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Knowledge Area

The works must be unpublished and refer to topics of Basic education, higher education, higher education, comprehensive education reform, national agreement for modernization, basic education and other topics related to Humanities and Behavioral Sciences.

Presentation of Content

In the first article we present *Virtual education, an engine to increase learning in the pandemic*, by MONCADA-RODRÍGUEZ, Gloria Rebeca, VILLARREAL-SOTO, Blanca Margarita, ESPERICUETA-MEDINA, Marta Nieves and GONZÁLEZ-CEPEDA, María Cristina, with adscription in the Universidad Autónoma de Coahuila, as second article we present *Foundations of the teen's second home*, by CEPEDA-GONZÁLEZ, María Cristina, VILLARREAL-SOTO, Blanca Margarita, MUÑOZ- LÓPEZ, Temístocles and CASTILLO-CANIZALEZ, Diana Cecilia, with adscription in the Universidad Autónoma de Coahuila, as third article we present *Importance of breakfast in schoolchildren*, by CAMPOS-RAMOS, Cynthia Ivett, GUTIÉRREZ-HERNÁNDEZ, Rosalinda, LAZALDE-RAMOS, Blanca Patricia and REYES-ESTRADA, Claudia Araceli, with adscription in the Universidad Autónoma de Zacatecas, as fourth article we present *The MTSK and TSD: didactic planning as a proposal for the learning of rational numbers in fifth grade primary school pupils*, by HERNÁNDEZ-GUTIÉRREZ, Francisco Javier, PACHECO-MACIAS, Melissa and LIZARDE-FLORES, Eugenio, with affiliation at the Escuela Normal Rural “Gral. Matías Ramos Santos”.

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Virtual education, an engine to increase learning in the pandemic

La educación virtual, un motor para aumentar el aprendizaje en la pandemia

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Abstract

The objective of this article is to know how virtual education intervenes in the learning process of students in Technical Secondary School No. 4 vs. General Secondary School No. 11 during the pandemic. The research that was carried out is of a comparative and differential type since two populations will be analyzed in order to know the learning process in virtual education; it is also of a preliminary nature since it will only have one moment in the validation of the external data. The instrument had 83 variables on a decimal ratio scale and 6 general data items. The statistical treatment was based on five levels in order to obtain validity and confidence in the information. The main results of the research highlight that carrying out a practice of the topics seen enhances the learning process in the subjects. The research concludes that the most suitable education for men is the virtual one since they generate a greater type of interrelationships, abilities, skills, communication and social situations that favor a quality education. It is proposed to carry out a course focused on virtual education to learn about technological tools.

Resumen

El objetivo del presente artículo es conocer como interviene la educación virtual en el proceso de aprendizaje de los alumnos en la Secundaria Técnica N°4 vs la Secundaria General N°11 durante la pandemia. La investigación que se realizó es de tipo comparada y diferencial ya que se estarán analizando dos poblaciones con para conocer el proceso de aprendizaje en la educación virtual; además es de corte preliminar ya que tendrá un solo momento en la validación de los datos externos. El instrumento contó con 83 variables en una escala decimal de razón y 6 ítems de datos generales. El tratamiento estadístico fue a partir de cinco niveles con el propósito de obtener validez y confianza en la información. Los principales resultados de la investigación destacan que el realizar una práctica de los temas vistos potencializa el proceso de aprendizaje en las materias. La investigación concluye que la educación más idónea para los hombres es la virtual ya que generan un mayor tipo de interrelaciones, habilidades, destrezas, comunicación y situaciones sociales que favorecen a una educación de calidad. Se propone la realización de un curso centrado en la educación virtual para conocer lo referente a las herramientas tecnológicas.

Pandemic, Technological, Comparative

Pandemia, Tecnológica, Comparativo

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Introduction

Virtual education is a phenomenon that has favored education, because in this modality students can learn from different spaces, hence the question of how does virtual education intervene in the learning process of students of the Technical Secondary School No. 4 and General Secondary School No. 11 during the pandemic?

The subject of the research focuses on virtual education because it is a problem that is currently being presented, in contrast to the learning process because it wants to analyze the levels of knowledge that students have acquired in times of pandemic.

With this analysis, it is intended that adolescents can detect if they have really acquired learning during their virtual education process during the pandemic, in order to create a solution to this problem.

The main beneficiaries of this research will be the students of Technical Secondary School No. 4 and General Secondary School No. 11, since it is intended to know how their learning process has been during the pandemic; however, the population will be benefited since students will be able to measure how much they have learned in virtual education, finally, society as a whole will benefit by having elements that favor virtual education.

The sections that will be addressed throughout this article focus on the following: the theoretical perspective, which consists of presenting a review of the main authors who offer their theoretical contributions to the phenomenon under study, and in this way have a more broad when investigating; the methodology to be developed, in which the type of research is exposed, the sample with which it was worked and the strategic line on which the choice of the topics to be studied was based; the results, in which the most significant data derived from the five statistical levels (frequencies and percentages, characterization, correlation, comparison and integration) are displayed; the conclusions, where a detailed and summarized synthesis of the contributions provided by the research is made and finally the bibliographical references.

Theoretical Perspective

Throughout history it has been detected that virtuality is a phenomenon that has favored education. In the field of virtual education, you can learn from various places and platforms because in this modality it is not necessary for a group of people to attend a school.

Pinto and Cuervo (2021), mention that the importance that online education has acquired in 2020 is an unprecedented fact that will mark a before and after in pedagogical practices and in current educational systems at a global level that will bring as a challenge to reduce maximize the negative impact that this pandemic will have on learning and education, and take advantage of this experience to resume an accelerated path of improvement in learning. As education systems face this crisis, they must also plan how to recover, with a renewed sense of responsibility from all actors and with a better understanding and sense of urgency of the need to ensure that everyone has an equal chance of success. receive a quality education.

In order to achieve a virtual education that meets the quality parameters, from the perspective of the authors Marciniak and Gairín (2020), it is necessary to attend to and analyze how the technological infrastructure of both the teacher and the student is; pedagogical aspects (training objectives, materials, teaching resources, online learning activities, evaluation, teaching strategies through platforms, tutoring); teachers (online teacher development); the students (characteristics of the learners); the structure and content of the disciplinary areas is relevant to offer training according to the needs; and satisfactory environment in the virtual classroom where participation, enthusiasm and dynamism are promoted.

For their part, Expósito and Marsollier (2020), add that virtual education establishes a different scenario for teacher-student communication, in addition, the use of technological resources originates novel ways of application and interrelation according to each context. Therefore, when referring to an educational process in a virtual modality, digital tools such as platforms, websites, computer equipment, etc., will be involved, which will represent substantial support for the construction of learning.

From all this uncertain panorama, Cabrera (2020), raises a series of questions that are the subject of debate in the current situation: what will become of the education system? Will inequality of opportunity widen? Will it increase competitiveness? Will personal and social relationships radically change? Will virtuality spread in the future or will it live with us permanently? Does it affect all students? All these questions and more haunt the family, students, teachers and researchers in education and society since they must respond to the uncertainty and changes that are coming, therefore, it is essential to analyze and contemplate in detail everything that education implies. virtual.

It should be noted that virtual education is related to the learning process, considering that this is the way in which students follow methodological processes in order to acquire knowledge.

Methodology to develop

The research that is being carried out is of a comparative and differential type since two populations will be analyzed to know the learning process in virtual education; it is also of a preliminary nature since it will only have one moment in the validation of the external data.

Therefore, two populations with differences in their operating characteristics were selected, which will be 50 students from Technical High School No. 4 and 50 students from General High School No. 11, since it is expected to know the number of students who have acquired learning in their virtual education. The concordance refers to the fact that both are at a basic level, however, one is of a technical nature and the other of a general nature, in addition to the fact that the population has the same age range.

Regarding the processing of the relative frequencies that were obtained, the instrument was processed in order to obtain validity and confidence in the information.

Results

With the purpose of providing a reliable and scientifically rigorous explanation to the research axes which correspond to the virtual education theme and the learning process contrast, the relative frequencies were processed, which were collected through the online instrument, using Statistica 7 and Excel programs in order to explain the phenomenon statistically through the levels of frequencies and percentages, characterization, correlation, comparison and integration.

Frequencies and Percentages

The purpose of processing the frequencies and percentages section is to characterize the study population so that once the levels of confidence in the phenomenon are reached, the information can be extrapolated to other populations with the same characteristics, which It involves generalization of data. At this level, it operates with signal variables which correspond to:

Age

Table 1 shows that the least part of the participating population is 16 years old, which is reflected in the fact that its frequency is 2, which is equivalent to 1%, however, the majority is represented by 14 years, denoting a frequency of 135 equivalent to 80% of the subjects. It is inferred that 14-year-old students are the most represented, therefore, the information can be extrapolated to other populations with this characteristic as long as the variables of the phenomenon present the confidence levels.

Age	Frequency	Percentage
14	135	80%
15	31	19%
16	2	1%
Total	168	100%

Table 1 Statistical behavior of frequencies and percentages of the age variable (2022)

Gender

With regard to table 2, it is observed that the least part of the surveyed group are men, which is reflected in the fact that their frequency is 73, which is equivalent to 43.5%, however, the majority is represented by women, corresponding at a frequency of 95, which is equivalent to 56.5% of the population. It is inferred that the female gender is the one that is mostly represented.

Gender	Frequency	Percentage
Female	95	56.5%
Male	73	43.5%
Total	168	100%

Table 2 Statistical behavior of frequencies and percentages of the gender variable (2022).

School adaptation

Table 3 shows that the least part of the group surveyed did not adapt to virtual education, which is reflected in the fact that its frequency is 64, which corresponds to 38%; however, the majority is represented by the that if they adapted to virtual education with a frequency of 104, which is equivalent to 62% of the population. It is inferred that the students who adapted to virtual education are predominant in the research.

Education	Frequency	Percentage
No	64	38%
Yes	104	62%
Total	168	100%

Table 3 Statistical behavior of frequencies and percentages of the school adaptation variable (2022)

Characterization

Table 4 shows the behavior of the mean, where it is read that the variables found in low values (0,1,2,3), technological resources ($X=3.93$), adaptation ($X=2.92$), change ($X=3.92$), virtual classroom ($X=1.89$), model ($X=3.45$), school ($X=1.96$) and extracurricular activities ($X=1.63$). It is inferred that the pandemic has brought an educational lag, therefore, virtual environments do not favor significant learning processes.

Variables	X
Technological resources	3.93
Adaptation	2.92
Change	3.92
Virtual classroom	1.89
Model	3.45
School	1.96
Extracurricular activities	1.63

Table 4 Statistical behavior of mean, (2022)

Correlation

Next, the correlation readings that were significant are presented, taking into account a probability of $p=.000001$ with a correlation level of $r=0.31$.

Correlation of the opportunities variable

Table 5 shows that when teachers provide students with opportunities, they better understand the educational programs ($r=0.49$) that were implemented during the pandemic to promote their training ($r=0.45$) and this has increased motivation in students. students ($r=0.47$). It is inferred that educational programs enhance the opportunities of virtual education.

Correlation Opportunities	r value
Educational programs	0.49
Motivation	0.47
Training	0.45

Table 5 Correlational behavior of the opportunities variable (2022)

Correlation of the interaction variable

Table 6 shows that interaction is a key factor in group work ($r=0.46$) in which the participation ($r=0.44$) and collaboration of all students ($r=0.47$) must be implemented. It is inferred that when students are active in their education, this increases their knowledge.

Correlation Interaction	r value
Group work	0.46
Collaboration	0.47
Participation	0.44

Table 6 Correlational behavior of the interaction variable, (2022)

Correlation of the methodologies variable

Table 7 shows that the methodologies implemented by teachers are linked to self-regulation by students ($r=0.46$), in this equity is implemented ($r=0.47$) at the time the teacher motivates them to continue learning ($r=0.48$). It is inferred that motivation potentiates the method that the teacher implements for learning.

Correlation Methodologies	r value
Self- regulation	0.46
Motivation	0.48
Equity	0.47

Table 7 Correlation behavior of the methodologies variable (2022)

Correlation of the collaboration variable

Table 8 analyzes that during the pandemic, collaboration between students was represented by group work ($r=0.56$) in various subjects ($r=0.43$), and this has raised the levels of self-management related to participation in decision-making. of decisions in the classroom ($r=0.50$). It is inferred that group work enhances collaboration in virtual education.

Correlation collaboration	r value
Group work	0.56
Self- management	0.50
Subjects	0.43

Table 8 Correlational behavior of the collaboration variable (2022)

Correlation of the practical variable

Regarding table 9, it is explored that when students carry out exercises to reinforce a topic as practice, they develop their critical analysis ($r=0.42$), thus improving their communication ($r=0.43$) in the various subjects ($r= 0.48$) in order to present the needs to the teacher ($r=0.46$). It is inferred that carrying out a practice of the topics seen enhances the learning process in the subjects.

Correlation practical	r value
Critical analysis	0.42
Communication	0.43
Needs	0.46
Subjects	0.48

Table 9 Correlational behavior of the practical variable, (2022)

Correlation of the communication variable

Table 10 shows that communication in virtual classes is a factor of the participation that students have ($r=0.64$) in the different subjects ($r=0.50$) and this has favored self-management in relation to students participating. in the decisions made in the classroom ($r=0.56$) to meet their needs ($r=0.59$). It is inferred that student participation enhances learning processes.

Correlation communication	r value
Stake	0.64
Subjects	0.50
Needs	0.59
Self- management	0.56

Table 10 Correlational behavior of the communication variable, (2022)

Comparison

In the lower part, the comparisons are exposed to observe the concordances and differences using the student's t statistic of two groups in the signal variables of gender and school.

Comparison of the gender variable

In order to find the significant differences between the Gender variable and the variables that correspond to the study phenomenon, a Student's t-test was performed for independent samples in the Statistica 7 program, with a probability of 0.05, with the purpose of accepting or reject the null hypothesis, with a sample of 168 students with a difference in the Gender variable in male and female, all of the above can be seen reflected in table 11.

Variables	X		t-value			
	M	F	df	p	p	
Interrelationship	5.7	4.59	2.24	166	0.03	0.78
Students	5.9	5.14	1.98	166	0.05	0.27
Social environment	5.8	4.56	2.62	166	0.01	0.50
Skills	6.23	4.85	2.74	166	0.01	0.34
Abilities	5.34	4.16	2.28	166	0.02	0.96
Communication	6.25	5.18	2.05	166	0.04	0.37

Table 11 Comparative behavior of the independent variable gender (2022)

As shown in table 11, in the interrelationship variable, it can be read that women are the ones who hardly communicate through virtual education ($x=4.59$) while men are the ones who present the greatest communication in this modality ($x=5.73$). It is inferred that the most comfortable in this type of education are men, since they are the ones who present the most ease in their interrelation.

In the student variable, it is observed that women have presented greater difficulty in entering virtual classes ($x=5.14$) while it is easier for men to attend meetings ($x=5.97$). It is inferred that men have been more aware of distance classes for their training.

In the social environment variable, it can be read that women presented greater problems when dealing with society during the pandemic ($x=4.56$), while men have managed more easily ($x=5.89$). It is read that virtual education has favored men in their social development.

In the skills variable, it is observed that women have found it difficult to express themselves ($x=4.85$), on the contrary, men have been more expressive ($x=6.23$). It is inferred that during the pandemic men developed their ability to express themselves more.

In the abilities variable, we read that women need to be more focused on the subject in order to learn ($x=4.16$) while men can learn with distractions ($x=5.34$). It is inferred that men have the facility to learn with noise and this facilitates their virtual education.

In the communication variable, it is observed that in general, women do not present their doubts to the teacher ($x=5.18$), on the contrary, men ask the teacher about their concerns ($x=6.25$). It is inferred that men feel safer when presenting their doubts in virtual education.

It is generally inferred that the most suitable education for men is virtual since they generate a greater type of interrelationships, abilities, skills, communication and social situations that favor a quality education.

Comparison of the school variable

In order to find the significant differences between the School variable and the variables that correspond to the study phenomenon, a Student's t-test was performed for independent samples, which is evidenced in Table 12. It should be noted that we worked with a probability of 0.001, in order to accept or reject the null hypothesis, with a sample of 168 students from General High School No. 11 and Technical High School No. 4.

Variables	X		df	p	p
	General N° 11	Technique N°4			
Session	9.19	3.89	166	0.00	0.00
Training	7.76	6.12	166	0.00	0.14
Continuous	8.87	7.71	166	0.00	0.00

Table 12 Comparative behavior of the independent variable school (2022)

In the session variable, it can be read that in technical secondary school No. 4, the students did not attend virtual classes daily ($x=3.89$), while in general secondary school No. 11, the students adapted to the distance modality ($x=9.19$). It is inferred that in general high school No. 11 there will be a lower educational gap because the students continued to learn day by day.

In the training variable, it is observed that the students of the technical secondary school No. 4 are not satisfied with the education they are receiving at a distance ($x=6.12$) while the students of the general secondary school No. 11 are satisfied with their education ($x=7.76$). It is inferred that the teachers of general high school No. 11 implemented the necessary strategies to transmit knowledge.

In the continuous variable, it is read that the students of the technical secondary school No. 4 have presented periods of time in which their education has been interrupted ($x=7.71$), while in the general secondary school No. 11 the students have had a without interruptions during the pandemic ($x=8.87$). It is inferred that general high school No. 11 has implemented its curriculum adequately.

It is inferred in a general way that the general secondary No. 11 has shown greater interest in the students having adequate training, for which they have implemented the necessary strategies so that their students do not show a greater educational lag, likewise the students have not had interruptions in their learning process which will favor their education.

Integrational

In this segment, the integration analysis based on factorial statistics is exposed, integrating the 168 students and 86 variables that make up the investigation of the parametric statistics of the phenomenon under study; with a main method R2= multiple communities with a normalized Varimax rotation, a sigmatic cut-off Eigenvalue of 1, a level of $p=.000000001$ and an $r=.46$.

Intrafactorial Analysis

Factor 1: Educational aspects

Table 13 shows the first factor that corresponds to the teacher's responsibility to motivate ($\text{exp}=0.64$) and guide students in the learning process ($\text{exp}=0.80$) as well as to make innovations in the content ($\text{exp}=0.80$). $\text{exp}=0.66$ so that these are important topics ($\text{exp}=0.74$) that cause interest in the students ($\text{exp}=0.47$), since in this way they will better understand the explanations ($\text{exp}=0.49$), however, the teacher must be flexible ($\text{exp}=0.68$) in relation to retaking those topics that are not clear to the students ($\text{exp}=0.67$) so that there is greater participation on the part of the students ($\text{exp}=0.48$) as well as giving them the opportunity to improve a task or activity ($\text{exp}=0.57$), for this, the teacher presents the way he will have to work during the course ($\text{exp}=0.71$) and the way to evaluate ($\text{exp}=0.67$) following a teaching methodology ($\text{exp}=0.60$) so that the students are satisfied with the education they are receiving ($\text{exp}=0.47$) and there is coverage ($\text{exp}=0.52$) equally ($\text{exp}=0.62$). It is inferred that the learning process during a pandemic depends largely on the actions implemented by the teacher.

Factor 1	Factor loading
Motivation	0.64
Accompaniment	0.80
Innovation	0.66
Relevance	0.74
Contents	0.47
Pedagogical	0.49
Flexibility	0.68
Orientation	0.67
Inclusion	0.48
Opportunities	0.57
Educational program	0.71
Planning	0.67
methodologies	0.60
Training	0.47
Coverage	0.52
Equity	0.62

Table 13 Intrafactorial statistical behavior of educational aspects (2022)

Factor 2: Work Links

Table 14 shows that if the students live together ($\text{exp}=0.81$) and talk to each other ($\text{exp}=0.77$), most of them become friends ($\text{exp}=0.83$) and in this way help each other when they need it ($\text{exp}=0.59$).), which favors collaboration ($\text{exp}=0.56$) and participation in group work ($\text{exp}=0.49$), as well as intervening in classroom decisions ($\text{exp}=0.53$), with this the students better express their ideas ($\text{exp}=0.61$) and present their doubts to the teacher ($\text{exp}=0.47$), this develops the ability to express themselves ($\text{exp}=0.57$) and function in society ($\text{exp}=0.60$). It is inferred that the links established between students favor their learning process.

Factor 2	Factor loading
Interaction	0.81
Interrelationship	0.77
Self-management	0.53
Team work	0.49
Collaboration	0.56
Communication	0.47
Skills	0.57
social environment	0.60
Support for	0.59
Ideas	0.61
Links	0.83

Table 14 Intrafactorial statistical behavior of work relationships (2022)

Factor 3: School factors

In relation to table 15, it is read that the students have a quality education (exp=0.66), because they are learning (exp=0.63) and acquiring the appropriate knowledge during the pandemic (exp=0.60), in this way students meet their educational objectives (exp=0.53) and are satisfied with their education (exp=0.61). It is inferred that receiving a quality education enhances the learning process during the pandemic.

Factor 3	Factor loading
Quality	0.66
Knowledge	0.60
To learn	0.63
Training	0.61
Objectives	0.53

Table 15 Intrafactorial statistical behavior of school factors (2022)

Factor 4: Educational exploration

Regarding table 16, it is explored that when students are satisfied with their education (Exp=0.68) they follow the instructions given by the teacher (Exp=0.61), they carry out their activities in the established time (Exp=0.59), make an effort to do (Exp=0.54) and fulfill their tasks during the pandemic (Exp=0.63), in addition to researching various sources to clarify their doubts (Exp=0.69) and understand a topic (Exp=0.57) with this they build their own definitions (Exp=0.50) and use a critical analysis in classes (Exp=0.53), these actions have a purpose (Exp=0.57), related to the understanding of the subjects (Exp=0.59) and have fundamental elements when studying for an exam (Exp=0.49). It is inferred that researching in various parts broadens the knowledge acquired by students and favors their learning process.

Factor 4	Factor loading
Responsibility	0.63
Self-regulation	0.57
Instruction	0.61
Study	0.49
Subjects	0.59
Activities	0.56
Research	0.69
Critical analysis	0.53
Training	0.68
constructivism	0.50
Effort	0.54
Explore	0.57

Table 16 Intrafactorial statistical behavior of educational exploration (2022)

Factor 5: School Tools

At the bottom is Table 17, which highlights that during the pandemic, students have handled computer applications more easily (exp=0.61), so with this medium it is easier for them (exp=0.74) to enter virtual classes (exp=0.48), do their homework (exp=0.71) and save them on digital platforms (exp=0.54). It is inferred that technological resources have played a fundamental role in the distance modality.

Factor 5	Factor loading
Technological resources	0.71
Tools	0.74
Class	0.48
Digital platforms	0.54
Software	0.61

Table 17 Intrafactorial statistical behavior of school tools (2022)

Conclusions

Next, the conclusions are presented through intervention proposals for the research axes in order to enhance excellence at the secondary level. For this reason, it was of special relevance that the data processing was carried out with a support in parametric statistics, in this way to achieve the criteria of reliability and validity in the results. Therefore, the contributions to generate a change for the benefit of the school community to improve the teaching-learning processes are observed below:

- Take the data to a congress where this topic can be presented, as well as its results.
- Carrying out a course focused on virtual education where it implies knowing what is related to technological tools.
- Disseminate the results in general high school No. 11 and in technical high school No. 4 so that both can know their areas of opportunity and thus offer a better quality education.
- Disseminate the results through social networks such as Facebook so that society in general learns more about virtual education.

- Disseminate the results to various secondary schools in the state so that the teaching staff can identify areas of opportunity for their virtual classes.
- Take the results to the state congress so that the importance of virtual education is debated and an educational policy is established that favors the implementation of strategies to improve learning processes in the distance mode.
- Establish an intervention model focused on distance education as a potential factor in educational quality.
- Establish dynamics in schools so that students can give their opinion related to the implementation of the distance modality.

STATISTICA (Version 7) [Software]. (1984-2004). StatSoft, Inc. This program is protected by US and international copyright laws.

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Foundations of the teen's second home

Cimientos del segundo hogar del adolescente

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Abstract

Man throughout history has sought to define what makes him reach his maximum splendor; For this reason, the present investigation developed the research question: ¿How are values related to the school climate in high schools No. 8 "Adolfo López Mateos" and No. 11 "Ricardo Flores Magón" in Saltillo, Coahuila? The present work is a comparative investigation for which 126 Secondary Level students were surveyed, enrolled in the third year, morning shift (Secundaria No.8 "Adolfo López Mateos" and No.11 "Ricardo Flores Magón"). The instrument that was applied was integrated by 8 signal variables and 50 simple variables, which were processed with the STATISTICA program. Among the main results, it was found that those school environments that satisfy the basic needs of furniture encourage the student to have the desire to continue with studies after secondary education. Likewise, the comfort of the students within the educational institution will be given thanks to a good performance of the teachers in terms of tutorials. Regarding the conclusions, it was found, among other things, that the networks of work among equals within the school community benefit the harmony and balance that must integrate an adequate school climate for learning; and that the successful academic projection in adolescents depends on the teaching promotion of an organized lifestyle.

Values, School climate, Secondary education

Resumen

El hombre a través de la historia ha buscado definir que es aquello que lo hace alcanzar su máximo esplendor; por lo anterior la presente investigación desarrolló la interrogante de investigación ¿Cómo se relacionan los valores con el clima escolar dentro de las secundarias No?8 "Adolfo López Mateos" y No.11 "Ricardo Flores Magón" de Saltillo, Coahuila? El presente trabajo es una investigación comparada para la cual se encuesta a 126 alumnos de Nivel Secundaria, inscritos en el tercer año, turno matutino (Secundaria No.8 "Adolfo López Mateos" y No.11 "Ricardo Flores Magón"). El instrumento que se aplicó se integró por 8 variables señalíticas y 50 variables simples, que se procesaron con el programa STATISTICA. Entre los principales resultados se encontró que aquellos ambientes escolares que satisfacen las necesidades básicas de mobiliario propician que el alumno tenga el deseo de continuar con los estudios posteriores a la educación secundaria. Así mismo que la comodidad de los alumnos dentro de la institución educativa estará dada gracias a un buen desempeño de los docentes en materia de tutorías. En cuanto a las conclusiones se encontró entre otras cosas que las redes de trabajo entre iguales dentro de la comunidad escolar benefician a la armonía y equilibrio que debe de integrar un clima escolar adecuado para el aprendizaje; y que la proyección académica exitosa en los adolescentes está en función de la promoción docente de un estilo de vida organizado.

Valores, Clima escolar, Educación secundaria

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Introduction

The present investigation seeks to identify the relationship that exists between values and the school climate within Secondary Schools No.8 "Adolfo López Mateos" vs. No.11 "Ricardo Flores Magón" in the city of Saltillo, Coahuila. General objective. To know how the values are related to the school climate within the high schools No.8 "Adolfo López Mateos" vs. No.11 "Ricardo Flores Magón" in the city of Saltillo, Coahuila.

Statistical objectives

- Identify the relationship that exists between the variables harmony and amplitude.
- Show the significant variables that make the difference between one population and another.
- Integrate the underlying structures of the phenomenon.

Justification. With the present work, the students of the secondary schools No.8 and No.11 will be benefited considering that the values within the school climate will have greater characterization, which allows the impact on the school climate and improvement in the security of the already mentioned schools. Secondary students in Coahuila will have the benefit that their teachers will be able to see characterized which are the values that promote an adequate school climate. In itself, the whole society will benefit, since by knowing what elements make up the phenomenon of study, a more committed and harmonious community can be obtained as a result.

Purpose. Achieve the proper integration of students into the everyday spaces in which they are immersed.

Goal. Contribute to the improvement of the school climate where students interact.

Theoretical framework

Throughout history, man has felt the need to live in society, which alludes to the need to set limits that contribute to harmony; For this, he has sought to understand what it is that allows a healthy coexistence with other people and, within this, it has been key for him to know and understand what values are.

Rokeach 1962, cited by Stefani et al., 2013, defines the values:

from the psychological perspective of value, as beliefs or principles that guide life, resist change, which are located at the center of an individual's global belief system. They are abstract ideals, positive or negative, independent of any specific object or situation, that represent a person's beliefs about the desired modes of behavior and about the ultimate goals to be achieved. (p.294)

Moreno and Mitrece (1996) argue that values are significant priorities that reflect the world internal of the subject and are manifested in his behavior. They are hierarchically structured in a value system, which is characterized by being sufficiently stable to allow the identity of a unique and singular personality, but with some instability to give rise to changes in personality produced by personal experience or by the process. of socialization.

In this sense, education has formed society according to the culture to which it belongs where there are particular habits, customs and ideologies; however, the goal of education is not focused on developing intellectual talent; but rather to provide the human being with capacities related to humanization, where values, ethics, morals, the rules of coexistence and the affective part unfold in their maximum splendor, in the words of García et al., (2011).

Returning to the fact that through education the individual can achieve humanization through a process to become a person of good with reflective attitudes in accordance with their principles where they exercise freedom and autonomy when making decisions which will be supported by the hierarchy of values that govern him, it is then that education in values translates into a humanizing process that marks the individual throughout his life, which will allow good relationships at a personal and social level, manifesting the virtues that distinguish him. From the perspective of Merma et al., (2013), since education is one of the pillars of society, the analysis of values within educational life is essential, for this it is necessary to delve into what is meant by climate school.

According to Herrera et al., (2014), the school climate should be understood as:

the quality of the school environment experienced by students, teachers and administrators, which, based on the perception they have about the school context, determines their behaviors. However, parents should be considered within the school climate, since it has been shown that for the integral development of the individual, the protection that the family nucleus provides from the beginning of existence is essential, in addition to the clear relevance that these have within the process of educational formation of the individual.

For his part, Sandoval (2014) mentions that "the school climate includes the environments for teaching and learning, the quality of relationships, the existence of clear rules, consensual discipline and the participation".

Methodology

Research typology. The present study is of a perimental cut, of a comparative and differential type carried out both by the population and some signal variables. The data obtained will be worked in a quantitative way since the corresponding statistical treatments will be carried out to obtain objective data that serve to propose alternative solutions.

General question. How are the values related to the school climate within the high schools No.8 "Adolfo López Mateos" vs.s No.11 "Ricardo Flores Magón" in the city of Saltillo, Coahuila?

Statistical questions

1. What relationship exists between the variables harmony and amplitude?
2. What are the significant variables that make the difference between one population and another?
3. 3. What are the underlying structures of the phenomenon?

Hypothesis

- The estimation of the relationship that exists between the variables harmony and amplitude.
- The showing of the significant variables that make the difference between one population and another.
- The integration of the underlying structures of the phenomenon.

Universe. 1,400 secondary school students in Saltillo; Secondary School No.8 "Adolfo López Mateos" and Secondary School No.11 "Ricardo Flores Magón".

Population. 450 Secondary students in the third year; Secondary School No.8 "Adolfo López Mateos" and Secondary School No.11 "Ricardo Flores Magón".

Sample. 140 third-year high school students, morning shift (Secondary No.8 "Adolfo López Mateos" and No.11 "Ricardo Flores Magón").

Characteristics of the subjects. This characterization is given by simple observation in the student populations of the General Secondary School No.8 "Adolfo López Mateos" and the General Secondary School No. 11 "Ricardo Flores Magón, both populations have a mixed population in terms of sex, without predominance of some; with an age range of approximately 12 to 15 years.

Conceptualization of axis variables. Values are defined as the set of qualities, habits (positive, negative) and beliefs that serve to establish norms that will contribute to harmonious coexistence, as well as the establishment of relationships that promote a sense of collective preference over individuality; which leads to a voluntary sacrifice to formulate ideas, goals, feelings, and interests based on the other.

The school climate is understood as the establishment of links between teachers, managers and students that will generate a pleasant environment based on trust, cooperation, camaraderie, and solidarity, in order to reduce the rate of conflicts, aggressions, threats and attitudes. selfish that may arise among the actors of the educational institution and affect the understanding of the issues to be met in the program.

Adolescence is conceptualized as a stage of development of the human being, in which the subject enters a crisis due to the intervention of previously non-existent factors, such as sexual relations, addictions, early pregnancy, hormonal, emotional changes, with the aim of that at the end of the change process an optimum degree of maturity is obtained for the adult life of the subject in question.

Instrument. In the first instance, it has a general data table, which is made up of 8 signal variables: 4 of them serve for the basic characterization of the subjects, and 2 anomalous variables, that will serve to identify the underlying structures of the phenomenon; It was decided that the responses of these variables are bounded. Next, the instructions are presented, where the subject is told that they must answer using a decimal scale (0-10), without leaving any empty space and that there are no correct or incorrect answers. In the lower part, the 50 simple variables to be answered are presented in a table format, of which 27 items are from the theme of "Values", and 23 are corresponding to the contrast "School climate" where the scale (0-10) is located on the right side and the items on the left side.

Information processing. Once confidence has been obtained for the final application of the instrument

We proceeded to work with the statistical programs: SPSS, STATISTIC, and Excel, which will serve for the foundation, objectification, and treatment of the results obtained in the final application. The levels that will be covered in the investigation are: frequencies and percentages, characterization, correlation, comparative and integrational.

Results

In order to explain the research axes Values and School climate that make up the study phenomenon, the relative frequencies obtained from the application of the research instrument were processed through different statistical programs in order to characterize both the population and the the study phenomenon through: frequencies and percentages, characterization, correlation, comparison, and integrational. It is worth mentioning that to obtain the development of parametric statistics, it was decided to work on the law of large numbers, because the necessary significance was found within the correlation between means and median, this in order to raise the levels of confidence in the explanations.

Frequencies and percentages. Next, the statistical processing of frequencies and percentages of the variables Age, Sex, Religion, Work, Application of values, Classroom, Music genre and Fast Soccer, which make up the study phenomenon, are presented.

Variable Religion. The relative frequencies of the signalitic variable Religion that is classified as Atheism, Catholic, Christian, Church of Jesus Christ of Saints, None, and Jehovah's Witnesses are presented, in which it can be observed that 14 of the secondary school students who were surveyed , belong to the Christian religion, being 11.11% of the entire sample, however, the Catholic religion is made up of 99 subjects in the sample, with 78.57%, the rest of the sample consider themselves atheists and of no religion . It is inferred that the subjects belonging to the Catholic religion are mostly represented.

Characterization. The characterization behavior of the study phenomenon is observed, which is made up of 50 variables of which 27 make up the values and 23 the study contrast, being the school climate construct, these variables present a normal distribution. Regarding \bar{x} , it is read that most of the variables are within the high values of the scale (10, 9, 8). It is deduced that those school environments that satisfy the basic needs of furniture encourage the student to have the desire to continue with studies after secondary education. In the mean of means reading, it is observed that the variables Aggression ($\bar{x} = 2.831$), Trust ($\bar{x} = 2.936$), Sacrifice ($\bar{x} = 4.824$), Beliefs ($\bar{x} = 2.738$), Coexistence ($= 4.008$), and Well-being ($\bar{x} = 0.935$) are below normality ($N = 4.969$, $X_x = 7.375$ $N = 9.779$). It is deduced that secondary school students do not have well-being, therefore, the coexistence they have in schools is affected.

Correlation. At this statistical level, we work with the total variance of the study phenomenon based on existing relationships. It should be noted that the operationalization of these relationships is based on a probability of error $p \leq 0.005$ and $r^2 \geq 0.13$.

Correlation of the Habits variable. It is observed that the students who are comfortable in their classroom ($r = .32$) is because they have teachers willing to clear up their doubts ($r = .29$) and promote entrepreneurship ($r = .27$) within the Therefore, they are competitive individuals ($r = .28$) who feel satisfied with their behavior in society ($r = .26$). It is inferred that the values acquired up to the stage of adolescence have a direct impact on a healthy lifestyle.

Comparison. A Student's T test is performed for independent samples.

6 variables out of 50 that resulted with significant statistical values are read, with a value of $p \leq 0.05$, which allows accepting or rejecting the working hypothesis that speaks of the showing of the significant variables that make the difference between one population and another: H1. Among the students of the Secondary School No. 8 "Adolfo López Mateos" and the students of the General Secondary School No.11 "Ricardo Flores Magón" there are differences of opinion regarding the observed variables.

In this sense, in the Aggression variable, the students of the General Secondary School No. 8 "Adolfo López Mateos" ($\bar{x} = 3.84$) have felt attacked (emotionally, physically) within the classroom to a greater extent than those students of the General Secondary School No.11 "Ricardo Flores Magón" ($\bar{x} = 1.75$). It is inferred that in the "Adolfo López Mateos" School the school environment has been more disturbed by attacks than in the "Ricardo Flores Magón".

In addition, the interest that the students of the General Secondary School No. 11 "Ricardo Flores Magón" give to their academic training and the curiosity that the contents arouse in them, impact areas such as expectations, and ideas, which have so much of them as well as their school authorities, which, from their perception, guarantee them to feel safe in the classroom.

Integrational. Next, an integrational analysis carried out with the factorial statistic is presented, which takes up the data of 126 subjects who responded to 50 variables that make up the study phenomenon; Said processing used the main method R²= multiple communalities with a normalized varimax rotation within a level of $p \leq 0.0001$ and $r \geq .30$, this serves to know the underlying structures of the study phenomenon.

Intrafactorial. An analysis of factors is shown, which is incorporated by 50 variables with 10 factors that explain 48.30%, which are presented below, it should be clarified that the Commulative Eigenvalue of 1,000 was taken into account, said value corresponds to the representation of the study phenomenon through the factorial load. Factor 1 is called Comprehensive Training (Exp= 4.11%), factor 2, Life Project, who retains (Exp= 3.14%), factor 3, called Moral Structure, which retains a charge of (Exp= 2.24 %), factor 4, Ethical structure, with a load of (Exp= 1.86%), factor 5, Social development, with a load of (Exp= 2.17%), factor 6, Student development, with a load of (Exp= 2.35%), factor 7, Institutional Dynamism, which has a load of (Exp= 2.90%), factor 8, Administrative Efficiency, with a load of (Exp= 1.78%), factor 9, School Comfort , which has a charge of (Exp= 1.77%), and finally, the factor 10, with the nomenclature of Collaborative work, which maintains a charge of (Exp= 1.84%).

Interfactorial. An analysis is presented where the presence of the same attributes in several factors is observed, which allows the formation of paradigms in favor of a common variance.

Factor 9 "School comfort". It is observed that the students do not ingest chemical substances to be able to cope with the school workload ($r = -.42$), thanks to the fact that they feel safe ($r = .51$) to ask for help ($r = .31$), and whether personal or academic, to their teachers because they tend to clarify all kinds of doubts ($r = .46$), which is why they are also willing to lend their class notes ($r = .31$) to their classmates. It is inferred that the comfort of students within the educational institution is given thanks to a good performance of teachers in terms of tutorials.

Discussion and Conclusions

According to the results obtained in this investigation, the following discussion is carried out with what has already been established by theorists.

Based on the results, it is agreed with Moreno and Mitrece (1996) who argue that values are significant priorities that reflect the internal world of the subject and are manifested in her behavior. They are hierarchically structured in a value system, which is characterized by being sufficiently stable to allow the identity of a unique and singular personality, but with some instability to give rise to changes in personality produced by personal experience or by the process of socialization. Because in the results, factors were observed that elucidate internal aspects of the subject and manifestations of behaviors, in which positive aspects that impact the socialization process underlie.

Sandoval (2014) mentions that "the school climate includes the environments for teaching and learning, the quality of relationships, the existence of clear rules, consensual discipline and participation". What the author said is supported according to the results obtained, since it is observed that the school climate includes aspects that impact the teaching-learning process, based on the fact that students have quality in their relationships.

Likewise, the conclusions that answer the research question are presented: How are values related to the school climate within the high schools No.8 "Adolfo López Mateos" and No.11 "Ricardo Flores Magón" in Saltillo, Coahuila?

It is concluded that the relationship of the values with the school climate of both conglomerates is the following:

Those school environments that satisfy the basic needs of furniture encourage the student to have the desire to continue with studies after secondary education.

- The values acquired up to the stage of adolescence have a direct impact on a healthy lifestyle.
- The population differences lie mainly in the interest that the students of the General Secondary School No. 11 "Ricardo Flores Magón" give to their academic training and the curiosity that the contents arouse in them, thus impacting areas such as expectations, and ideas that both they and their school authorities have, which, from their perception, guarantee them to feel safe in the classroom. The existence of significant differences is accepted and, therefore, the working hypothesis is affirmed.
- Working networks among equals within the school community benefit the harmony and balance that must integrate an adequate school climate for learning.

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Importance of breakfast in schoolchildren

Importancia del desayuno en escolares

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Abstract

Feeding during childhood is essential for the quality of life that is achieved in adulthood, which is why it is essential to start the day with a nutritious breakfast that provides the necessary macro and micronutrients according to the age of the children. There are several authors who mention that breakfast is the most important intake of the day. When the boy or girl begins their attendance at educational institutions, they require an adequate nutritional accompaniment, in order to be able to perform adequately in the academic-personal activities of their age. Objective: To increase the habit of having breakfast at home and to identify the characteristics of a healthy breakfast in schoolchildren. Methodology: In a descriptive, analytical and longitudinal study, through a population nutrition intervention project, food guidance activities were carried out weekly for 4 months to 437 schoolchildren in the municipality of Zacatecas. Contribution: At the end of the intervention activities, the number of schoolchildren who ate breakfast from home increased and identified that breakfast should not exclude healthy food groups, thus contributing to the modification of eating habits.

Resumen

La alimentación durante la niñez es fundamental para la calidad de vida que se llegue a tener en la edad adulta, es por ello que se hace indispensable iniciar el día con un desayuno nutritivo que aporte los macro y micronutrientes necesarios de acuerdo a la edad de los infantes. Existen varios autores que mencionan que el desayuno es la ingesta más importante del día. Cuando el niño o la niña empiezan su asistencia a las instituciones educativas requiere un acompañamiento nutricional adecuado, para poder desempeñarse adecuadamente en las actividades académicas-personales propias de la edad. Objetivo: Incrementar el hábito del desayuno en casa e identificar las características de un desayuno saludable en escolares. Metodología: En un estudio descriptivo, analítico y longitudinal, mediante un proyecto de intervención en nutrición poblacional se llevaron a cabo actividades de orientación alimentaria durante 4 meses, semanalmente a 437 escolares del municipio de Zacatecas. Contribución: Al término de las actividades de la intervención, aumentó el número de escolares que desayunaron desde casa e identificaron que el desayuno no debe excluir los grupos de alimentos saludables, contribuyendo así a la modificación de hábitos alimentarios.

Schoolchildren Breakfast, Healthy

Escolares, Desayunos, Saludables

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Introduction

Biological-physiological and psychosocial changes occur in the infant stage that allow adequate and healthy development at this stage (Zumba *et al.*, 2019). From the age of 6 years old, most children are ready to start learning and performing in a school environment. The first years are focused on learning basic aspects but gradually the focus becomes more complex (Ortiz & Cabrera, 2022); the ability to pay attention is important during growth both at school and at home, a child must be able to concentrate continuously on one or several tasks, this school performance also depends on good eating habits (López & González-Martí, 2022).

The school stage is defined as that between 6 and 12 years of age (United Nations Children's Fund (UNICEF), 2022), a period in which biological, psychological and behavioral changes occur and where the schoolchild acquires a certain independence from the family nucleus as a result of the school activities in which he/she begins to participate, which may require changes in food consumption patterns, either because of the acquisition of new habits or because they demand more energy and nutrients as they become more active.

The diet during the school stage should meet the nutritional demands that each person needs, covering without exception the different macronutrients: proteins, carbohydrates and lipids, as well as vitamins and minerals that are essential for healthy development and growth (McIntosh, 2022).

According to the Mexican Official Standard 043 of the Ministry of Health, the diet of the population, including school children, should be complete, varied, balanced, safe, sufficient and adequate to tastes and food preferences without sacrificing nutritional aspects; and in addition, three to 5 main meals a day should be considered: breakfast, lunch and dinner, as the most substantial meal, and two snacks or refreshments between them, which although they are lighter do not lose the aforementioned characteristics (Solana, 2016).

Importance of breakfast

Breakfast is one of the most relevant eating habits is the consumption of food before leaving home (Lizano-Vega, Madrigal & Cerna-Solís, 2021), it represents the first food consumed after a period of fasting during the night's rest (Martínez, 2019); This first meal provides the body with nutrients and calories that allow starting and carrying out the day's activities with sufficient energy and thus avoiding energy fluctuations, in addition to the fact that it can avoid the consumption of energy-dense foods or foods low in nutritional quality in the following meals of the day, as it regulates and contributes to metabolism and digestion (Meler & Burgos, 2022).

According to the President of the Spanish Foundation for Nutrition on the occasion of the National Breakfast Day (DND) 2022 in Spain, Ms. Rosaura Leis Trabazo, "Consuming a healthy breakfast is related to a higher daily intake of nutrients, better compliance with nutritional recommendations and a better quality of the total diet" (Moreno-Aznar *et al.*, 2021, p. 398).

In the latest health and nutrition surveys (ENSANUT) 2012 and 2018, in Mexico the combined prevalence of overweight and obesity was has been increasing in school children with a prevalence of 34.4% and 40.1% respectively (Shamah-Levy *et al.*, 2020).

Eating some foods for breakfast can influence to increase or decrease the consumption of others or provide combinations with higher or lower nutritional value. To configure a healthy breakfast, foods with high caloric content and low nutritional density, which simply contribute calories, fat, sodium or sugar to the total intake for the day, should be avoided (Moreno-Aznar *et al.*, 2021).

People who do not eat breakfast are more likely to become obese because they undergo prolonged fasting and when the first meal is received the body responds by accumulating it as an energy reserve.

Children with overweight and obesity (UNICEF, 2022):

- Have higher blood pressure.
- They are exposed to a higher risk of suffering from diseases such as diabetes, hypertension, cardiovascular and respiratory diseases.
- They are more likely to suffer from emotional problems such as depression, anxiety, stress, body preoccupation and low self-esteem.
- The vast majority will remain overweight or obese into adulthood if their diet is not modified.

Healthy breakfast

An optimal breakfast should include (López *et al.*, 2018):

- Bread and cereals preferably whole grains that provide the body with fiber and carbohydrates that provide energy, vitamins and minerals.
- Low-fat dairy that provide protein, calcium and vitamins.
- Fruits and/or vegetables that provide water, vitamins, minerals and fiber.
- Protein foods that provide protein, fat, vitamins and minerals.

Methodology to be developed

An observational, analytical and longitudinal study was carried out in a population of school children who belonged to a primary school in the municipal capital of the State of Zacatecas. The population consisted of 437 girls and boys from first to sixth grade of elementary school, it was considered as long as they answered the questionnaire and were present at the nutritional orientation provided; if they did not comply with this, they were eliminated from the study.

This work was monitored for 4 months, the students were given a survey type questionnaire with prior authorization (the school authorities were asked for permission to develop the project and each parent was asked for written consent where they were informed about the objectives of the same and the possibility of not authorizing to answer the questionnaire of eating habits), the purpose of the instrument used was to know the practice of breakfast before leaving home, as well as the identification of the food groups that compose it and was asked to identify options for healthy breakfasts; and after the talks (which were given weekly) and reinforcement of dietary orientation, the participants' breakfast habits were measured again.

Statistical analysis

IBM SPSS Statistics Package for the Social Sciences version 22 was used for data processing.

Ethical considerations

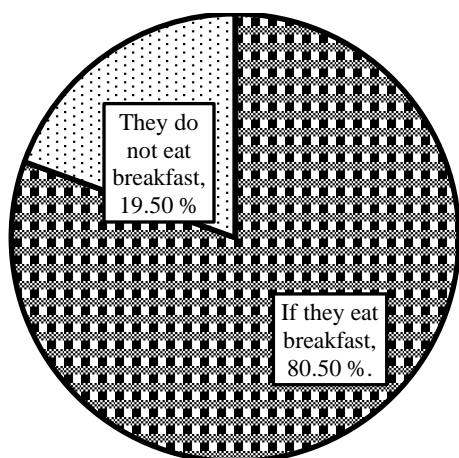
The study complied with the Declaration of Helsinki of the World Medical Association. It complied with the provisions of the regulations of the General Health Law on Research for Health in Mexico. It was declared safe.

Results

As already mentioned, the total sample was 437 schoolchildren. The instrument was applied at the beginning of the work to know the opinion of the surveyed population and also once the informative talks were given to show the importance of macro and micronutrients at breakfast (the survey was applied again).

Breakfast is considered one of the most important meals, since after eating dinner, food is not eaten again until the next day, as it is known, food is the fuel of the body because it transmits energy for all vital functions, according to nutritionists, breakfast is ultra necessary for schoolchildren.

At the beginning it was found that 19.5% of the participants did not have the habit of eating breakfast before going to school, but 80.5% did (see graphic 1).



Graphic 1 Responses to the question Do you eat breakfast before leaving home?

Source: Own elaboration

When the children were asked about the importance of eating breakfast, 89.9% mentioned that it is important and 10.1% did not consider it important (see Table 1).

	Frequency	Percentage	Valid percentage	Cumulative percentage
Si	393	89.9	89.9	89.9
No	44	10.1	10.1	100.0
Total	437	100.0	100.0	

Table 1 Responses to the question Do you know why breakfast is important?

Source: Own elaboration

Food is fundamental at all ages, but in the case of children it is necessary for growth, and goes hand in hand with good health. Infants learn about eating habits depending on their family, since they are in the mother's womb and later through breast milk, this becomes more acute depending on the growth and good habits that each family has, children at this age also know how to recognize if a breakfast is adequate or not. When asked if they know what an adequate breakfast is, they said that they did (85.8%), but there are also those who said they did not know (14.2%).

In order to learn more about healthy breakfasts, they were asked questions to see if they considered that a cereal with milk can be an adequate breakfast, they mentioned no with 36.6%, followed by don't know with 32.3% and finally yes with 31.1%. They were also asked if they can consider a breakfast only a bread with milk and the boys and girls mentioned yes with 41.5% followed by 36.0% don't know and 22.8% that they do not know.

Likewise, when asked their opinion about having a healthy breakfast with only an apple, 42.6% said yes, 27.7% said no and 29.7% said they did not know.

As mentioned in the methodology, food-nutritional orientation activities were carried out for boys and girls, in which topics were considered that would allow this population to have more knowledge about healthy breakfasts and their impact on health.

The first talk that was handled with the children was about healthy and unhealthy food groups, the purpose of this was that the school children were able to identify the plate of good eating as the Mexican guide of food orientation and as a basis for the consumption of healthy foods, allowing to recognize the healthy food groups that should compose each meal time, thus achieving an adequate and healthy dish for the age of the infants.

Another talk was about correct nutrition, here the objective was to identify the characteristics of a diet to be considered as correct for the stage of life in which the children are, the correct ones that a correct diet should consider were explained (see Figure 1): safety (free of microorganisms and pathogens), balanced (containing amounts of carbohydrates, proteins and lipids), sufficient (covering the energy needs for daily activities of the age), adequate (to the tastes and nutritional needs of the stage), complete (containing all healthy food groups) and varied (including a diversity of foods from each group).



Figure 1 Food-nutritional orientation

Source: Own elaboration

One of the central talks within this work was the approach to the importance of breakfast (see Figure 2), where the benefits of breaking the fast after the night's rest hours and as an initial part of the day's activities were explained and fed back to the children. This is necessary to reduce fatigue and tiredness, to avoid energy fluctuations during the day, to perform at school, to help concentration, metabolism and development and growth.



Figure 2 Food and nutrition orientation, with the theme importance of breakfast
Source: Own elaboration

For the orientation on healthy beverages for school children, a workshop was held, in which it was possible to expose and identify that beverages are part of every meal time but that there are drinks that do not always comply with the characteristics of being healthy due to their high sugar content (see Figure 3), and many others that should not be consumed at school age due to their content of stimulating substances such as caffeine; these drinks can also damage physical and even dental health in frequent consumption.



Figure 3 Food and nutrition orientation talk on the importance of breakfast.
Source: Own elaboration

Likewise, when the topic of food groups that make up a healthy breakfast was taught, the students were very attentive, since the components of a healthy breakfast and lunchbox were addressed (see Figure 4), the purpose was for the students to recognize which are those components that in a meal of this type should be considered, this to show if through their few years of life they will identify if what they consume as breakfast is nutritionally adequate for their age because of deficiencies among the food groups that compose them.



Figure 4 Food-nutritional orientation session, with the theme of food groups that make up a healthy breakfast
Source: Own elaboration

At the end of the dietary-nutritional orientation, the survey was applied again in order to analyze the impact that this information could have had on the children, and the results showed that when asked again "Do you eat breakfast before leaving school?" There was an increase with respect to the answers given before the orientation, as can be seen in Table 2, where it can be seen that after the orientation there was an increase of 2.6% with respect to the previous answer.

Similarly, when the responses to the question about the importance of eating breakfast after the lectures were analyzed, there was an increase of 7.6% in terms of the responses obtained, going from 89.9% before to 97.7% after the lectures. There was also an increase in the students' responses to the question about the importance of eating breakfast, from 85.8% to 94.7%, which translates into an increase of 8.9%.

	Before		Then	
	Frequency	Percentage	Frequency	Percentage
Si	352	80.5	363	83.1
No	85	19.5	74	16.9
Total	437	100.0	437	100.0

Table 2 Responses to the question Do you eat breakfast before leaving school? before and after orientation

Source: Own elaboration

Where the impact of the orientation was most noticeable was in the children's perception of the consumption of only cereal and milk as an adequate breakfast, since there was a variation of 38.7% in terms of not considering it adequate, this can be seen because in the initial survey it was 33.6% and in the final survey it was 75.3%, and as for the students who did not know, the percentage was reduced by 90%.

This also goes hand in hand with the significant change in the percentages of students who believe that eating bread with milk for breakfast is adequate, going from 51.1% in the initial survey to 5.9% in the final response.

The percentage of students who believe that eating only one apple is healthy began the survey with 51.7% and in the second survey the percentage dropped to 37.3%.

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Conclusions

As a result of the research and intervention, we were able to increase the number of school children who eat breakfast at home before going to school; the most noticeable changes were when considering the importance of breakfast for their health and acquiring this habit. The most significant was that once the food groups and characteristics of a breakfast to be considered healthy, complete and age appropriate were demonstrated, they were able to identify when a breakfast was incomplete.

During the school stage, the population is very receptive to new information; and it is crucial for the acquisition of new eating habits to work in this population to prevent diseases such as malnutrition, non-communicable diseases and other lifestyle-related ailments.

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The MTSK and TSD: didactic planning as a proposal for the learning of rational numbers in fifth grade primary school pupils

El MTSK y la TSD: planificación didáctica como propuesta para el aprendizaje de los números racionales en alumnos de quinto grado de educación primaria

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Abstract

This research shows how, based on an analysis proposal based on the MTSK (Mathematics Teacher Specialized Knowledge) (Carrillo, Montes, Contreras, & Climent, 2017), related to the use of the TSD didactic device (Theory of the didactic situations), it was possible to favor the learning of the content of rational numbers, specifically from the part-whole relationship sub construct and the understanding of the same in students of the 5th grade of a primary school. The results show a greater mastery of the content in question and with it, the students' learning advanced towards different levels of complexity through the established representations and relationships.

Mathematics, Didactics, Specialized

Resumen

La presente investigación muestra cómo, a partir de una propuesta de análisis basada en el MTSK (Conocimiento especializado del profesor de matemáticas) (Carrillo, Montes, Contreras, & Climent, 2017), relacionado con el uso del dispositivo didáctico de la TSD (Teoría de las situaciones didácticas), se logró favorecer el aprendizaje del contenido de los números racionales, específicamente desde el sub constructo relación parte-todo y la comprensión de los mismos en alumnos del 5° de una escuela primaria. Los resultados muestran un mayor dominio del contenido en cuestión y con ello, el aprendizaje de los alumnos avanzó hacia niveles de complejidad distintos a través de las representaciones y relaciones establecidas.

Matemáticas, Didáctica, Especializado

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Introduction

Among the specific objectives that have been proposed in basic education is that students learn to analyze, reflect and solve mathematical problems through conventional algorithms so that they can communicate and interpret different numbers and apply them in everyday life. However, recent results and evaluations (OECD, 2017), show that mathematics present problems in its teaching and learning, particularly, in one of its contents, which are assumed in such evaluations to be of greater complexity: "fractions".

This paper offers an analysis of the way in which teachers perceive fractions and the way in which they work with them, in order to determine to what degree their mastery of the content influences their students' learning.

In this sense, the need arises to understand what the student must learn and for this, the strategies applied for teaching must be considered, so that the student can access the creation of a concept rather than the mastery of a procedure. From this research, it is intended to generate or complement strategies that imply greater results in which school distances, referred to inequalities among students, are less and less, allowing to reach favorable comprehension levels that avoid failure or school lag.

Likewise, it allows building a broader notion about what fractions imply both in the concept and in the procedures for the resolution of problematic situations, in such a way that they lead students to evolve in their conceptualizations in order to advance in increasingly complex levels.

Theoretical framework

We start from the fact that fractions have multiple definitions and representations, but what determines their teaching is the way in which students "grant meaning and establish relationships" (Chamorro, 2003), so that students must adapt new representations and cognitive demands that will be used in different situations.

At this point, we consider one of the delimitations that will be addressed in this research, which is established as a measure and which the author Ma. Del Carmen Chamorro (2003) defines as "relationship between a part and a whole (whether continuous or discrete). The situations that configure this interpretation of the rational number imply situations of measurement and therefore consider a whole divided into parts. The rational number indicates the relationship between the part and the whole" (p. 192).

In Primary Education, it is essential to establish relationships between the first three types of knowledge, that is, "how the representations and language used help to give meaning to the symbols and their manipulation" (Chamorro, 2003, p. 200), in such a way that the students' construction process regarding the topic of fractions can be understood, with the intention that they develop or build representations.

In this same line, the author Juan D. Godino (2004) expresses that the teaching and learning of fractions in students represents a great change in their way of thinking, which brings with it different difficulties in the way they are accustomed to using numbers. Therefore, he mentions that students should understand the notion of fractions progressively in order to build and develop the different meanings derived from them.

Salvador Llinares (1997), states that the meaning of fractions has two different meanings: "on the one hand, it is presented to us as <<the division of a whole into its parts>>, or <<the parts of a whole>>. On the other hand, within the meanings of Arithmetic there are meanings such as <<broken number>>, <<expression that indicates a division that cannot be carried out>>" (Llinares & Sánchez, 1997, p. 18).

With this he mentions that regardless of the meaning that we give and that prevails in most people, since we are children we are in constant contact with this concept, since we use expressions in which these are immersed.

The understanding of the part-whole relationship opens the way and gives rise to different interpretations of fractions, which, with its use, generates the language and symbols that will form the basis for working with rational numbers. For this reason, it is expressed that the teacher must be careful and pay special attention when working with these contents.

In order to carry out the aforementioned activities, a device is required to help us carry them out in a progressive manner, in which an analysis of the student's knowledge can be performed. For this reason, the Theory of Didactic Situations formulated by (Brousseau, 2007) is implemented.

This model is a proposal that is seen as a production process in which relationships are established, transformed and reorganized.

The environment plays a very important role, since it includes the problems faced by students, with the intention of modifying relationships as they interact and produce knowledge, through the implementation of validation of procedures in problem solving.

Based on this, two types of situations are mentioned:

- Didactic situation: it is intentionally constructed so that the student acquires knowledge, but for this, there must be interactions between subject/medium and student/teacher.
- Adidactic situation: the student faces the problem without the intervention of the teacher. This leads the student to incorporate new ideas, which "give rise to the conscious rejection of erroneous decisions" (Sadovsky, 2005, p. 6).

In turn, Panizza (2003), describes the basic concepts of the Theory of Didactic Situations, which arises from the French School of Didactics of Mathematics. It mentions that:

(...) The theory of situations appears then as a privileged means, not only to understand what teachers and students do, but also to produce problems or exercises adapted to the knowledge and to the students and finally to produce a means of communication between researchers and teachers. (Brousseau, 1999, cited in Panizza, 2003, p. 3).

Within these concepts, it is important to clarify that the intention that children learn certain mathematical knowledge does not disappear in the adidactic situation, but refers to the fact that "the student must relate to the problem, responding to it based on his knowledge, motivated by the problem and not to satisfy a desire of the teacher, and without his direct intervention in helping him to find the solution" (Panizza, 2003, p. 5).

However, not only the student's knowledge should be considered when developing activities, but also, it is important to take into account the teacher's knowledge "what he/she knows, how, what makes it possible, what he/she needs, which will allow designing training proposals (initial and continuous) consistent with such needs" (Climent, et al., 2014, p. 42).

From this, professional knowledge is seen as support for the teacher's own development, so an analysis of the practice in which it is contemplated must be carried out.

Taking the above aspects as a reference, the (MTSK; Carrillo, Montes, Contreras, & Climent, 2017) Mathematics Teacher Specialized Knowledge, for its acronym in English, which is observed its emergence from Shulman's contributions and its distinction of two components:

- Content knowledge of the subject to be taught (MK).
- Didactic knowledge of the content to be taught (PCK).

From which the MKT is configured, which considers "the teacher's knowledge for teaching mathematics closely linked to the mathematical content and is evidenced from teaching situations (hence its name)" (Climent, et al., 2014, p. 44).

The purpose of MTSK is "to understand what knowledge the teacher has/needs" (Climent, et al., 2014, p. 47) with the intention of transforming it in practice by making sense of teaching-learning situations:

Mathematics Teachers' Specialised Knowledge (MTSK) has a duality in that it is a theoretical proposal that models the core knowledge of the mathematics teacher's professional knowledge and is, in turn, a methodological tool that allows the analysis of different practices of the mathematics teacher through its categories (Climent, et al., 2014).

It is recognized then, that it arises as a response to the difficulties of the MKT, although it retains the two domains proposed by Shulman, and confers three subdomains to each one:

- Mathematical knowledge, which refers to the knowledge of the discipline taught, so it should be considered, to know what and how mathematics knows/should know. Within this, the following subdomains are established:
 - Knowledge of mathematical topics (KoT): the teacher must know the contents and meanings of the contents he/she teaches in a grounded manner.
 - Knowledge of mathematical structure (KSM): This refers to the knowledge of the relationships that the teacher makes between different contents, either of the course he/she is teaching or with contents of other courses or educational levels.
 - Knowledge of mathematical practice (KPM): Emphasizes the importance of the teacher not only knowing the established mathematical results, but also the ways of proceeding to reach them and the characteristics of mathematical work.
- Didactic knowledge of the content (PCK): It characterizes as a particular knowledge of the teacher, the teaching work itself. The following subdomains are distinguished:

- Knowledge of learning characteristics (KFLM): encompasses knowledge about the learning characteristics inherent to the mathematical content.
- Knowledge of mathematical teaching (KMT): knowledge of resources, materials, ways of presenting the content and the potential it may have for instruction, as well as knowledge of appropriate examples for each given content, intention or context.
- Knowledge of mathematics learning standards (KMLS): knowledge that a teacher has about what a student is expected to learn and the conceptual level at which he or she is expected to learn it at a given time in school.
- In general, these elements allow the teacher to focus and use them as a tool to have the knowledge that is useful to perform his or her work, so they are used for the analysis of this research and the following scheme is considered:

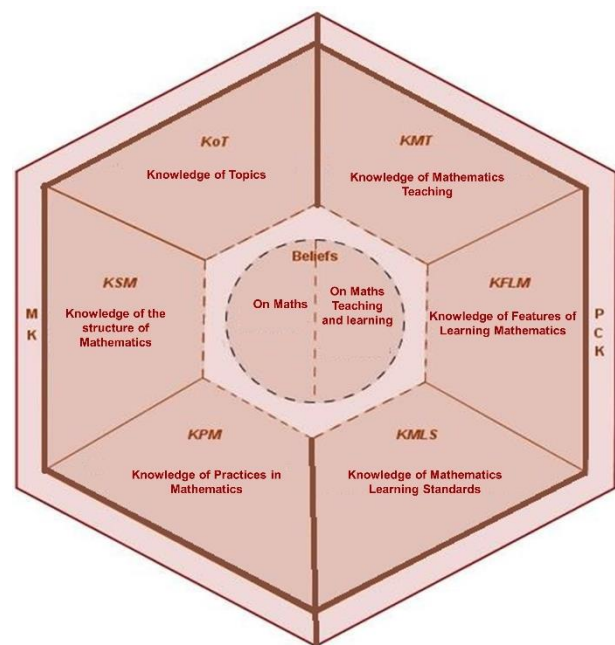


Figure 1 Diagram of the MTSK

Methodology

A qualitative approach was used since it allows the use of data collection involving an interpretative approach to the object of study.

A didactic device is shown as a proposal that includes the theoretical proposals of the TSD and the MTSK, in addition to contemplating aspects of content mastery with respect to fractions.

The purpose is to visualize planning as an initial guideline for programming, analysis and reflection on professional practice, in this sense, there is an opportunity from the two theories addressed to deepen the knowledge that the teacher has about the content, and its didactification, in addition to translate it into a powerful teaching device for mathematics.

Results

The proposal that concentrates The MTSK, The TSD in the teaching of fractions in the mentioned school grade is shown below:

Subject: Mathematics	Axis: Number sense and algebraic thinking
Mathematical Content Knowledge (MK)	
Knowledge of Mathematical Topics (KOT):	
For the development of these activities it is important that students recognize the meaning of a fraction, which is understood as follows:	
Fraction: It expresses a numerical value that, unlike natural numbers, represents quantities of an object that has been divided into equivalent parts. In turn, it consists of two important elements for its understanding:	
Numerator: It is the number that indicates the parts we have or have taken and is written above the dash, for example: $\frac{2}{6}$	
Denominator: It is the number that indicates the parts into which the object has been divided and is written below the dash, for example: $\frac{2}{6}$	
It is necessary to consider that there are also different types of fractions:	
Proper fractions: Those in which the numerator is smaller than the denominator, for example: $\frac{1}{3}$	
Improper fractions: Fractions in which the numerator is larger than the denominator, for example: $\frac{4}{3}$.	
Mixed fractions: Fractions in which an integer and a fraction are written together, for example: $1\frac{1}{2}$.	

Knowledge of the Structure of Mathematics (KSM):
Knowledge package shown in APPENDIX 1.

In this scheme, the relationship of the different contents that are worked on in the topic of fractions are shown, which go from the commensuration of the unit with the context starting with the measurement that begins with lengths and later capacities, with the intention that the teacher introduces formally the fractions: $\frac{1}{4}$, $\frac{3}{4}$, $\frac{2}{5}$, $\frac{1}{2}$, etc.

From this, equivalent parts are generated, to understand the part-whole relationship and the concept of unity that integrates the numerator and denominator. It continues with the formalization of fractions that are converted into integers, for example: $\frac{6}{6} = 1$, and mixed and improper fractions are integrated and their representation from the transformation by converting them.

Knowledge of Mathematical Practice (KPM):

This aspect considers the teaching and learning of the content, for which, it is important to take into account the curricular considerations that establish the following:

- Students should use mental calculation, estimation of results or written operations with natural numbers, as well as addition and subtraction with fractional and decimal numbers to solve additive and multiplicative problems.

It is suggested that students build knowledge and skills with meaning and significance, such as solving problems that involve the use of fractional numbers; also, a work environment that gives students, for example, the opportunity to learn to face different types of problems, to formulate arguments, to use different techniques depending on the problem to be solved, and to use mathematical language to communicate or interpret ideas.

Didactic Content Knowledge (PCK)

Knowledge of learning standards (KMLS):

Mathematics Standards:

Students know how to communicate and interpret quantities with natural, fractional, or decimal numbers, as well as solve additive and multiplicative problems using conventional algorithms:

1.1.1.1. Reads, writes, and compares natural, fractional, and decimal numbers.

1.2.1. Solves additive problems with fractional or decimal numbers, using conventional algorithms.

Expected Learning: Knowledge of different representations of a fractional number: with numbers, with surfaces, etc. Analysis of the relationship between the fraction and the whole.

Mathematical Competence:

- Solve problems autonomously
- Communicate mathematical information
- Validate procedures and results

- Manage techniques efficiently																																																		
Topic: "Let's learn fractions with different surfaces".																																																		
Content: Representation of fractions on different surfaces.																																																		
Knowledge of mathematics teaching (KMT):																																																		
DIDACTIC MATERIAL: Different surfaces (triangles, circles, squares, rectangles).																																																		
A priori analysis: The group of 5 "A," has shown in a diagnosis and different exercises that they have difficulties in recognizing the notion of a fraction and the elements of which it is composed, referring in this case to the numerator and denominator, since they have repeatedly confused these terms when writing the representation of a rational number. Likewise, most of the students have shown that they have complications in making graphical representations because they get confused when establishing relationships between the part-whole notion, mainly in what refers to improper and mixed fractions, because they do not identify the number of elements or figures that must be used to make the representation or conversion to whole numbers.																																																		
Preparation of the medium: Before starting with the session, an activity consisting of a fraction bingo as follows will be performed:																																																		
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B	I	N	G	O	B	I	N	G	O																																									
For this activity we will use different cards like the previous ones, with the intention of recognizing the students' previous knowledge (how they represent a rational number when they hear it, how they identify the numerator and denominator and how they identify proper, improper and mixed fractions).																																																		
Group organization: The bingo activity will also bring students together to work in pairs.																																																		
CONSIGNA - I am going to give you a sheet of paper that contains some figures, these are divided and shaded in different parts (the figures will be pointed out). In the two little squares in front of each figure you have to write the fraction that you think is represented. - Then they will have to take out the figures that they were given as homework (circle, triangle, square rectangle) and represent the fractions that I am going to write on the blackboard, here they must consider that each one will choose the figure they want and the divisions they make must be exactly the same.																																																		

- RESTRICTIONS: Students will not be able to ask for help from other pairs, since it is a pair activity.
RETURN OF THE QUESTIONNAIRE: Students will be asked randomly: What does the activity consist of? How will we organize ourselves?
DEVELOPMENT OF THE CLASS:
PHASES
ACTION: -The following worksheet will be given to students to identify the fractions that are represented:
- Next, students will be asked to represent the following fractions, considering that the partitions they make must be exactly EQUAL IN THE FIGURES THEY CHOOSE TO USE FOR THEIR REPRESENTATION:
$\frac{1}{4} \quad \frac{4}{8} \quad \frac{1}{2} \quad \frac{3}{6}$
Once this is done, they will be instructed to cut out each of the partitions made in the figure to do the following:
<ul style="list-style-type: none"> - The children will be instructed to put together different parts of a figure to observe how another fraction is obtained, e.g.: - Take $\frac{1}{4}$ plus $\frac{1}{4}$ of the same figure and realize that they form $\frac{1}{2}$. - Take $\frac{1}{2}$ plus $\frac{1}{2}$ of the same figure to realize that it forms 1 whole. - Put together $\frac{1}{8}$ plus $\frac{3}{8}$ of the same figure to realize that you get $\frac{4}{8}$ or else $\frac{1}{2}$. - Put $\frac{1}{6} + \frac{1}{6} + \frac{1}{6}$ together and realize that you get $\frac{3}{6}$ or $\frac{1}{2}$. - Put $\frac{6}{6}$ together and realize that you get 1 whole. - Put $\frac{4}{4}$ together and realize that it forms a whole.

- Once the activity is finished, the students will be given figures similar to the ones they already had so that they can divide them in the same way as the previous ones, with the intention of forming improper and mixed fractions (here it is that the students manage to represent the indicated fraction and transform it into a mixed fraction), for example:
- First figure that is divided into 8 parts plus the 8 of the second one that has been divided in a similar way gives us a total of 16, of which we take 11 and it is represented as $11/8$ or else 1 integer and $3/8$.
- From the previous figure, we take $12/8$ which can also be represented as 1 integer and $1/2$.
- From the previous figure we take $16/8$ which can also represent 2 integers.
- A figure that is divided into 6 parts plus the 6 parts of the second one that has been similarly divided gives us a total of 12, from which we take $10/6$ which also represent 1 integer and $4/6$.
- From the previous figure we take $8/6$ which also represent 1 integer and $2/6$.
- A figure that is divided in 2 parts plus the 2 of the second one that has been divided in a similar way gives us a total of 4, from which we take $4/2$ that also represents 2 integers.
- A figure that is divided into 4 parts plus the 4 of the second one that has been similarly divided gives us a total of 8, of which we take that, also representing $8/4$ which also represents 2 integers.

FORMULATION: Within each team (bina) they will analyze the figures presented in the activity to write the fraction that is represented in each case.

In the same way, they will analyze and reflect on the figure that is easier for them to represent the previous fractions.

VALIDATION: Each group will share with the rest of their classmates the figures they used to represent the fraction, the way they divided each figure and why they did it that way, for which different questions will be asked:

Which fraction did they consider the easiest to represent?

Which figure did they use?

Why did they use that figure and not another one?

Which fraction was the most difficult to represent? Why?

Which figure did they use to represent the most difficult fraction?

Which of the figures was the most difficult to divide into equal parts?

How can they form a whole with the shapes they have (students will have to choose one of the shapes to give an example)?

How do you get a half (students will use the different shapes to form a half)?

How can they represent 1 whole $3/8$?

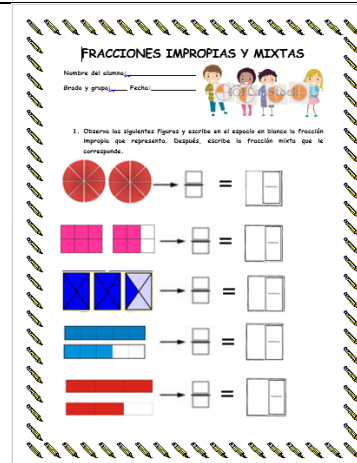
Using one of the figures, how can they obtain 2 integers?

How can they get 1 integer a half (use a figure to explain)?

INSTITUTIONALIZATION:

Once the previous activities are finished, the elements of a fraction will be explained, which in this case are the numerator and denominator, and which are important for students to be able to represent a fraction, as well as proper fractions.

We will also explain improper and mixed fractions and how to obtain a mixed fraction from an improper one, taking some examples with the figures formed by the students, as part of this, a worksheet will be integrated:



Knowledge of the characteristics of learning mathematics (KFLM):

- Among the most common difficulties that can be found in students when developing the activities, are the following:
- Students do not identify the difference between numerator and denominator and it is noticeable when writing the representation of fractions.
- Students perform the divisions of a given fraction but these are not equal.
- Students have trouble identifying how a fraction is obtained from joining different parts of a division, i.e., establishing part-whole relationships.
- Students have difficulty understanding improper fractions and it is noticeable because they cannot represent them with the given figures.

Students have trouble transforming an improper fraction to a mixed fraction because they do not establish relationships with the given figures.

Chamorro (2003) emphasizes that the representations of fractions allow the student to give them meaning and establish relationships to understand this notion, thus making it easier for him to find meaning in solving problems where he feels motivated to apply different strategies. Based on this, Godino (2004), Llinares & Sánchez (1997) establish different proposals for teaching:

- Chamorro, embraces a recursive theory in which seven aspects are considered: inventing, structuring, formalizing, observing properties, having images, constructing images and doing.
- Godino, proposes three types of models or representations: areas (in which rectangular or circular figures are used), by means of sets (representation with objects), and linear (numerical line).
- Llinares and Sánchez, develop a sequence in which 6 topics are broken down into different points: unit (identifying the number of units, quantities larger or smaller than the unit), parts of a unit using concrete materials (number of parts of a unit, parts of the same size, dividing a unit into equal parts), oral names by part of the unit (establishing the name of fractions, using fractions to answer "how many", identifying fractions equal to one, identifying fractions equal to one), identifying fractions equal to one, identifying fractions equal to two, identifying fractions equal to one, identifying fractions equal to one, and so on, identifying fractions equal to one), writing fractions to represent parts of the unit -translations between representations- (from oral to written form or vice versa, from concrete to written form or vice versa), representing fractions with drawings (transition from objects to diagrams, repetition of previous steps) and extending the notion of fractions (fractions greater than one, mixed fractions, use of sets, comparison of fractions).

Despite the fact that each one proposes different strategies, it is possible to determine that in all cases learning is carried out in a progressive manner, with which the pupil acquires a structured knowledge that goes from the informal to the formal, in such a way that the children learn to interpret, to construct concepts with which they can solve problems.

Likewise, Godino, Llinares & Sánchez coincide in the use and implementation of geometric figures such as the circle, rectangle and square, because they are easy to divide according to the denominator and they are also the ones with which the students are most familiar, however, within this, there is a difference, since the second authors propose the establishment of other figures such as the rhombus and the pentagon to expand the notion of rational numbers.

On the other hand, the Theory of Didactic Situations is presented, approached by Panizza (2003) and Sadovsky, who approach it from different phases (action, formulation, validation and institutionalisation) to understand the way in which the student acts when in contact with the environment (problem situation), this allows to interpret the work that he/she executes, since not only his/her results are considered, but it is contemplated through a process.

However, it is important to recognise that in the teaching-learning process, the student does not act alone, but requires a mediator of the knowledge he/she is expected to acquire, that is to say, he/she requires the support of the teacher (not in the erroneous sense of being a mere transmitter of knowledge), as it is he/she who develops situations in accordance with the needs of the classroom.

This is why we include a methodological proposal by the authors Medrano, Ávila, Montes, Aguilar, & Carrillo (2013), called MTSK (Mathematics Teachers' Specialised Knowledge), which includes the analysis of the content domain that the teacher requires/needs to put into practice, this through two domains and their three corresponding sub-domains, as it is from this that he/she will design the strategies that he/she considers relevant to carry out with the students.

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Clearly explain the problem to be solved and the central hypothesis.

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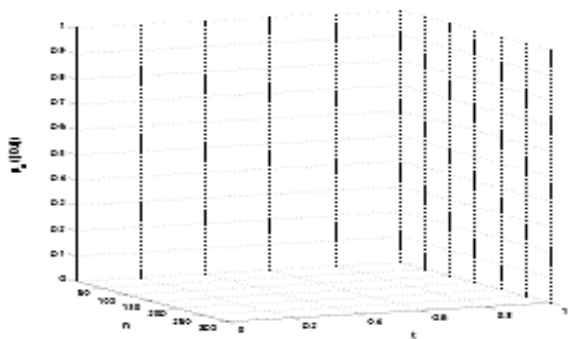
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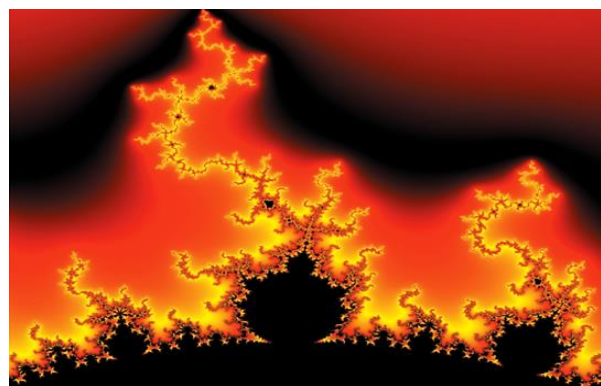


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