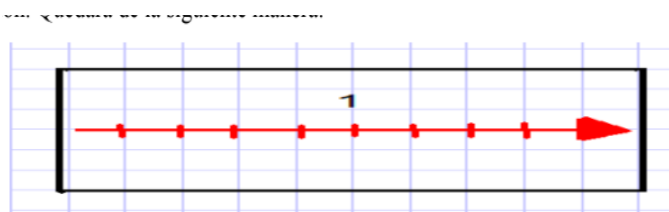
Rational Numbers

1. Teaching strategy
 - a. On the google website, download the Geoenzo program: <https://geoenzo.softonic.com/descargar>
 - b. Once the program is installed, you will be asked to draw 6 cardboard formats (it can be of different colors), with the virtual geometric game you will have to measure the length and width of each cardboard.
 - c. For the length each format should be 50cm and for the width 30cm. As shown in the following example:

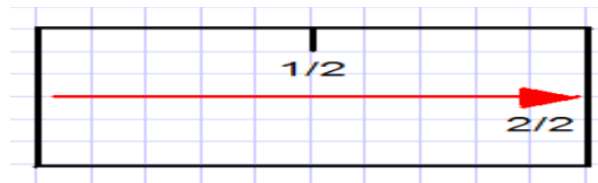


2. On the blackboard, once the first cardboard format is drawn, write on it the number 1 (which will represent a unit) and draw a number line on it.

Solution: It will be as follows.



3. Now on the digital whiteboard, let's divide the second cardboard in $\frac{1}{2}$, taking as a reference that it should measure 25cm when split in half, in the first part we will write $\frac{1}{2}$ and in the second half $\frac{2}{2}$.



Now it's your turn.

4. The third cardboard we divide into 4 equal parts, of 12.50 cm each, in the first part we write $\frac{1}{4}$, in the second $\frac{2}{4}$, in the third $\frac{3}{4}$ and in the fourth $\frac{4}{4}$. How would you do it?

Set Screenshot:



5. Divide the fourth piece of cardboard into 5 equal parts, 10 cm each, in the first part we write $\frac{1}{5}$, in the second part $\frac{2}{5}$, in the third part $\frac{3}{5}$, in the fourth part $\frac{4}{5}$, and in the fifth $\frac{5}{5}$. How would you do it?



6. Take all the cardboard formats as a reference and in work teams discuss and draw your own conclusions.

Source: Revised bibliography

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Thus, the research design becomes quasi-experimental with two groups belonging to the eighth year of the Minerva School of Basic Education, specifying that parallel "A" would become the control group made up of 22 students who will be taught a traditional class,

while "B" would be established as the experimental group, also with 22 members, who will receive the content through didactic situations. Table 2.

Table 2. *Variables Scheme*

Experim ental group	O 1
Control group	O 2

x: Didactic situations mediated by ICTs

O1: Representation of numerical sets

O2: Representation of numerical sets

On the other hand, since the data recording is in numerical form, the study takes a quantitative approach, with which descriptive statistics will be used for the tabulation and graphic representation of results, as well as inferential statistics, since the Student's t-test for independent samples will be used.

It is important to mention that the results were based on the tests applied directly to the sample, which consisted of a 10-question questionnaire.

Based on the objective of this quasi-experimental study, it is estimated that:

- Null hypothesis (H0): the use of ICT and didactic situations do not influence the representation of numerical sets.
- Alternative hypothesis (H1): the use of ICT and didactic situations influence the representation of numerical sets.

Results

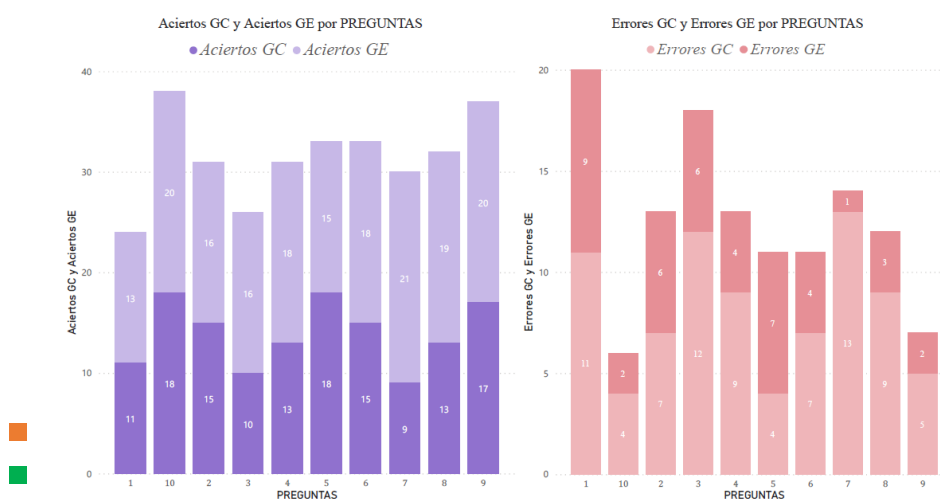
Calculation of Test Validity - Cronbach's Alpha

A non-standardized test was applied to the research sample, and because of this it will be subjected to validation by means of Cronbach's alpha coefficient. Table 3.

Table No. 3: Cronbach's Alpha

Source: Test applied to students
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 Since the value obtained is greater than (0.7), it is concluded that the test is correctly structured.
 Comparison between the control group without didactic situation and the experimental group with didactic situation
 The results obtained in the test performed on the Control and Experimental Groups are detailed below:

Figure 1. GC and GE Test Results



Source: Student test
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The students in the control group obtained 63.18% of correct answers in general, showing that they still do not manage to represent the numerical sets. On the other hand, the students in the experimental group obtained a percentage of 80.00% of correct answers, which shows that by correctly applying didactic situations with the help of ICT, students can be guided to the indicated scope of the skill.

Analysis of the test results by means of the T-test

Due to the fact that we will apply a t-test for independent samples, we resort to the calculation of data normality, which is shown below.

Normality of the data Control and Experimental Group

Within the calculation it is possible to verify a p-value greater than the significance in both samples, therefore it is concluded normality of data in both parallels. Table 4.

Table 4. *Normality of data*

8th "A" grade		8th "B".	
p-value>0	.100	p-value>0	.100

Source: Test applied to students

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Equal Variances

Once the normality of the data was verified, they were subjected to the calculation of the F statistic, which obtained a value of 0.56 and, being greater than the significance value (0.05), an equality of variances was established. Table 5

Table 5. *Equality of Variances Test*

Method	Test statistics	GL1	GL2	p-value
F	0,56	21	21	0,186

Source: Test applied to students

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T-test

Finally, due to the research design used, the independent samples T-test was applied; within this test "p" reached a value of "0" and with

it we conclude that the means of the ratings of the parallels "A" and "B" are different.

Discussion

The study variables were examined bibliographically to elaborate didactic situations mediated by ICT that facilitate the representation of numerical sets and to be evaluated in the test, which measured the acquisition of the mathematical theme, obtaining 80% in the general average of correct answers for the group to which the didactic situation was applied, thus reflecting an improvement in comparison to the control group that showed only 63.18% of correct answers.

With the T-test, the results obtained in the test applied to the eighth grade students were analyzed and with it the alternative hypothesis is accepted, which indicates that the use of ICT and didactic situations influence the representation of numerical sets. Thus, the use and correct application of didactic actions and activities facilitate the acquisition of the desired mathematical skill.

In view of the results provided by the test, it is verified that students and teachers need a tool that allows them to optimize mathematics classes; therefore, it is assured that the elaboration of a pedagogical document for the application of didactic situations mediated by ICT in the representation of numerical sets will be of help.

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