International Interdisciplinary Congress on Renewable Energies, Industrial Maintenance, Mechatronics and Informatics
Booklets

RENIECYT 1702902 CONAHCYT

RENIECYT - LATINDEX - Research Gate - DULCINEA - CLASE - Sudoc - HISPANA - SHERPA UNIVERSIA - Google Scholar DOI - REDIB - Mendeley - DIALNET - ROAD - ORCID - V|LEX

Title: Ludic didactic strategies for meaningful learning in undergraduate students

Authors: SOLTERO-SÁNCHEZ, Jazmín del Rocío, HUERTA-CHÁVEZ, Irma Alicia, GONZÁLEZ-QUEZADA, Esperanza and FIGUEROA-OCHOA, Edgar Benjamín

Editorial label RINOE: 607-8695
VCIERMMI Control Number: 2023-02
VCIERMMI Classification (2023): 261023-0002

Pages: 20
RNA: 03-2010-032610115700-14

RINOE - Mexico
Park Pedregal Business. 3580-Adolfo Ruiz Cortines Boulevard – CP.01900. San Jerónimo Aculco-Álvaro Obregón, Mexico City
Skype: RINOE-México S.C.
Phone: +52 1 55 1260 0355
E-mail: contact@rinoe.org
Facebook: RINOE-México S. C.
Twitter: @Rinoe_México

www.rinoe.org

Holdings
Mexico Peru
Bolivia Taiwan
Cameroon Western
Spain Sahara

Introduction

The search for didactic strategies to improve learning in undergraduate students is a constant task for the teaching activity, given the prevalence of lack of knowledge in basic conceptualizations of chemical science, such as chemical nomenclature.

These deficiencies are detected from the initial levels of academic training: secondary school, high school and even in their first approaches to this science during the learning units of the university career.

Introduction

Among the obstacles detected by some researchers on the subject of learning chemical nomenclature.

- It is worth mentioning the confusion of rules after a memorized learning, short term and little reflexive about what is learned.
- As well as the disconnection between the concepts studied and the belief that this learning is complicated.
- Also, it is found that the subject taught is isolated from the context of the student, limiting the relationship with the environment and particular interests.

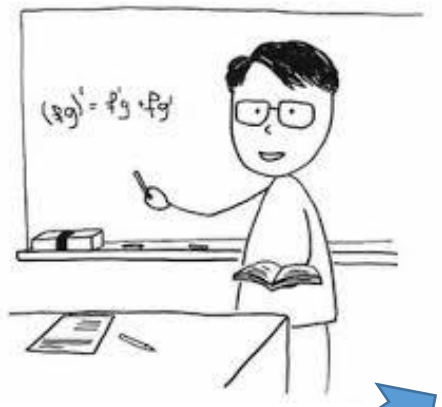
Introduction

What is the relationship between the implementation of ludic didactic strategies by teachers with the significant learning of chemical nomenclature in undergraduate students?

H_0: The implementation of ludic didactic strategies by teachers does not have a significant relationship with the meaningful learning of chemical nomenclature of undergraduate students.

H_a: The implementation of ludic didactic strategies by teachers has a significant relationship with the meaningful learning of chemical nomenclature of undergraduate students.

Literature review



Traditional teaching

Teaching-centered model defines knowledge as an external construction based on the scientific knowledge of a discipline shared by the teacher in an organized manner, who is an expert, understands, dominates, explains and is updated on the topics

Teaching-learning

Teaching-learning process is conceived not only as a mere transmission of knowledge, but as a process of reconstruction, involving the accumulation of different learning experiences (Piaget, 1950). The techniques used are active cooperative learning as opposed to traditional passive learning.

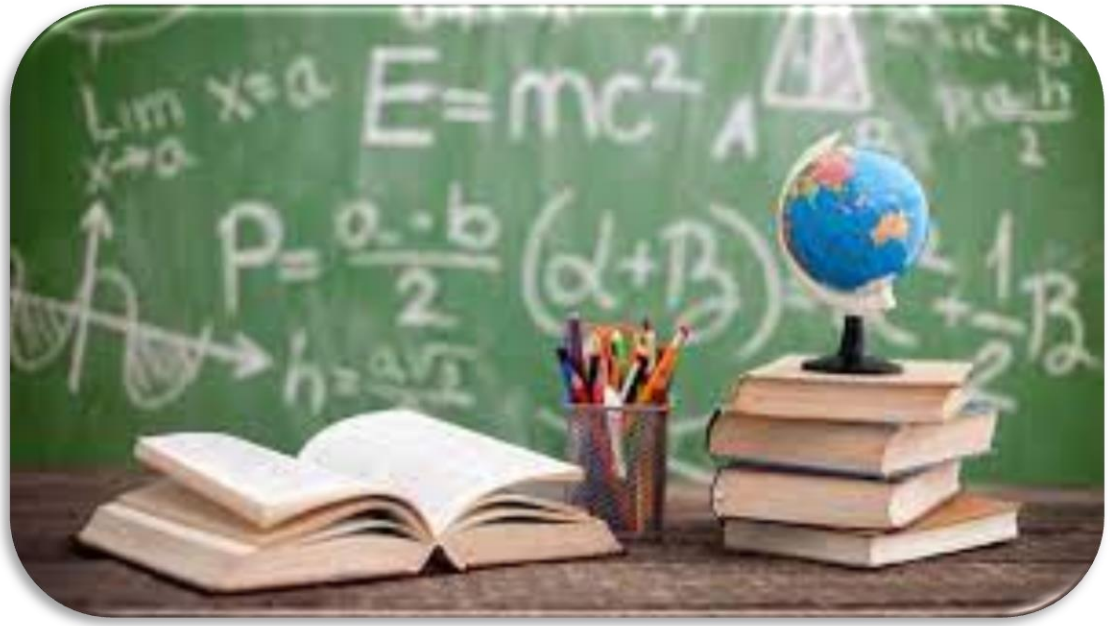
Constructivist learning

A very important event in pedagogy is the so-called Copernican revolution, where the focus shifts from teaching processes to learning processes, that is, on the learner. This does not mean that the role of the teacher is unknown, but rather that the figure of the teacher changes to being a guide, a tutor, a facilitator of learning (Tünnermann, 2011). So, the acquisition of knowledge is a process that is incorporated into pre-existing knowledge in the mind of the learner that can be modified or reorganized according to each individual (Piaget, 1950).

Literature review

Meaningful learning

Currently, in educational teaching, the concepts of stimulus, response and positive reinforcement have been replaced by meaningful learning, conceptual change and constructivism. At this time, quality teaching, considered as good, should contribute to conceptual change that facilitates meaningful learning (Moreira et al., 1997).



Ludic didactic

The aspects of didactic strategies are united in ludic learning, both teaching, learning and evaluation. This turns the teacher's work into an interactive and reflective practice that impacts on teaching innovation. The student is the center of learning and the teacher the driver to achieve the desired learning (Gutiérrez-Delgado et al., 2018).

Literature review

Gamification

Classic teaching model has been modified by the new educational trends of active student participation, where students actively influence their learning and gamification arises from these trends (Corchuelo, 2018).

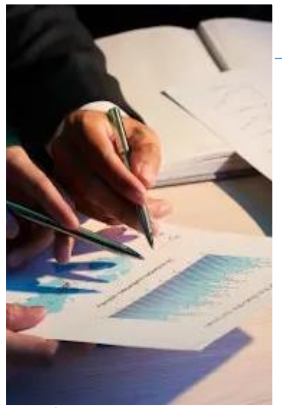
Conectivism

Connectivism is a new theory of the digital era (Siemens, 2004), with new technologies such as: wikis, social networks, blogs, among others. In addition to having unlimited access to the computer world at the moment, students can control their own learning path (Hernández, 2008).

Ludic

Ludic refers to the pleasurable and fun action, which is free and voluntary, it may or may not have rules, if there are rules it is a game. Therefore, the game in education has two functions: ludic and educational (Gutierrez & Barajas, 2019).

Methodology



Research type and design. The current research presents a quantitative and qualitative approach, of a non-experimental type with cross-sectional cut (Bernal, 2016; Hernández et al., 2014).

Variables: Ludic didactic strategies variable and meaningful learning variable

Participants: 104 students of the Bachelor's Degree in Pharmaceutical Chemical Biologist, who voluntarily agreed to participate in the "Chemical Nomenclature Workshop Course", within the scientific and cultural event called "Week of the Pharmaceutical Chemical Biologist".

Measuring instrument

The instrument used to measure the implementation of ludic didactic strategies in the meaningful learning of undergraduate students consisted of 15 items, of which 9 were evaluated on a 10-point Likert scale. The remaining 6 items evaluated qualitative variables, of which, 1 was evaluated in terms of time, 1 was evaluated in terms of knowledge of the three types of nomenclature, 2 evaluated the perception of the games and the preference of these, and the last 2 were open-ended questions regarding the opinion of the didactic strategy in which they participated.

This instrument was validated by means of the expert judgment technique and the reliability test was carried out by calculating Cronbach's Alpha.

Data analysis: Data were processed with the statistical program SPSS (Statistical Package for the Social Sciences) version 25 and Microsoft Excel spreadsheet software. Descriptive statistics were used for data analysis, measures of central tendency, graphs and hypothesis testing.

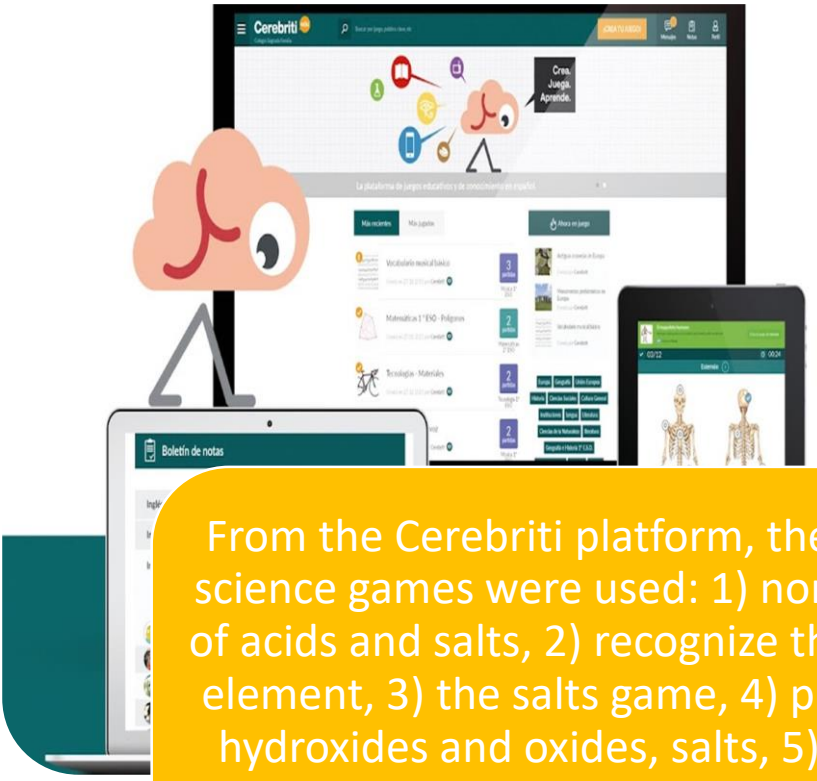
Methodology

Procedure:

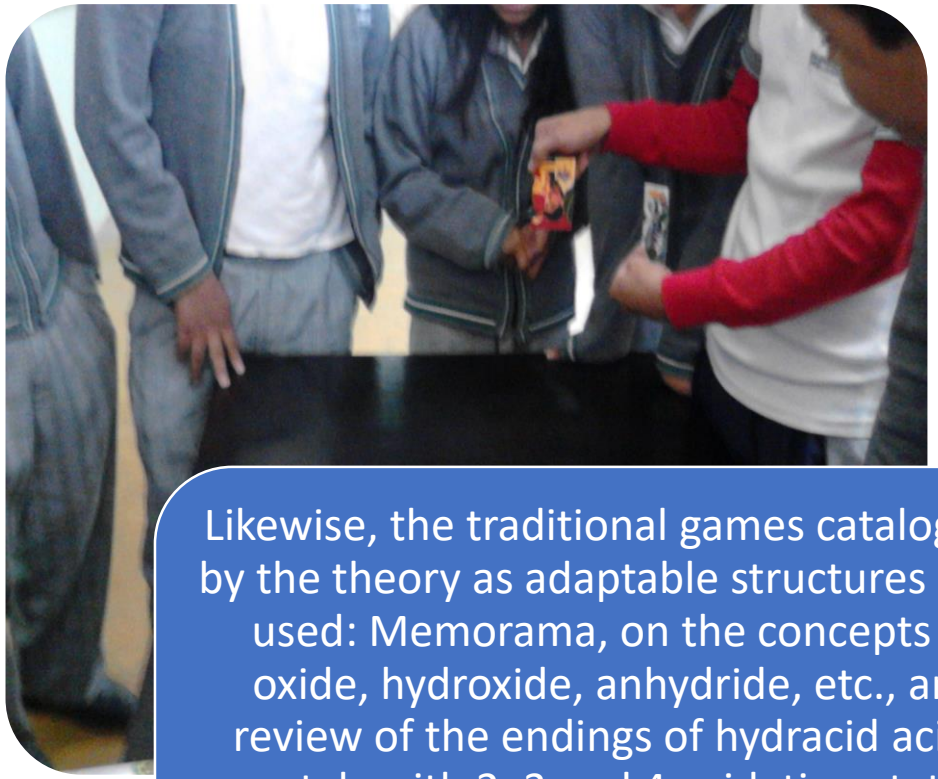
Within the program of the scientific and cultural event called "Week of the Pharmaceutical Chemist and Biologist", we offered the "Chemical Nomenclature Workshop Course" with a duration of 2 hours, which was enough time to implement the didactic and ludic strategies.

First, an explanation of chemical nomenclature was given, which included: nomenclature of elements, ancient and current nomenclature, types of nomenclature (systematic, stock and traditional). At the same time, the games portal Cerebriti (https://www.cerebriti.com/) and Aula of Red (https://aulaenred.fundacionibercaja.es/) were used, which are virtual platforms originating in Spain, where free access to ludic didactic tools, i.e., different games as a fun way to learn, is available.

Methodology



From the Cerebriti platform, the following science games were used: 1) nomenclature of acids and salts, 2) recognize the chemical element, 3) the salts game, 4) playing with hydroxides and oxides, salts, 5) inorganic chemistry formulas, 6) inorganic nomenclature best game ever. While from the Aula of Red platform, inorganic chemistry nomenclature formulation exercises were used for binary and tertiary compounds, relating the formula with the type of stock, systematic or traditional nomenclature.



Likewise, the traditional games catalogued by the theory as adaptable structures were used: Memorama, on the concepts of oxide, hydroxide, anhydride, etc., and review of the endings of hydracid acids, metals with 2, 3 and 4 oxidation states. Dominoes were also used to review the formation of various compounds in molecular form. And as an integrating game, the virtual platform Kahoot (https://kahoot.it/) was used to review what was learned.

Methodology

Additionally, undergraduate students were recommended some applications to install on their cell phones to continue improving their learning (https://www.quimitube.com/aplicaciones-moviles-para-formulacion-quimica/, https://www.yoformulo.com/, https://play.google.com/store/apps/details?id=com.chemist&hl=es_MX). As well as the book of Chemical Nomenclature by Solis Correa, 2009, published by Patria, which contains an interactive CD for practice.

At the end of the workshop course, after the implementation of the ludic didactic strategies for meaningful learning, the measurement instrument with 15 items was applied virtually, using the Google Forms virtual platform (https://docs.google.com/forms/u/0/), from which the databases were obtained for subsequent analysis.

Results

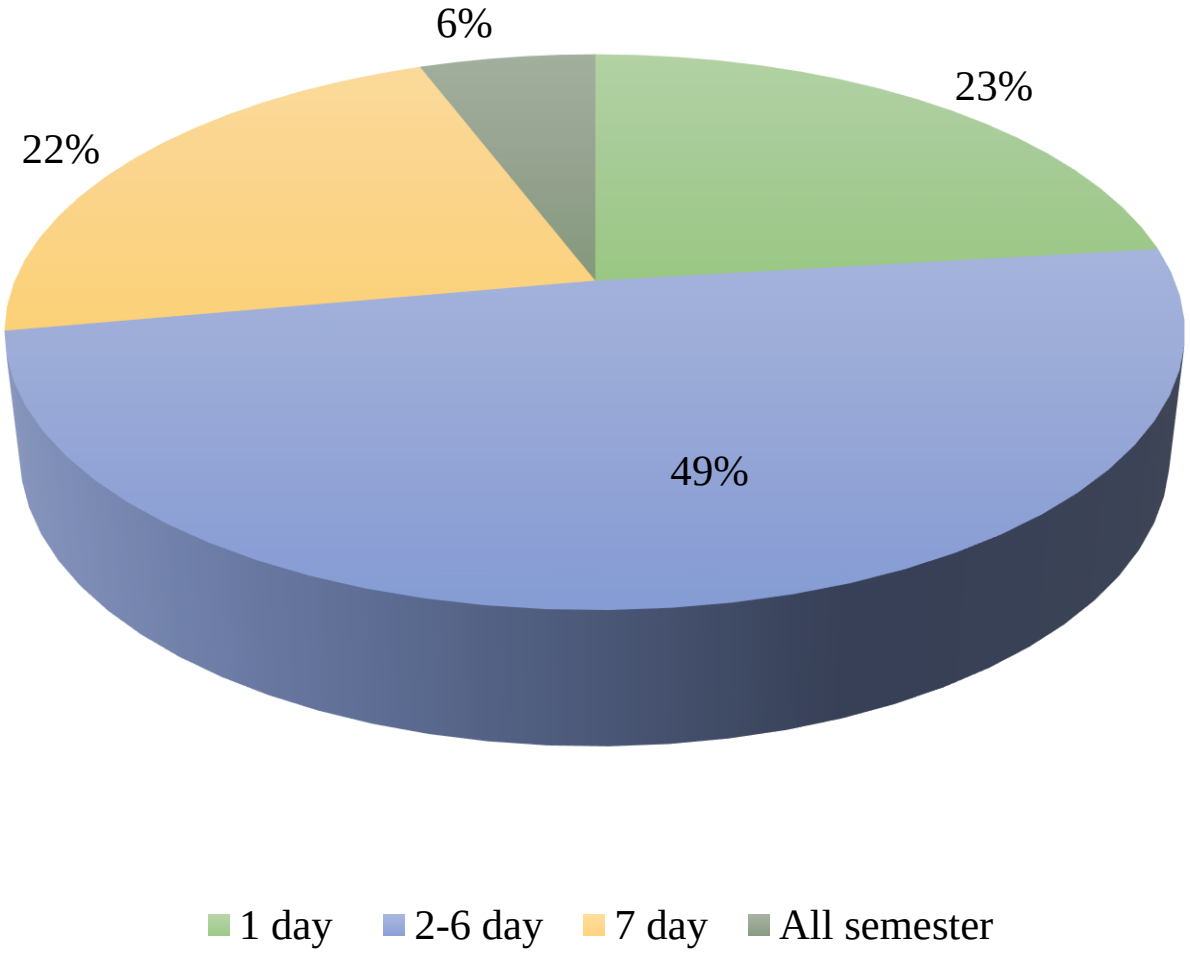
The measurement instrument used, in addition to having been evaluated by expert judgment, the Cronbach's Alpha Index was calculated and presented values above .700 as indicated by Nunnally (1978) and Hair et al. (1999). This proved that the scale is valid and reliable (see Table 1).

Variables	Cronbach's Alpha > .700 (Nunnally, 1978)
LCNSS1, LCNHS2, LCNGC3, KSCE6, KTCN7, KSCN8, KSCN9, ACNC10, ACNLSC11	0.790

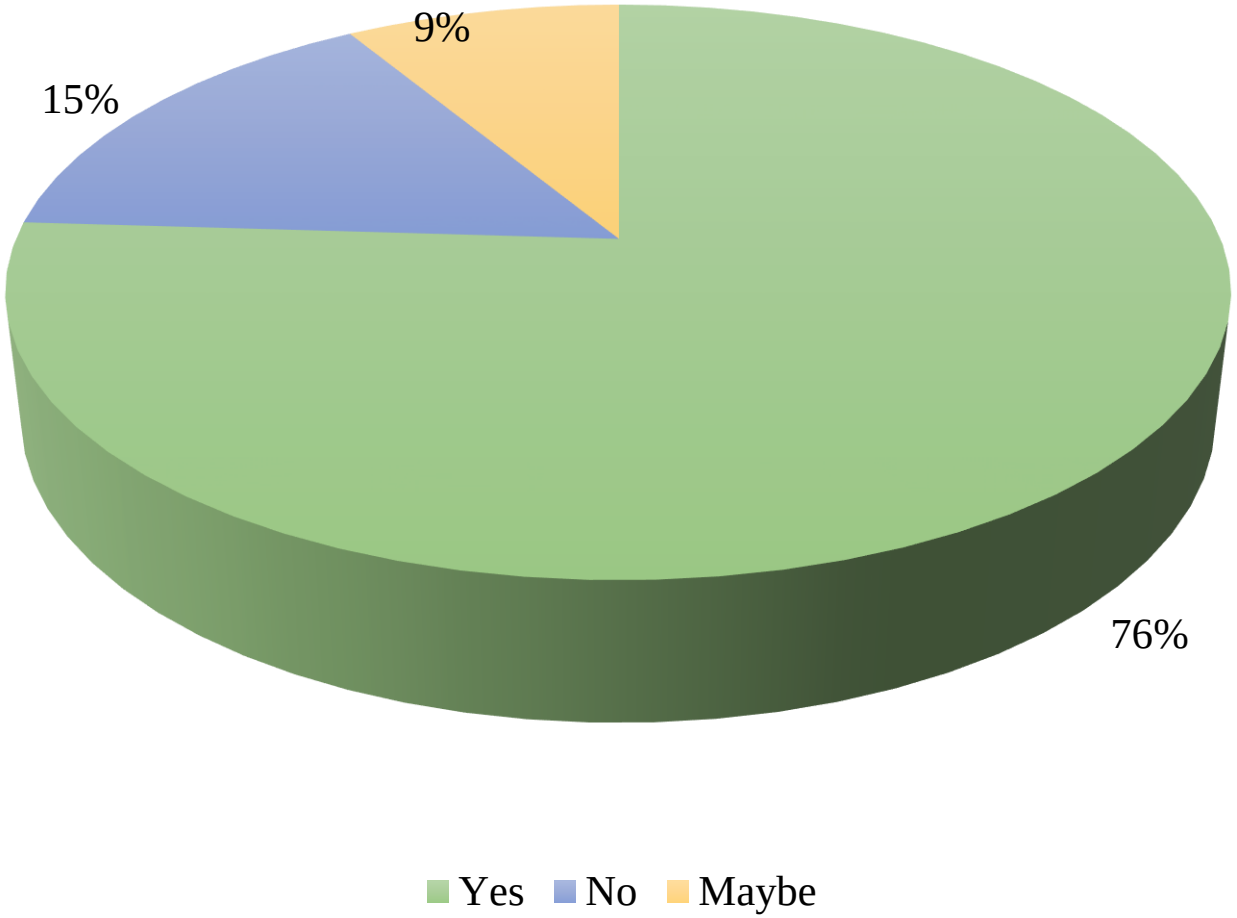
Table 1 Calculation of Cronbach's alpha index. *Source: Own elaboration (2023).*

Of the 15 items that made up the measurement instrument, 6 of these correspond to qualitative variables, i.e., for their analysis, the responses issued by the students had to be categorized, for subsequent counting and quantitative analysis (Bernal, 2016; Hernández et al., 2014).

Results

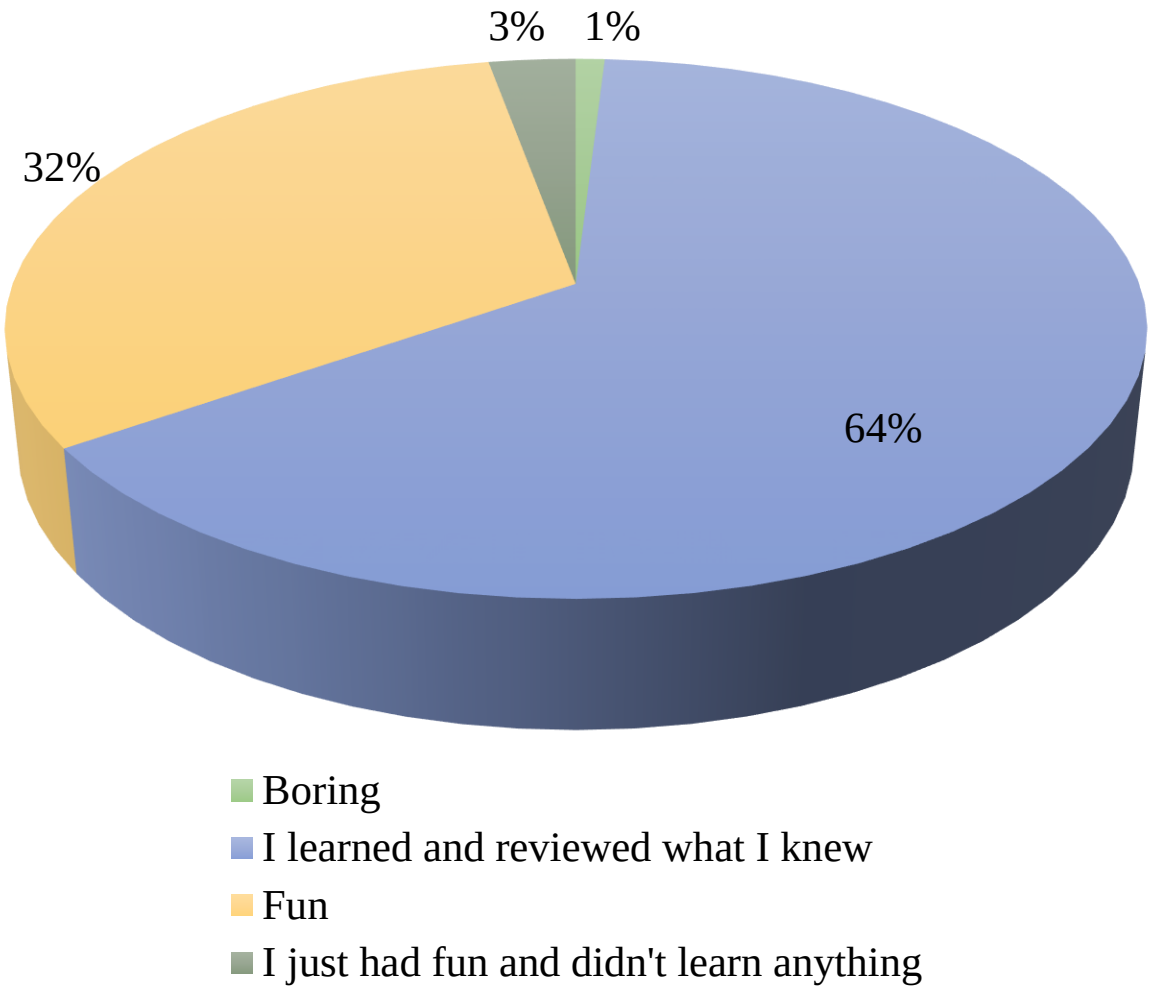


Graph 1 Time devoted to the study of chemical nomenclature in the learning unit General Chemistry 1. *Source: Own elaboration (2023).*

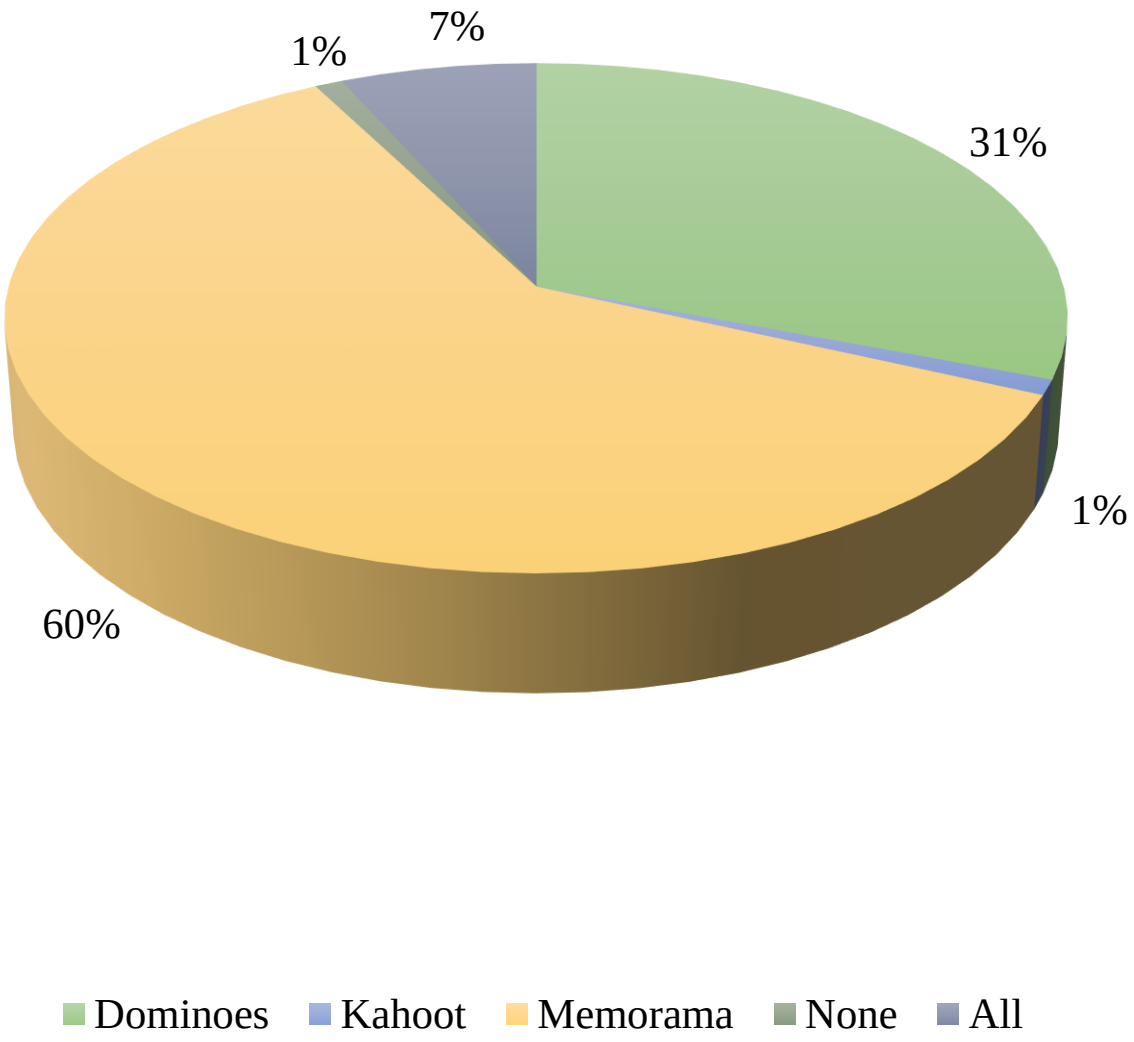


Graph 2 Knowledge of the types of traditional, systematic and stock nomenclature. *Source: Own elaboration (2023).*

Results

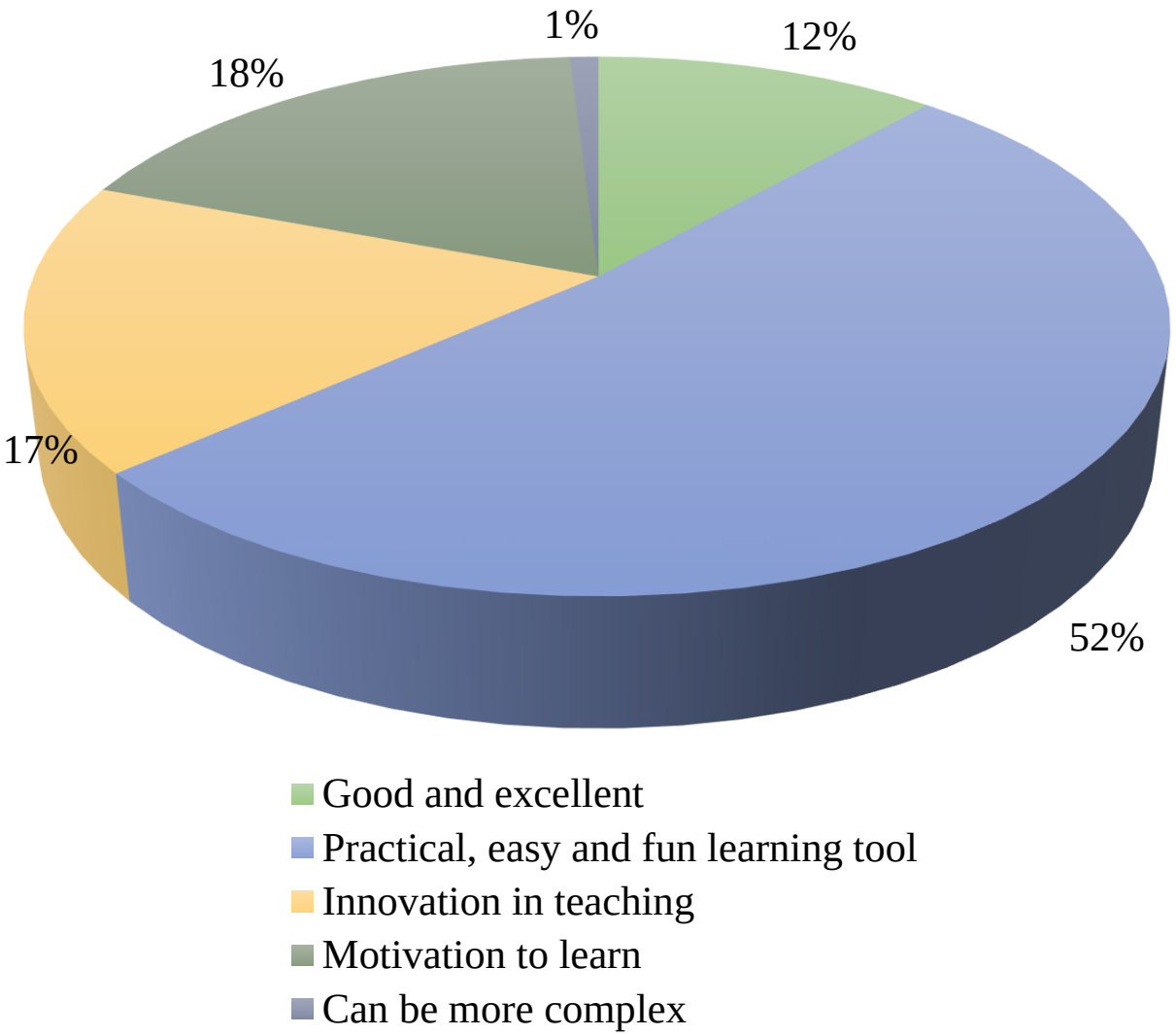


Graph 3 Perception of the didactic games used. *Source: Own elaboration (2023).*

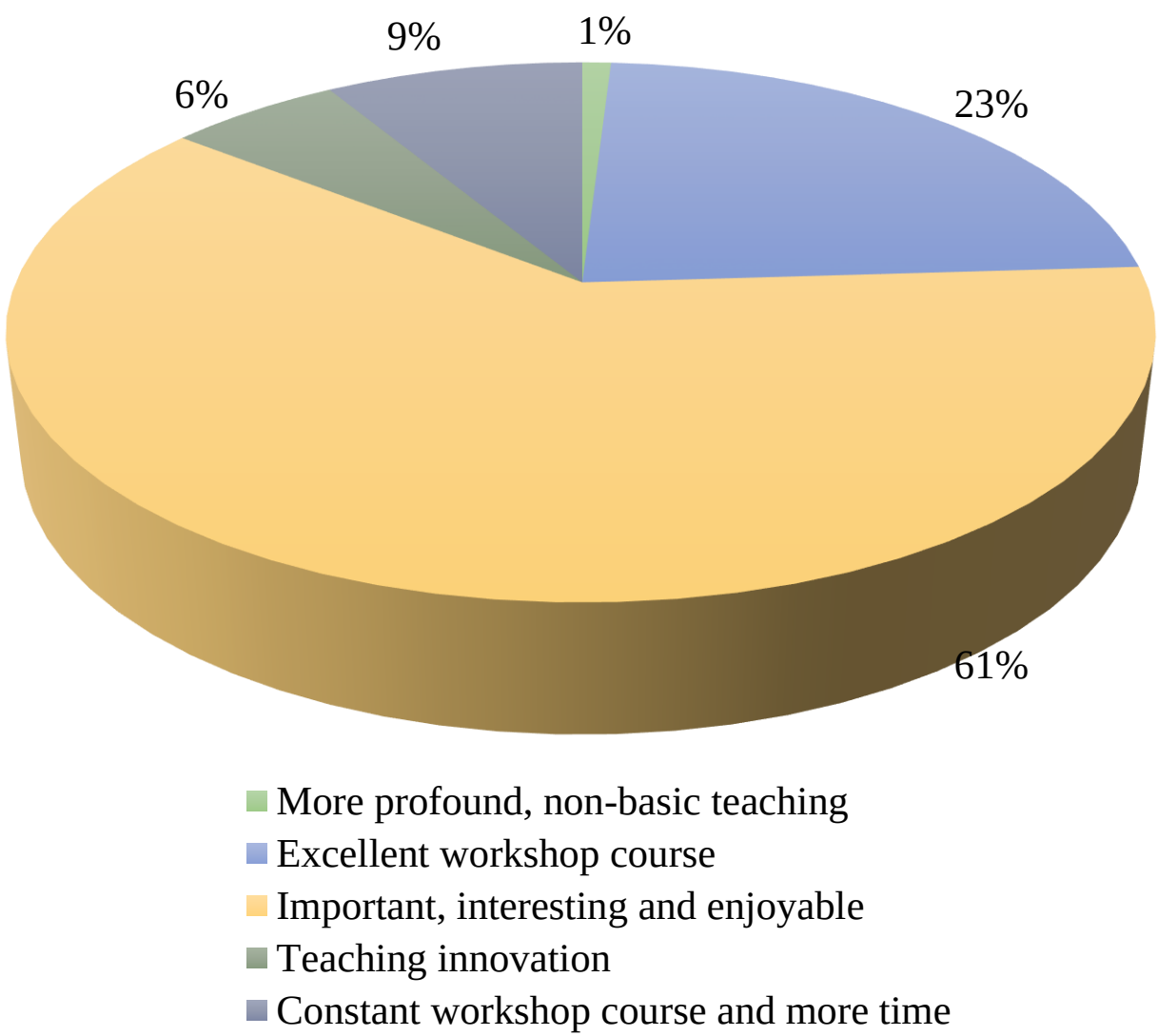


Graph 4 Effectiveness of didactic games used for learning. *Source: Own elaboration (2023).*

Results



Graph 5 General perception of the didactic games for learning used. *Source: Own elaboration (2023).*



Graph 6 General perception of the chemical nomenclature workshop course. *Source: Own elaboration (2023).*

Results

For the analysis and interpretation of the 9 quantitative variables of the instrument, measures of central tendency were used (see Table 2).

Variable	N	Min	Max	Mean	Standard deviation
LCNSS1	104	1	10	3.56	2.584
LCNHS2	104	1	10	4.52	2.569
LCNGC3	104	1	10	6.27	2.358
KSCE6	103	3	10	7.34	1.432
KTCN7	104	1	10	6.32	1.907
KSCN8	104	1	10	7.01	2.152
KSCN9	104	1	10	6.66	1.831
ACNC10	104	6	10	9.62	0.828
ACNLSC11	104	3	10	9.59	1.094

Table 2 Central tendency measures. *Source: Own elaboration (2023).*

Regarding the initial learning (MLI) the minimum value obtained was 1 and the maximum was 10, the mean was 5.98 and the standard deviation was 1.481. For the final learning and knowledge achieved, that is, meaningful learning (MLF) the minimum value was 6 and the maximum was 10, the mean was 9. 62 and the standard deviation was 0 > 1. Finally, the effectiveness of the didactic ludic strategies (EDLS) in the students' meaningful learning had values between 3 and 10 as maximum, the mean was 9.59 and the deviation between 1 > 2 (see Table 3).

Variable	N	Min	Max	Mean	Standard deviation
MLI	104	1	10	5.98	1.481
MLF	104	6	10	9.62	0.828
EDLS	104	3	10	9.59	1.094

Table 3 Central tendency measures. *Source: Own elaboration (2023).*

Results

In order to perform the hypothesis test to find the relationship between the variables MLF and EDLS, Pearson's correlation coefficient was calculated. The existence of a very strong relationship between both was detected, thus testing the central hypothesis, where the null hypothesis is rejected and the alternative hypothesis is accepted, i.e., the implementation of ludic teaching strategies by teachers has a significant relationship with the meaningful learning of chemical nomenclature of undergraduate students (see Table 4).

		MLF	EDLS
MLF	Pearson´s correlation	1	.466**
	Sig. (bilateral)		0.000
	N	104	104
EDLS	Pearson´s correlation	.466**	1
	Sig. (bilateral)	0.000	
	N	104	104

Table 4 Cronbach's alpha index calculation. *Source: Own elaboration (2023).*
** The correlation is significant at the 0.01 level (bilateral).

Annexes

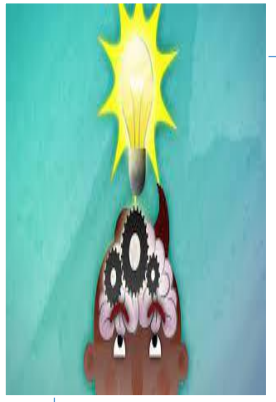
The items evaluated in the instrument are shown below (see Table 5).

Variable	Item
LCNSS1	Learning in chemical nomenclature in secondary school.
LCNHS2	Learning in chemistry nomenclature in high school.
LCNGC3	Learning chemical nomenclature in General Chemistry 1.
TIMECN4	Study time of chemical nomenclature in General Chemistry 1.
TYPECN5	Knowledge of chemical nomenclature types: traditional, systematic and stock.
KSCE6	Knowledge of the symbols of chemical elements.
KTCN7	Knowledge of traditional chemical nomenclature.
KSCN8	Knowledge of systematic chemical nomenclature.
KSCN9	Knowledge of stock chemical nomenclature.
ACNC10	Assessment of the chemical nomenclature workshop course.
ACNLSC11	Assessment of chemical nomenclature learning ludic strategies.
PDGL12	Perception of didactic games for learning used.
EDGL13	Effectiveness of didactic games for learning used.
PDGL14	General perception of the didactic games for learning used.
GPCNC15	General perception of the chemical nomenclature workshop course.

Table 5 Items and variables of the instrument applied. *Source: Own elaboration (2023).*

Conclusions

The evolution of the teaching-learning theory, the emergence of new theories such as constructivism, meaningful learning, ludic, gamification and connectivism.

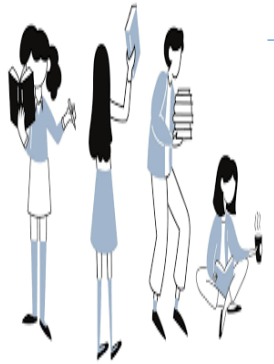


In which the student is increasingly made responsible for his own learning and the role of facilitator or guide is given to the teacher.

It is possible to conclude that it is imperative to design new didactic strategies that include both information technology tools and face-to-face activities, in order to involve students in their learning and make it meaningful.

Conclusions

A great challenge facing educational research is to teach students to "learn to learn".



That is why the role of the teacher has not been distorted; on the contrary, now, in addition to being knowledgeable about the subjects, he must have pedagogical didactic skills to promote learning.

This does not detract from the fact that learning is found in each individual, who is responsible for selecting the learning content, which must be linked to the objectives of each subject.

References

Bernal, C. A. (2016). *Metodología de la Investigación. Administración, economía, humanidades y ciencias sociales (4 ed.)*. Colombia: Pearson. Last date of access June 8th, 2023. https://books.google.es/books?hl=es&lr=&id=h4X_eFai59oC&oi=fnd&pg=PR13&dq=Metodolog%C3%ADa+de+la+Investigaci%C3%B3n.+Administraci%C3%B3n,+econom%C3%ADa,+humanidades+y+ciencias+sociales+&ots=vWHIr2vny_&ig=oUsEUyBmgmqmUnmO5C5hZXFU9RU#v=onepage&q=Metodolog%C3%ADa%20de%20la%20Investigaci%C3%B3n.%20Administraci%C3%B3n%2C%20econom%C3%ADa%2C%20humanidades%20y%20ciencias%20sociales&f=false

Corchuelo, C. A. (2018). Gamificación en educación superior: experiencia innovadora para motivar estudiantes y dinamizar contenidos en el aula. *EDUTEC. Revista electrónica de tecnología educativa*, (63), 29-41. Last date of access June 8th, 2023. https://doi.org/10.21556/edutec.2018.63.927

Gutierrez, A., & Barajas, D. S. (2019). Incidencia de los recursos lúdicos en el proceso de enseñanza-aprendizaje de la Química Orgánica I. *Educación química, 30*(4), 57-70. Last date of access June 8th, 2023. https://doi.org/10.22201/ fq.18708404e.2019.4.69991

Gutiérrez-Delgado, J., Gutiérrez-Ríos, C. A. R. L. O. S., & Gutiérrez-Ríos, J. (2018). Estrategias metodológicas de enseñanza y aprendizaje con un enfoque lúdico. *Revista de educación y desarrollo, 45*(1), 37-46. Last date of access June 8th, 2023. https://www.cucs.udg.mx/revistas/edu_desarrollo/anteriores/45/45_Delgado.pdf

Hair, J. F., Anderson, R. E., Tatham, R. L., y Black, W. C. (1999). *Análisis Multivariante*. Quinta Edición. Madrid, España. Editorial Prentice Hall. Last date of access June 8th, 2023. https://documat.unirioja.es/servlet/libro?codigo=320227

Hernández, R., Fernández, C. y Baptista, M. P. (2014). *Metodología de la Investigación* (6 ed.). México: McGraw-Hill. Last date of access June 8th, 2023. https://dspace.scz.ucb.edu.bo/dspace/bitstream/123456789/21401/1/11699.pdf

Hernández, S. (2008). El modelo constructivista con las nuevas tecnologías: aplicado en el proceso de aprendizaje. *Rev. U. Soc. Conocimiento, 5*(2), 26. Last date of access June 8th, 2023. https://www.redalyc.org/pdf/780/78011201008.pdf

Moreira, M. A., Caballero, M. C., & Rodríguez, M. L. (1997). Aprendizaje significativo: un concepto subyacente. *Actas del encuentro internacional sobre el aprendizaje significativo, 19*(44), 1-16. Last date of access June 8th, 2023. https://d1wqtxts1xzle7.cloudfront.net/40784677/apsigsubesp-libre.pdf?1450278743=&response-content-disposition=inline%3B+filename%3DAPRENDIZAJE_SIGNIFICATIVO_UN_CONCEPTO_SU.pdf&Expires=1691553413&Signature=fvlJvV9su5dbatqM6xfM~wp9aJeJ-tfIsewY6EsJgmH0c~Am8lZ3OVB7p2Gn8BeX2osdEX9~YP-oM376i8wcCgEjmYLxPmeeKfLpdaJYfBx4NMfD1Dq3-~wd2Z2dBns8UfCGb484x4ONJzp2eLIrdCA2M6y~jTJIfbeuU5urylqXxNsLX2sqT5qKyh0alpTiHS2f-iK399LjIdflJaak~6abfGJgWrZKhxX~wo8MqAs~8egNYZEMtnqYne97Tzgut8KJFCd9TQBVTqDK-6u6pBUUtho7NN~WrIifTBtNFAs3kvXESf8NUP2BSFKUJTT8kwFS7NoXVW~xD6xz5iM4Mg__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

Nunnally, J. C. (1978). Pyscometric Theory. New York. Mc Graw Hill. Last date of access June 8th, 2023. https://books.google.com.mx/books/about/Psychometric_Theory.html?id=WE59AAAAMAAJ&redir_esc=y

Piaget, J. (1950). *The Psychology of Intelligence*. New York: Routledge. Last date of access June 8th, 2023. https://doi.org/10.4324/9780203164730

Tünnermann, C. (2011). El constructivismo y el aprendizaje de los estudiantes. *Universidades*, (48), 21-32. Last date of access June 8th, 2023. https://www.redalyc.org/articulo.oa?id=37319199005

RINOE®