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Presentation of the Content

In the first article we present, *A study oriented to significant learning: Learning styles*, by HERNÁNDEZ-CRUZ, Luz María, CASTILLO-TÉLLEZ, Margarita, MEX-ÁLVAREZ, Diana Concepción and UICAB-BRITO, Luis Alberto, with adscription in the Universidad Autónoma de Campeche and Instituto Tecnológico Superior de Hopelchén, as the next article we present, *Leadership, a way of life that should be teached from the beginning of school education* by VIEYRA-REYES, Patricia, BERNAL-GARCIA, María Paula and TRUJILLO-CONDES, Virgilio Eduardo, with adscription in the Universidad Autónoma del Estado de México, as the next article we present, *Universal Learning Design (ULD) and instructional strategies for inclusión,* by MUÑOZ-LÓPEZ, Temístocles, AYALA-GARCÍA, Jacqueline, SÁNCHEZ-RIVERA, Lilia and ESPERICUETA-MEDINA, Marta Nieves, with adscription in the Universidad Autónoma de Coahuila, as the next article we present, *Methodology for the management of Academic projects requirements in Research calls for a requirements organizing system* by VARGAS-PÉREZ, Vanessa Atenea, VARGAS-PÉREZ, Laura Silvia and DIBUT-TOLEDO, Lázaro, with adscription in the Universidad Internacional Iberoamericana and Instituto Tecnológico de Ciudad Madero.

Content

A study oriented to significant learning: Learning styles

Un estudio orientado al aprendizaje significativo: Estilos de aprendizaje

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Abstract

Education is a priority axis for the government of our country, Mexico. The teaching-learning process is a challenge in each classroom, its importance lies mainly in raising the productivity of society. In this context, the application of pedagogical approaches and environments that allow meaningful learning are sought. For its part, we identify learning styles as cognitive, physiological and affective traits, of how students perceive, interact and respond to different learning environments. The objective of this research is to analyze and evaluate learning styles as an indicator that serves as a starting point to distinguish the way in which students learn and guide the teaching act in the design of learning strategies according to a segmentation of students of according to their learning styles or their predominance to achieve meaningful learning. The study proposes a field investigation using the Honey Alonso Learning Styles Questionnaire (CHAEA) as a data collection instrument. The methodological process of the research was divided into two phases: the first covers the design and application of the CHAEA instrument. In the second, the results obtained by means of a frequency analysis are exhibited.

Learning style, Significant knowledge, CHAEA

Resumen

La educación constituye un eje prioritario para el gobierno de nuestro país, México. El proceso de enseñanza-aprendizaje es un reto en cada aula, su importancia radica principalmente en elevar la productividad de la sociedad. En este contexto, se persigue la aplicación de enfoques pedagógicos y entornos que permitan un aprendizaje significativo. Por su parte, los estilos de aprendizaje son rasgos cognitivos, fisiológicos y afectivos, de cómo los estudiantes perciben, interaccionan y responden a los diferentes ambientes de aprendizaje. La presente investigación tiene como objetivo principal analizar y evaluar los estilos de aprendizaje como un indicador que sirva de punto de partida para distinguir la forma en que aprenden los alumnos y guiar el actuar docente en el diseño de estrategias de aprendizaje conforme a una segmentación de estudiantes de acuerdo con ellos, a fin de alcanzar un aprendizaje significativo. El estudio plantea una investigación de campo utilizando el cuestionario Honey Alonso de Estilos de Aprendizaje (CHAEA) como instrumento de recogida de datos. El proceso metodológico de la investigación se dividió en dos fases: la primera abarca el diseño y aplicación del instrumento CHAEA. En la segunda, se exhiben los resultados obtenidos mediante un análisis de frecuencias.

Estilo de aprendizaje, Conocimiento significativo, CHAEA

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† Researcher contributing as first author.

Introduction

The study presents the importance of learning styles within the meaningful learning system. A field research is conducted on university students in the area of computer science using the CHAEA questionnaire aligned to Honey and Mumford's model as a data collection instrument.

The main objective of this research is to analyze and evaluate learning styles as an indicator that serves as a starting point to distinguish the way in which students learn and to guide teachers in the design of learning strategies according to a segmentation of students according to them, in order to achieve meaningful learning.

The central hypothesis of the study establishes that the way in which students learn allows for a segmentation with its own characteristics that leads to meaningful learning. The sections of the article involve:

a)   The state of the art: it includes the priority foundations of meaningful learning, learning styles and the CHAEA questionnaire.

b)   The methodology: defines the description of the methodological design carried out in the field research conducted. And finally

c)   Presentation of the results: shows the frequency analysis of the findings derived from the field research data collection.

State of the art

Significant learning

Learning is a process of individual and social construction that the learner must regulate. Biggs argues that four conditions are necessary for learning (Biggs & Burville Biggs, 2006):

–   Well-structured knowledge base
–   Appropriate motivational context
–   Student activity
–   Interaction with others

Significant learning is characterized by:

–   Development of autonomy: learning is centered on the student who is primarily responsible for it.

–   Creation of critical sense: through permanent processes of reflection.

–   To be dynamic: due to its cyclical nature and where the significant learning obtained at a given moment subsequently becomes prior learning.

–   Personal: because the new knowledge is significantly related to the student's interests, allowing him/her to be interested in retaining the new knowledge.

–   Development of creativity: if the new information does not easily adapt to the student's cognitive structure and the student is interested in acquiring the new information, associations will be made that allow him/her to acquire significant knowledge.

–   Being a metacognitive process: the learner makes conscious, learning to learn.

As a theoretical reference associated with meaningful learning, Piaget and García (2008) state, in relation to the construction of the different forms of knowledge, that these are sequential, i.e., that knowledge is the consequence of the results of previous knowledge, and this in turn will be the necessary condition for the construction of a new one. Figure 1 shows the meaningful learning system.
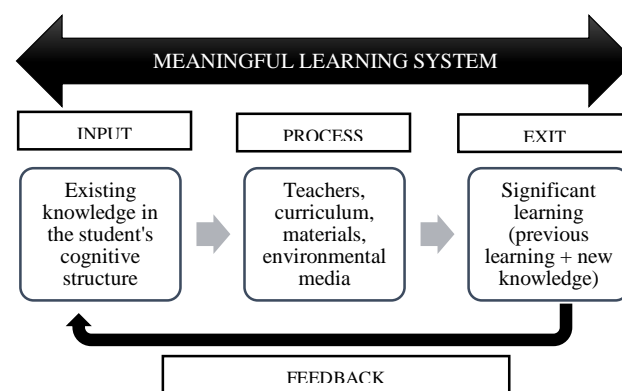

Figure 1 Meaningful Learning System
Source: (Ahumada Méndez & et. al., 2019)

Based on the learning system

The present study addresses two critical points: student-centered learning and the importance of environments in the learning process. Furthermore, valuing that, the significant knowledge acquired, in turn, will become an input to the system, that is, prior learning.

In the teaching-learning process, the product resulting from the task performed by the student is as important as the process followed to perform it. If the teacher wants to have complete information on the learning process of his students, he cannot forget either of these two aspects. However, currently there are educational currents that give priority to the importance of "how" over "what". That is to say, they focus on the processes used, the strategies chosen, the mistakes and successes made, etc. Each student faces a task according to his or her own cognitive, affective and behavioral variables. Hence the differences that exist between different people when performing the same task.

In the educational field, the learning style is defined as the way of perceiving a task, of facing it and performing it, and will depend on personal cognitive, affective and physiological traits. Learning styles must be considered as individualized profiles that will be determined by different aspects such as the learning processes that each student sets in motion, the physical conditions required in the task (Design of Teaching-Learning Environments: Considerations based on NLP and Learning Styles, 2017).

The challenge circulates around the idea of the value of teaching styles and learning styles as a contribution to a comprehensive education and the articulation of teaching processes according to the interests, needs and motivations of social actors. Likewise, it seeks to glimpse alternatives to understand the performance of the teacher and the student in the relationship established in teaching and learning, highlighting the leading role of each person in the construction of knowledge. (Ruiz Ospino & Sánchez Fontalvo, 2019).

Learning styles

One classification of learning styles is that proposed by Honey and Mumford (1986), who suggest that students should be able to adopt each of the four learning styles they propose in their model in order to successfully solve diverse learning tasks. The four learning styles proposed in the Honey-Mumford model are: active, reflective, theoretical, and pragmatic.

Students with an active style show ease in learning, but just as easily forget what they learn. They tend to be improvisational learners.

Students with a reflective style think about the why of things. They think exhaustively about why things happen.

On the other hand, students with a theoretical style find it difficult to abandon their previous theory, their way of doing things. They tend to be critical of the versions that appear.

And finally, the pragmatic style experiments with the new. It is usually a realistic profile.

The research

The research proposes a field study in the Faculty of Engineering of the Autonomous University of Campeche. The purpose is to be able to segment or group students with the same ways of learning. From this, the need arises to apply a specific instrument to assess or weigh the four different learning styles of Honey-Mumford (active, reflective, theoretical and pragmatic) and thus affirm the hypothesis proposed.

In this sense, the Honey-Alonso Questionnaire of Learning Styles (CHAEA) is an instrument to diagnose learning styles. Inscribed within the cognitive approaches to learning, it is based on the vision of learning in line with Kolb, Juch, Honey and Mumford. These authors propose a scheme of the experiential learning process divided into four stages:

–   Living the experience: Active Style.
–   Reflection: Reflective Style.
–   Generalization, Hypothesis development: Theoretical Style.
–   Application: Pragmatic Style.

The reliability and validity of CHAEA has been demonstrated based on the relevant statistical tests by analyzing the Learning Styles in a sample of 1371 students from 25 faculties of the Complutense and Polytechnic Universities of Madrid. (Navarro Cadavid, Fernández Martínez, & Morales Vélez, 2013).

The CHAEA Questionnaire consists of eighty questions (twenty items referring to each of the four learning styles) to which one must respond with agreement or disagreement. In addition, a series of socio-academic questions have been added, which provide a total of eighteen variables to analyze the relationships between these variables and the responses to the items. (Alonso & Honey, 1994).

Like Honey and Mumford, CHAEA posits the existence of four learning styles (Sáez López, 2018):

–   Active: People with predominance in the Active Style are fully involved and without prejudice in new experiences. They are open-minded, not at all skeptical and undertake new tasks with enthusiasm. They are very group-oriented people who get involved in the affairs of others and center all activities around them.

–   Reflective: Reflective people like to consider experiences and look at them from different perspectives. They collect data, analyzing it carefully before reaching a conclusion. They are people who like to consider all possible alternatives before making a move. They enjoy observing the actions of others, listen to others and do not intervene until they have taken ownership of the situation.

–   Theorist: Theorists adapt and integrate observations into logical and complex theories. They tend to be perfectionists. They integrate facts into coherent theories. They like to analyze and synthesize. They are deep in their system of thought, when it comes to establishing principles, theories and models.

–   Pragmatic: The strength of people with a predominantly Pragmatic Style is the practical application of ideas. They discover the positive aspect of new ideas and seize the first opportunity to experiment with them. They like to act quickly and confidently on ideas and projects that appeal to them. (Cañas, 2000).

Methodology

The methodological process of the research was carried out as described below:

The design of the CHAEA questionnaire was implemented with the Google Forms Tool to easily, quickly and consistently submit, collect, consolidate and analyze the results. Figure 2 shows the CHAEA questionnaire (digital) divided into 4 categories, where the specific questions for each of the learning styles are combined in each block.

The evaluation of the sample was performed using the CHAEA test score scales of learning styles shown in Table 1.
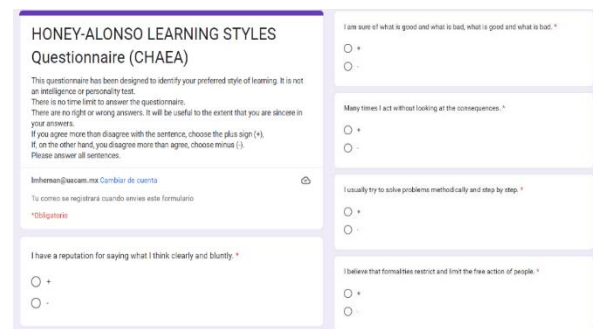
Figure 2 The CHAEA questionnaire in Google Forms
Source: Own

Style	Preferences				
	Very low	**Low**	**Moderate**	**High**	**Very High**
Active	0-6	7-8	9-12	13-14	15-20
Reflective	0-10	11-13	14-17	18-19	20
Theoretical	0-6	7-9	10-13	14-15	16-20
Pragmatic	0-8	9-10	11-13	14-14	16-20

Table 1 Scoring scales for the questionnaire CHAEA
Source: (Buzón García, Romero García, & Verdú Vázquez, 2021)

The population of the field research covers two groups of the last active semester of the Computer Systems Engineering Educational Program in the 2022-2023 Phase 1 school year with a maximum total of 100 students of the Faculty of Engineering of the Autonomous University of Campeche. The sample size was defined using the Normal Distribution formula:

$$n = k^2 qpN / (e^2(N-1) + k^2 pq) \qquad (1)$$

The minimum required sample size is 67 subjects, Table 2 shows the values and the calculation performed.

Parameter	Description	Value
N	The total number of people who could be surveyed.	80
k	Probability that the answers are true. A confidence level of 95% was proposed here,	1.96*
p	Proportion of individuals in the population that possess a specific characteristic.	50%**
q	Proportion of individuals who do not possess a specific characteristic, q=1-p.	50%
e	Difference between the responses of the sample and the total population.	5%
n	Sample size	66.35
* Confidence level of 95% ** The same probability of success or failure is taken.		

Table 2 Calculation of the sample size with normal distribution
Source: Own

The questionnaire was sent to 100% of the population. However, only the following responded 70 students, which is sufficient for an accepted sample. The Questionnaire can be accessed from the following link:

https://forms.gle/bXY5QzcLX1DuQ4Rq5

Results

Next, after collecting the data through the CHAEA Questionnaire (using institutional e-mail as a channel), the results obtained for each of the four learning styles previously described are presented. Figure 3 shows the concentrate of the data obtained through Google Forms and exported for analysis to Microsoft Excel 2019. The data collected are downloaded into an Excel spreadsheet, consolidating the results obtained according to the score scales of the CHAEA questionnaire specific to each learning style.
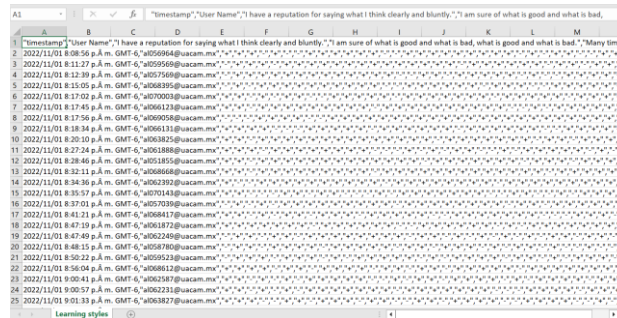
Figure 3 Database collected through the CHAEA Questionnaire in the field study
Source: Own

After consolidating the results by each category, i.e., by learning style, Table 3 reveals the ratings obtained from the field study.

Learning style *	MA	A	M	B	MB
Active	39	19	10	1	1
Reflective	3	4	35	21	7
Theoretical	25	17	22	6	0
Pragmatic	13	13	27	9	8
* MA=Very high, A=High, M=Moderate, B=Low and MB=Very low					

Table 3 Consolidated results of the data collected in the field study
Source: Own

Analyzing the consolidated results of the field study, out of 70 students who answered the CHAEA Questionnaire, for the Active learning style dimension, the majority, 39 out of 70 students obtained a preponderance for the Very high scale, corresponding to 56%, and an additional 27% for the High scale. Graph 1 shows the result obtained for the "Active" learning style.
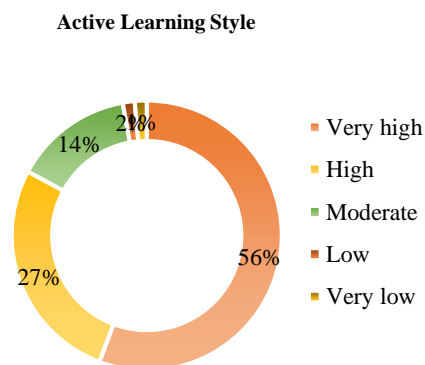
Graph 1 Results for the Active Learning Style
Source: Own

The results of the field study for the Reflective learning style dimension obtained a preponderance for the Moderate scale corresponding to 50%, and an additional 30% for the Low scale. Graph 2 shows the results obtained for the "Reflective" learning style.

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Reflexive Learning Style
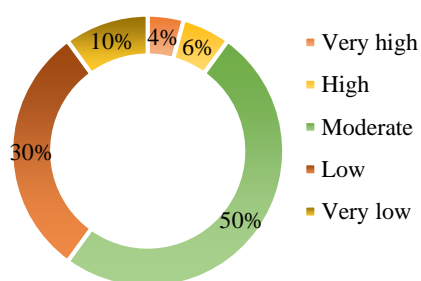
Graph 2 Results for the Reflective Learning Style
Source: Own

The Theoretical learning style dimension, on the other hand, obtained a preponderance for the Very high scale corresponding to 36%, and an additional 31% for the Moderate scale. Graph 3 shows the result obtained for the "Theoretical" learning style.

"Theoretical" Learning Style
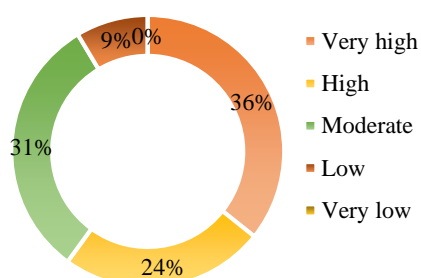
Graph 3 Results for Theoretical Learning Style
Source: Own

The results of the field study for the Pragmatic learning style dimension, for the most part, obtained a preponderance for the Moderate scale corresponding to 38%, and an additional 19% for the Very high and High scale. Graph 4 shows the result obtained for the "Pragmatic" learning style.

Pragmatic Learning Style
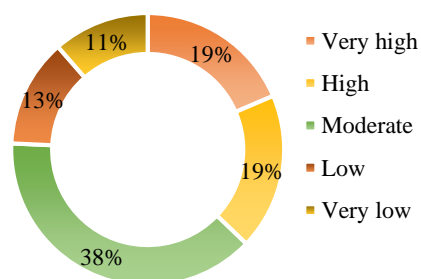
Graph 4 Results for the Pragmatic Learning Style
Source: Own

Conclusions

The quality of education is a continuous challenge in the development of our country, Mexico. However, educational models must be focused mainly on student learning. From this, the diversity of teaching-learning strategies becomes valuable when they are in accordance with the learning styles of specific groups of students.

Aligning methodological and didactic activities to the predominant learning style(s) will have a positive impact on the significant knowledge achieved by students.

Evaluating, distinguishing and considering learning styles in the educational task is undoubtedly a strategy that allows segmenting groups of students to specifically determine, accordingly, how and what tools will be used to carry out learning.

Finally, it should be emphasized that learning styles are only one aspect of the perspective of the way or manner to reach meaningful knowledge, but it is not the instrument or the tool.

References

Ahumada Méndez, L. S., & et. al. (2019). *Estrategias de enseñanza y aprendizaje: una mirada desde la investigación.* Bogotá, Colombia: Universidad Cooperativa de Colombia. ISBN 978-958-760-193-0.

Alonso, C., & Honey, P. (1994). *LOS ESTILOS DE APRENDIZAJE. PROCEDIMIENTOS DE DIAGNÓSTICO Y MEJORA.* Bilbao, España: Mensalero.

Biggs, J., & Burville Biggs, ,. (2006). *Calidad del aprendizaje universitario.* Madrid, España: NARCEA S. A. DE EDICIONES. ISBN 84-277-1398-3.

Buzón García, O., Romero García, C., & Verdú Vázquez, A. (2021). *Innovaciones metodológicas con TIC en educación.* Dykinson S. L. ISBN 978-84-1377-319-3.

Cañas, J. L. (2000). *Cómo estudiar en la U.N.E.D. (y redactar trabajos universitarios).* Madrid, España: Publidisa. ISBN 82-8155-656-4.

Diseño de Ambientes de Enseñanza-Aprendizaje.: Consideraciones con base en la PNL y los Estilos de Aprendizaje. (2017). Bogotá, Colombia: Ediciones Universidad Simón Bolivar. ISBN 978-958-651-611-2.

Navarro Cadavid, A., Fernández Martínez, J. D., & Morales Vélez, J. (2013). Revisión de metodologías ágiles para el desarrollo de software. *Prospectiva, 11*(2), 30-39.

Ruiz Ospino, E. A., & Sánchez Fontalvo, I. (2019). *Qué piensan los profesores universitarios de los estilos de aprendizaje.* Bogotá, Colombia: Universidad de Málaga. ISBN: 978-958-746-187-9.

Sáez López, J. M. (2018). *ESTILOS DE APRENDIZAJE Y MÉTODOS DE ENSEÑANZA.* Madrid, España: Universidad Nacional de Educación a Distancia. ISBN 978-84-362-7472-1.

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Leadership, a way of life that should be teached from the beginning of school education

Liderazgo, una forma de vida que debe enseñarse desde que inicia la educación escolar

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Abstract

Context: Leadership is a quality that is reflected in attitudes and actions. It is built on the abilities of individuals and groups.It helps in decision making to achieve objectives that improve lifestyles, exploit skills and attitudes, and provide practical and effective solutions to everyday problems. In a globalized world, the leader can learn and enhance their knowledge about living with different cultures, languages, dialects, and ages. Objective: To analyze and explain, based on the literature, why leadership is a way of life that should be taught from the beginning of school education. Method: A systematic review of specialized literature was carried out using the following search engines: Library of Congress, Scholar Google, and Redalyc. Purpose: a) to define leadership, b) to show tools that support the teaching of leadership, c) to inform about the importance of teaching leadership. Results: Teaching leadership requires preparation and support, teachers should encourage students to stay motivated, enthusiastic to learn; teach them to deduce, distinguish, and form themselves. Conclusions: Leadership is a way of life that leads to the transformation of society. Not preparing leaders contributes to form people who are limited at a competitive level and in decision making.

Leadership, Education, Scholar

Resumen

Contexto: El liderazgo es una cualidad que se refleja con actitudes y acciones. Se desarrolla a partir de habilidades de personas y grupos. Ayuda en la toma de decisiones para alcanzar objetivos que mejoren estilos de vida, exploten aptitudes y actitudes y den soluciones prácticas y efectivas a problemas cotidianos. En un mundo globalizado, el líder puede aprender y potenciar sus conocimientos en torno a la convivencia con diferentes culturas, lenguas, dialectos y edades. Objetivo: analizar y explicar, con base en la literatura, porque el liderazgo es una forma de vida que debe enseñarse desde que inicia la educación escolar. Método: Se realizó revisión sistemática de literatura especializada empleando los motores de búsqueda: Library of Congress, Scholar Google y Redalyc. Finalidad: a) definir y clasificar liderazgo, b) definir herramientas que apoyen la enseñanza de liderazgo, c) justificar la importancia de enseñar liderazgo. Resultados: Enseñar liderazgo exige preparación y apoyo, directivos y profesores deben incentivar y motivar al alumnado a comunicarse, aprender, deducir, distinguirse, formarse y actualizarse. Conclusiones: El liderazgo constituye un estilo de vida que encamina a la transformación de la sociedad. No preparar líderes contribuye a formar personas limitadas a nivel competitivo y en la toma de decisiones.

Liderazgo, Educación, Escolar

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1. Introduction

Leadership is inherent to human beings; it is an intrinsic characteristic of the species. It is a quality that is reflected in attitudes and actions. Other definitions indicate that it is the ability to influence a group of people to achieve a vision or set of goals (Robbins, 2002). It is a highly interactive and shared process that involves the establishment of direction, vision and strategies to reach a goal (French, 1996). A leader is someone whose qualities, attitudes, knowledge and skills in the field in which he/she operates achieve synergies, motivate and commit in a non-coercive and individualistic manner (Páez-Gabriunas, 2004).

From the beginning of school education is the best time to develop permanent leadership skills. By motivating and opening the panorama of options and possibilities that children and young people have in the present and future, it is possible to avoid the school dropout that is widely rooted in several Latin American countries and that, with the opening of new schools, has not been able to be controlled.

When training leaders, the teaching of effective communication is indispensable, in addition to knowing the great advantages of learning from cultural and generational diversity. The negative effects of excessively controlling one's own actions or those of others must also be taught; a controlling subject opens the door to the development of destructive leadership such as: authoritarianism and narcissism. Authoritarians and narcissists are egocentric, overconfident, domineering, highly aggressive and unable to accept constructive dissent; which impacts the well-being of peers or collaborators generating permanent negative feelings (helplessness, dislike, anger, resentment) (Rosenthal & Pittinsky, 2006; Schyns & Schilling, 2013).

The leader must have a positive impact with ethics and values in each of his actions, whoever teaches leadership must be an example of this. The objective of this paper was to analyze and explain, using various bibliographic sources as support, why leadership is a way of life that should be taught from the beginning of school education.

2. Method

A systematic review of specialized literature was carried out using the following keywords: leadership, education, lifestyle, school. These words were chosen given the broad nature of the concept in order to focus on the teaching of leadership during school education.

The search databases were: Library of Congress, the largest library in the world; Scholar Google, Google's search engine focused and specialized in the search of scientific-academic content and bibliography; Redalyc; Red de Revistas Científicas de América Latina y el Caribe, España y Portugal - disseminates scientific articles in open access. Inclusion criteria: articles related to the teaching of leadership in school education. Exclusion criteria: references with a focus on labor leadership or in a specific area, for example, health sciences.

Selection process: after searching in each database, the following number of documents was obtained: Library of Congress: 22; Scholar Google: 50; Redalyc: 15: Library of Congress: 22; Scholar Google: 50; Redalyc: 15. Subsequently, we proceeded to review, select and compile based on the inclusion and exclusion criteria; and then analyze and structure the present paper.

3. Results

After entering the keywords in each search engine, 87 articles were obtained. When analyzed by applying the inclusion and exclusion criteria, only 20 articles met the requirements.

3.1. Leadership

Leadership is the ability that develops from the characteristic skills of individuals and groups. It can be exercised in any environment, whether educational, family, sports, professional, scientific, social, military or political. It is based on influencing and motivating others, transforming people and groups, it is a potential opportunity for individual and social growth that seeks positive results for all; completely excluding the development of narcissistic or egocentric characteristics of those involved (Excelencia, 2015).

Today's society needs leaders who have a solid foundation and know the right direction in which to walk to achieve their goals. To the question "What is leadership in society?", we must answer categorically that it is the assumption of responsibility, it is to be creative, innovative, assertive, risk-taking, optimistic and proactive.

Leadership development occurs from home education (Seago, 2012); and should be oriented and sustained during school education, since children learn to be leaders just when they begin to read, write and develop mathematical skills (Seago, 2012). The consideration of personality traits as an indicator and predictor of leadership style should be explored (Frey, 2007). Talking about leadership styles is a very broad topic that can be reflected in various classifications.

3.2. Leadership classification

Over the course of time, different types of leadership have been identified and developed, moreover, they continue to emerge day by day, in this section we will describe only some of the best known types. Precisely, Paez and Yepes, 2004, classify and summarize leadership in 6 sections (Paez-Gabriunas, 2004):

– Leadership as a personal characteristic: it is based on the skills of the person who exercises it.
– Leadership as a behavior: it concludes that in addition to the attributes that the leader may possess, he/she has a way of addressing others and the situations he/she faces that make him/her acquire the trust of his/her followers through the communication and vision he/she projects.
– Leadership as an ability: highlights that he/she must have the ability to carry out what he/she promotes in a constant challenge of renewal, motivation and ability to expose to the maximum the attributes of each of his/her followers.
– Leadership as a function: the leader, in addition to occupying the position of leader, must find a way to integrate the work of the team, motivating and involving them in such a way that they strive to achieve common results.

– Leadership as a process: implies the participation of different agents, which must interrelate, recognize and accept each other, with a clear direction towards a common goal.
– Leadership as an art: emphasizes the analysis of expectations and perceptions, and prioritizes interpersonal relationships as a vehicle for group success in a dynamic, continuous and unexpected process.

Another classification of leadership is focused on development, from which two concepts emerge:

Transactional leadership

The leader identifies the desires and preferences of his followers and helps them to achieve them, creates dependencies (Gómez-Rada, 2014;; JM, 1978).

Transformational leadership: the leader is characterized by the ability to inspire his followers to achieve greater goals than those initially planned and to obtain intrinsic rewards. He must use his ability to convince and transform his followers to continue growing and improving for the benefit of the group (Gómez-Rada, 2014; JM, 1978). Poutiatine, 2009; developed nine principles of transformational leadership with the goal of developing understanding of transformational processes. These principles help educators consider how the educational environment, methods and pedagogies favor leadership processes (Poutiatine, 2009). These principles are:

– Transformation is not synonymous with change.
– Transformation requires consent for change.
– Transformation always requires changing a second order.
– Transformation always involves all aspects of an individual's or organization's life.
– Transformational change is always irreversible.
– Transformational change involves letting go of any myth of control.
– Transformational change involves some aspects of risk, fear and loss Loss.

−   Transformational change always involves broadening the scope of one's view of the world world.
−   Transformation is always a movement toward greater integrity of identity; a movement toward wholeness. identity; a movement towards wholeness .

Another type of leadership that has emerged is sustainability leadership. These leaders are those who take discretionary actions to protect the environment and impact social welfare; with ethics and respect for human rights, making their core strategy in close collaboration with stakeholders (European Commission, 2011).

A sustainability leader must know that our world faces more challenges than ever before in terms of declining global ecosystems, population growth and unprecedented macroeconomic pressure. Most sustainability leaders recognize that while some of their efforts to create a more sustainable world will work, many will not (Beth, 2022).

Education for sustainable development underscores the idea that education is a way to equip students with the body of knowledge, skills, attitudes, and values needed throughout their lives to enact sustainable development, progress, or growth. Education for sustainability (ES) is broader, as sustainability is integrated into education across the board and aims to change the behavior of individuals so that they live in tune with their society, their *environment and the planet (Bianchi, 2020).*

Policies to introduce sustainability issues in education have existed since the 1970s (Scott, 2009). However, their approach has changed emphatically since the beginning. Michelsen, 2016 has divided the evolution of education for sustainable development into three key phases: the orientation and experimentation phase, spanning from the 1970s to 1990, focusing on environmental issues; the transition phase, running from 1990 to 2000, with the introduction of development-related topics; and the expansive phase up to 2014 and onwards, which focuses on sustainability (Bianchi, 2020; Michelsen, 2016).

3.3. Useful tools to be learned by a leader

a)   Being innovative

Innovation is the ability to exploit knowledge and translate it into potential educational, even economic, benefit. It is known that the innovative strength of a nation or organization can be modified by changing (parts of) its culture.

A practical implication of this finding is that a government can, for example, increase the innovative strength of its nation by encouraging cooperation between different institutions and by limiting rules and regulations that might cause barriers in the innovation process. To enhance a nation's innovative strength, for example, by implementing leadership education from the beginning of school education, a government needs to pursue a proactive policy of transforming the national culture. For example, changing the education system, for the good of society, and decreasing the power distance between teachers and students.

b)   Leveraging cultural diversity

It is a fact that in a globalized world, students from different countries, regions, religions and even dialects coexist in classrooms. Diversity and inclusion continue to grow in importance and must be recognized as part of the dynamics of leadership. Geert Hofstede, 2001 identified cultural behaviors based on multiple studies from the 1980s involving more than 50 countries (Hofstede, 2001). Such cultural values must be taken into account when leading any action in order to understand the possible responses in the groups.

Hofstede's cultural values. Taken from Piet Moonen, 2017 (Moonen, 2017).

Power distance

Reveals the extent to which power and hierarchical relationships are considered essential in the culture in question. For example, it has been argued that bureaucracy, strict control and detailed instructions reduce creative thinking and activity**.**

Individualism vs. collectivism

Individualism can be defined as a preference for a loosely knit social framework in which individuals are expected to care only for themselves and their immediate family members. Collectivism, on the other hand, represents the preference for a close-knit social framework in which individuals expect (reciprocally) that their family members or members of a particular in-group will take care of them in exchange for unconditional loyalty.

Individualistic cultures value freedom more highly than collectivistic ones. Therefore, in individualistic societies employees have more opportunities to try something new.

Masculinity vs. femininity

Masculinity represents the preference in society for achievement, heroism, assertiveness and material reward for success. Society in general is more competitive. Its opposite, femininity, represents the preference for cooperation, modesty, discretion, tolerance, solidarity, caring for the weak and quality of life. Society in general is more consensus-oriented.

Uncertainty avoidance

This is how a society deals with the fact that the future can never be known: should we try to control the future or let it happen? Or just let it happen? Countries that exhibit strong uncertainty avoidance maintain rigid codes of belief and behavior and are intolerant of unorthodox behavior and ideas. Societies with weak uncertainty avoidance maintain a more relaxed attitude in which practice counts more than principles.

Long-term vs. short-term orientation

Long-term orientation can be interpreted as society's pursuit of virtue. Societies with short-term orientation tend to have a strong concern for establishing absolute truth. They are normative in their thinking. They show great respect for traditions, a relatively small propensity to save for the future, and a focus on achieving quick results. In long-term oriented societies, people believe that truth is highly dependent on situation, context and time. They show an ability to adapt traditions to changing conditions, a strong propensity to save and invest, and perseverance in achieving results.

Indulgence vs. restraint

Indulgence represents a society that allows relatively free gratification of basic, natural human urges of urges related to the enjoyment of life and fun. Restraint represents a society that suppresses need gratification and regulates it by strict social rules.

Monumentalism vs. self-efficacy

Monumentalism represents a society that rewards people who are, metaphorically speaking, like monuments: proud and immutable. Its polar opposite, self-efficacy, represents a society that rewards humility and flexibility.

After knowing the points that a leader must take into account in terms of cultural values in order to know the ideals he has learned throughout his life and understand the ideals of others, let us know what he must consider in terms of generational diversity.

c) Leveraging generational diversity

A generation is a set of individuals who, having been born in the same period of time, would be exposed to similar social and cultural experiences. It can also be defined as an age group that shares throughout their history a set of formative experiences that distinguishes them from their predecessors (Novo-Varela, 2015).

Currently, academic environments are marked by generational diversity, which represents a challenge when it comes to carrying out teaching-learning processes. Given that generational gaps are widening and what is relevant for one generation is not relevant for another, it is essential to know the ways of assuming knowledge, interpreting it and reviewing its concepts (Rocío Moldes, 2021). Any school that aspires to prepare its students for a global and diverse world must know and teach about intergenerational talent in the school itself. To do this, it is necessary to know what the intergenerational differences are and how these generations perceive each other. The following is a classification of the generations and the main characteristics of each of them (Figure 1).
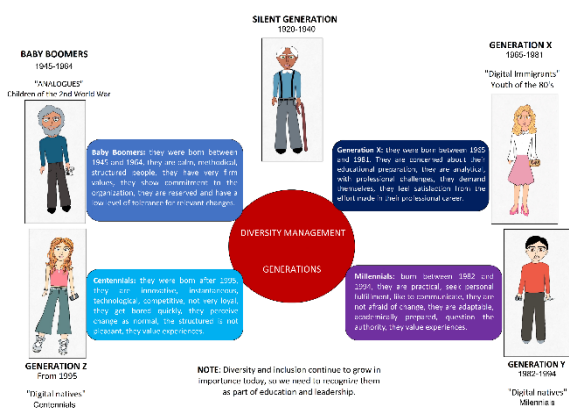
Figure 1 Intergenerational Diversity Management

By knowing the representative characteristics of the behavior of each generation, the understanding of their attitudes and reactions will be more obvious and will lead us to a better approach to them. When teaching about the transcendence of generational diversity, we must emphasize the teaching of collaborative leadership, which is based on the formation of teams and the abandonment of hierarchies. In addition to the indispensable teaching of emotional intelligence, defined very succinctly as the ability to effectively connect thinking and communication on the basis that our emotions guide (or bias) behavior and decision making (Damasio, 1994). Moreover, intergenerational diversity management is considered a type of leadership, "intergenerational leadership"; a dimension of collaborative or team-type leadership that prioritizes the generational factor combined with emotional intelligence to achieve effective communication (Rocío Moldes, 2021).

d) **Practicing effective communication - a cornerstone of leadership:**

Empathy (putting oneself in the other's place), active listening, respect, and together, the keys to effective communication practiced at the classroom level, will improve and promote interaction between students within the development of a work or project in order to enable them to achieve common goals based on real problems. Once this great tool is learned and practiced constantly in the classroom, the student will be able to use it in his daily life, bringing positive results individually and in his relationship with others.

The keys and elements of effective communication are shown below (Figure 2).
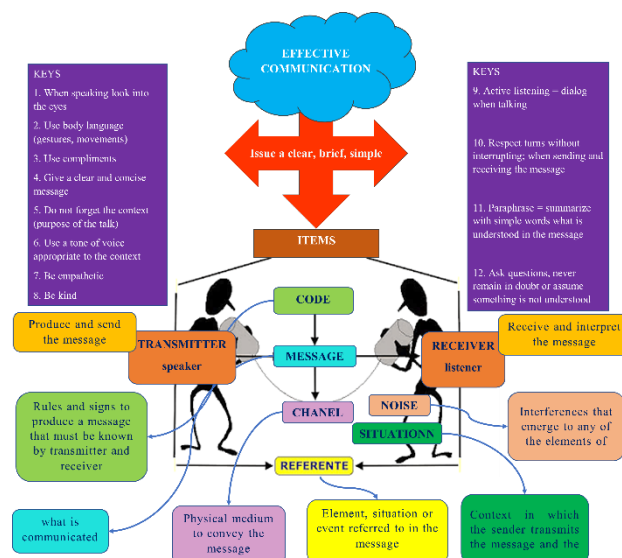
Figure 2 Effective communication and its key elements

The image shows twelve essential keys that a leader should practice when communicating, regardless of the message to be delivered, considering the six elements included in effective communication: code, message, channel, noise, situation and referent.

e) **To be highly ethical**

To achieve any leadership objective, the leader must follow to the letter a code of ethics or conduct as a guiding element for the behavior expected from peers or employees, as the case may be. A code of ethics articulates the student or professional mission and vision, as well as its values and principles. To enforce codes of ethics or conduct, it is recommended to practice the following:

1. Disseminate widely, preferably through mechanisms and channels in which the guiding axis or leader participates or is present.

2. Write the code of ethics in a simple and straightforward manner, with the goal that its content is understood by all, regardless of the reader's level of education.

3. Demand its compliance, designating a person in charge of supervising its observance.

4.   Implement dissemination and training mechanisms that promote a better understanding of the contents of the code, preferably using examples and practical cases that allow relating what is established therein.

This is due to the fact that students, collaborators, workers or professors are often unaware of the regulations and rights they have (Excelencia, 2015).

It should be noted that a good leader motivates and informs his or her community, whether student or labor, which makes his or her actions more competitive and inclusive.

f)   To be competent:

As Hofstede mentions in his sixth point, indulgence vs. restraint; there are cultures where the outlook on life is optimistic and positive, they are indulgent or relaxed, they enjoy life, they have many vacation days, for example, Latin America. There are other cultures where they are more pessimistic or negative, they are contained, therefore, they are competitive and hard-working, for example, Japan or the United States of America. Precisely, the term "competence", was originated in the United States and focuses on behavior, motivations and personal traits; it is used in reference to superior performance and high motivation (Gagliardi, 2015; Lester, 2014).

The term competence, of British origin, refers to practical skills, knowledge and understanding of the work environment and is linked to job performance (Winterton, 2002). Competency-based education is focused on outcomes, on enabling individuals to perform effectively in different situations and contexts (Rieckmann, 2012). Competence is one of the challenges that concerns any person who wishes to progress, to stand out as a student or professional; it allows him/her to innovate and adapt to demands derived from cultural norms, study or consumption habits, to improve at a professional level without sacrificing the standard of living. Competing, acquires relevance due to its legislative transcendence, there are specific laws that govern it, for example in Mexico there is the law for the development of competitiveness of micro, small and medium enterprises published in 2002 in the Official Journal of the Federation with a recent reform on March 13, 2019 (UNION, 2019).

Or the Law of competitiveness and commercial order of the State of Mexico published in the Official Gazette "Gaceta del Gobierno" on December 18, 2014 and reformed on March 10, 2022 (MEXICO, 2022).

Competing healthily creates bonds, support groups, drives, promotes active school and community participation, improves the quality of education and with it the quality and reliability of knowledge. A leader must manage these characteristics in order to motivate and foster collaboration, generate trust and interpersonal relationships in an easy way, recognize the contributions of others, have problem-solving skills, act based on his or her values, know how to set a good example, maintain an encouraging vision of the future and be optimistic, seek opportunities and take advantage of them, form a temperament of his or her own.

4. Discussion

Leadership is a way of life that leads to the transformation of society

As mentioned earlier, leadership has been given low priority, resulting in a confused and inadequate understanding of the essential nature of the phenomenon. Exceptional leadership requires better preparation and support (Pearson *et al.*, 2018). The need for a different mindset, the benefits of improving soft skills, embracing complex challenges, and seeking encouraging responses to uncertainty will foster leaders with a more rewarding future and higher self-esteem (Clarke C, 2016). Based on interdependence, dialogic communication and ethical leadership, the results will be a high personal reward that will allow the emergence of a progressive whole (Ladkin & Taylor, 2010). Therefore, for exceptional leadership to progress, perspective must be gained through self-reflection, accountability, inclusion, and shared responsibility (Pearson *et al.*, 2018).

Reflection on personal motivation, improved understanding of others, and a focus on solutions rather than obstacles will advance inclusive and ethical leadership, leveraging the benefits of empowered, diverse, and valued teams (A., 2016; Grant & Parker, 2009).

For a leader it is not enough to have talent, charisma, experience, motivation, good will... he or she must have ingenuity, courage and innovation. A leader's vision is formed by the dreams he wants to achieve. To achieve this vision, he must share it with his colleagues or collaborators so that everyone works in the same direction (Excelencia, 2015). This information gives us the basis to support why society needs leadership and the place where it begins is the place of study or daily work.

To teach leadership is to motivate to be better people and achieve dreams, leadership should be taught from early education to strengthen decisions and expand their panorama of opportunities. When teaching leadership, generational and cultural diversity must be considered; that meeting of people of different ages and customs that coexist in an educational or work space. A leader must be able to identify and manage the communicative preferences of each person, it is always necessary to appreciate the characteristics of each being, each person deserves individual management. Generational or cultural diversity is not an obstacle, but a strategic opportunity. Each generation has valuable aspects to offer, in addition to complementing, they are capable of driving levels of innovation and progress.

Managing diversity effectively allows organizations to build a collaborative educational and workforce. The leader must know how to redirect power, without abusing it, using it responsibly. If he/she acts in an authoritarian manner, he/she will be making a mistake and will lose his/her position. You must understand that all human beings have different motivations. A person's motivating forces may vary with the occasion and the situation. The leader needs to understand the ways in which a student, teacher, or any collaborator or employee acts. Therefore, he needs to foresee different types of motivation according to each of the situations in order to achieve stability in his group. It must be understood that the ability to inspire is essential in a leader. When we speak of inspiring, we are referring to the example he/she sets as a reference for others. The work environment or climate is a very relevant aspect, for this reason the leader must take care to keep it in balance and as a source of motivation (Excelencia, 2015).

The disillusionment of young people due to the lack of support from managers and teachers (Futures, 2016), from the environment at home or in their community, is a further indication that there is already a problem. If exceptional leadership is to be achieved, the understanding of well-being must continue to improve (Pearson *et al*., 2018). Excessive control in one's own or the other's decisions or actions, opens the door to destructive leadership traits, where overconfidence, dominance, aggression and inability to accept proposals from students or work team; generates impotence, displeasure and permanent discomfort in the student body, faculty, colleagues and institutions. If the goal is exceptional leadership, the challenge will be to recognize and prevent the symptoms of destructive leadership (Krasikova D, 2013).

As Arnold J. Toynbee's phrase goes:

The growth of human societies is explained by the presence of minorities or creative personalities who always give successful answers to the challenges of the environment and who, because of their integrity and their commitment to the group, are freely followed by the majority (Toynbee, 1948).

5. Acknowledgments

6. Conclusions

Leadership as a way of life should be taught from the moment a student sets foot in a classroom. Learning effective communication and how to make the most of the individual, generational and intercultural differences that this globalized world offers us, will allow the formation of successful leaders at a personal and work level. To become a leader you must first build a dream and then try to make it a reality with responsibility, ethics and teamwork.

7. References:

A., G. (2016). How to build a culture of originality. *Harvard Business Review*.

Beth, K. (2022). *A Behavioural Competency Model for Sustainability Leaders*. https://www.cisl.cam.ac.uk/system/files/docum ents/a-behavioural-competency-model-for-sustainability.pdf

Bianchi, G. (2020). *Sustainability competences.* European Comision. https://op.europa.eu/en/publication-detail/-/publication/9c1f897c-4598-11eb-b59f-01aa75ed71a1/language-en

Clarke C, K. D., Finch G. (2016). *Addressing disillusionment among young vets* (Vol. 179).

Damasio, A. (1994). El error de Descartes. Emoción, razón y cerebro humano. *Barcelona: Planeta.*

Excelencia, E. E. d. (2015). *Qué es el liderazgo.* https://www.escuelaeuropeaexcelencia.com/2015/08/que-es-el-liderazgo-aspectos-relevantes/

French, L., y Bell, C. H. (1996). *Desarrollo Organizacional: aportaciones de las ciencias de la conducta para el mejoramiento de la organización* (5ta Edición ed.). Prentice-Hall Hispanoamericana.

Frey, M. R. (2007). *Personality, lifestyle, and transformational leadership from a humanistic perspective.* Georgia State University.

Futures, V. (2016). Disillusionment among young vets: causes and potential solutions. *Vet Rec.*

Gagliardi, D. K., I. (2015). Entrepreneurship Competence: An Overview of Existing Concepts, Policies and Initiatives (OvEnt) Joint Research Centre.

Gómez-Rada, C. (2014;). Liderazgo conceptos, teorías y hallazgos relevantes. *Cuadernos hispanoamericanos de psicología*, 2, 61-67.

Grant, A. M., & Parker, S. K. (2009). 7 Redesigning Work Design Theories: The Rise of Relational and Proactive Perspectives. *The Academy of Management Annals*, *3*(1), 317-375. https://doi.org/10.1080/19416520903047327

Hofstede, G. (2001). Culture's Consequences: Comparing values, behaviors, institutions, and organizations across nations. *Thousand Oaks, CA: Sage Publications*(2).

JM, B. (1978). Leadership. *Harper Colins, New York*, 530.

Krasikova D, G. S., LeBreto n J. (2013). Destructive leadership: a theoretical review, integration, and future research agenda. *Journal of Managment*

Ladkin, D., & Taylor, S. S. (2010). Enacting the 'true self': Towards a theory of embodied authentic leadership. *The Leadership Quarterly*, *21*(1), 64-74. https://doi.org/https://doi.org/10.1016/j.leaqua.2009.10.005

Lester, S. (2014). Professional competence standards and frameworks in the United Kingdom. *Assessment & Evaluation in Higher Education,*, *39*(1), 38-52.

MÉXICO, H. L. L. D. E. D. (2022). *LEY DE COMPETITIVIDAD Y ORDENAMIENTO COMERCIAL DEL ESTADO DE MÉXICO.* https://legislacion.edomex.gob.mx/sites/legislacion.edomex.gob.mx/files/files/pdf/ley/vig/leyvig217.pdf

Michelsen, G. (2016). Policy, politics and polity in higher education for sustainable development. *Routledge handbook of higher education for sustainable development*, 64-79.

Moonen, P. (2017). The impact of culture on the innovative strength of nations a comprehensive review of the theories of Hofstede, Schwartz, Boisot and Cameron and Quinn. *Journal of Organizational Change Management.* https://doi.org/doi.org/10.1108/JOCM-08-2017-0311

Novo-Varela, B. M.-G. L. (2015). *Gestión de la diversidad generacional.* http://gestiondepersonas.org.uy/wp-content/uploads/2015/11/Informe-Gesti%C3%B3n-de-la-Diversidad.-cap%C3%ADtulo-1-Empresas-BD.pdf

Páez-Gabriunas, I. Y.-L., Gustavo. (2004). Liderazgo: Evolución y conceptualización. *Universidad Externado de Colombia.* https://books.google.com.mx/books/about/Liderazgo.html?id=4urAZpIP-pAC&redir_esc=y

Pearson, C. E., Butler, A. J., & Murray, Y. P. (2018). Understanding veterinary leadership in practice. *Vet Rec*, *182*(16), 460. https://doi.org/10.1136/vr.104485

Poutiatine, M. (2009). What is transformation? Nine principles toward an understanding transformational process for transformational leaderschip. *Journal of transformational education*, *7*(3), 189-208.

Rieckmann, M. (2012). Future-oriented higher education: which key competencies should be fostered through university teaching and learning? *Futures*, *44*(2), 127-135.

Robbins, S. (2002). *Comportamiento Organizacional*. Prentice Hall.

Rocío Moldes, F. G. (2021). Hacia la construcción de un modelo de liderazgo intergeneracional. *Revista Internacional de Organizaciones*, 127–150.

Rosenthal, S. A., & Pittinsky, T. L. (2006). Narcissistic leadership. *The Leadership Quarterly*, *17*(6), 617-633. https://doi.org/10.1016/j.leaqua.2006.10.005

Schyns, B., & Schilling, J. (2013). How bad are the effects of bad leaders? A meta-analysis of destructive leadership and its outcomes. *The Leadership Quarterly*, *24*(1), 138-158. https://doi.org/https://doi.org/10.1016/j.leaqua.2012.09.001

Scott, R. (2009). Sustainable curriculum, sustainable university. *eCULTURE*, *2*(1), 112-129.

Seago, J. (2012). A third reason to home school: leadership development. *Home school researcher*, *28*(1), 1-7.

Toynbee, A. J. (1948). *Civilization on trial*. Oxford University Press.

UNIÓN, C. D. D. D. H. C. D. L. (2019). *LEY PARA EL DESARROLLO DE LA COMPETITIVIDAD DE LA MICRO, PEQUEÑA Y MEDIANA EMPRESA*. https://www.diputados.gob.mx/LeyesBiblio/pdf/247_130819.pdf

Winterton, J. (2002). Entrepreneurship: Towards a competence framework for developing SME managers. *United States Association for Small Business and Entrepreneurship Conference Proceedings, January*.

Universal Learning Design (ULD) and instructional strategies for inclusión

El Diseño Universal de Aprendizaje (DUA) y las estrategias didácticas para la inclusión

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Abstract

A study on Universal Design for Learning (UDL) was carried out with a sample of 373 teachers of the Elementary School of the Southeast region of Coahuila de Zaragoza in the 2021 – 2022 cycle, in three Axes that are Universal Design for learning, Educational Inclusion and Didactic Strategies from which 146 variables were obtained that were applied in an online digital instrument and processed with a spreadsheet and a statistical program, using descriptive statistics, correlation and factor analysis with the method of Principal Axis and Varimax rotation. 11 factors were obtained that explained 47.42% of the total variability of the phenomenon and was selected in Factor 1 since it concentrated the greatest variability with 27.22% with 38 variables selected. It was shown that teachers in their practice use 7 variables that correspond to the DUA, which allows to show a model with a central structure that was graphed. It also emphasizes the need to strengthen teacher training in variables that were not significant in their pedagogical practice.

Resumen

Se realizó un estudio sobre el Diseño Universal para el Aprendizaje (DUA) con una muestra de 373 docentes del Nivel Primaria de la región Sureste de Coahuila de Zaragoza en el ciclo 2021 – 2022, en tres Ejes que son Diseño Universal para el aprendizaje, Inclusión Educativa y Estrategias didácticas de los que se obtuvieron 146 variables que se aplicaron en un instrumento digital en línea y se procesaron con una hoja de cálculo y un programa estadístico, utilizando la estadística descriptiva, correlación y análisis factorial con el método de Eje Principal y rotación Varimax. Se obtuvieron 11 factores que explicaron el 47.42% de la variabilidad total del fenómeno y se seleccionó en Factor 1 dado que concentró la mayor variabilidad con el 27.22% con 38 variables seleccionadas. Se mostró que los docentes en su práctica utilizan 7 variables que corresponden al DUA, lo que permite mostrar un modelo con una estructura central que fue graficada. Se enfatiza también la necesidad de fortalecer la formación de los docentes en las variables que no resultaron significativas en su práctica pedagógica.

Universal Design for Learning. Educational Inclusion. Didactic Strategies

Diseño Universal para el Aprendizaje. Inclusión Educativa. Estrategias didácticas

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Introduction

Universal Design for Learning is a concept that refers to the design of didactic materials and activities that allow learning objectives to be achieved by individuals with wide differences in their abilities" (SEP, 2018). In this empirical research it is considered necessary to assess teaching practices in order to establish the degree of implementation of Universal Design for Learning in Primary Level Institutions in the Southeast region of Coahuila de Zaragoza in the 2021 - 2022 cycle in order to have an overview that allows us to identify inclusive pedagogical practices that incorporate diversity as a source of enrichment of the teaching-learning process. The aim is to obtain results that allow us to assess and verify the degree of implementation of the SAD by teachers and, based on this, to determine whether or not it is an alternative to improve inclusion.

The SEP indicates that when we refer to Universal Design, we are talking about the design of products, environments and services to be used by all people, to the maximum extent possible, without adaptations or the need for specialised design according to the National Council for the Development and Inclusion of Persons with Disabilities since 17 June 2016, so talking about Universal Design for learning, automatically refers us to think about inclusion (Secretaría de Educación Pública, 2016).

We constantly talk about accessibility to refer to the right of persons with disabilities to enter, move around, go out, orient themselves and communicate with safe, autonomous and comfortable use of built spaces, furniture and equipment, transport, information and communications. Sometimes modifications and adaptations have to be made, for example, in the organisation of a work environment or an educational establishment in order to remove barriers that prevent a person with a disability from participating in an activity or receiving services on an equal basis with others.

However, when we refer to Universal Design, we are talking about the design of products, environments and services to be used by all people, to the maximum extent possible, without adaptations or the need for specialised design, i.e. the same design for everyone without distinction of people with or without disabilities. Universal Design for Learning (UDL)

In one of the classic texts on Universal Design for Learning (UDL), it is an approach that addresses the primary barrier to making expert learners of all students: it is the existence of inflexible curricula, which are intended to fit all students and therefore only increase the barriers to learning. They see learners with disabilities or in other disadvantaged situations as more vulnerable to such barriers, but many non-disabled learners also find that the curriculum is poorly designed to meet their learning needs. They insist that diversity is the norm, not the exception, wherever individuals are gathered, including schools.

These authors believe that when curricula are designed to meet the needs of the general average (to the exclusion of those with different abilities, learning styles, backgrounds, and even preferences), they fail to provide all individuals with fair and equal learning opportunities. The SAD helps meet the challenge of diversity by suggesting flexible instructional materials, techniques and strategies that empower educators to address and recognise these multiple needs. A universally designed curriculum is designed from the outset to try to meet the educational needs of the greatest number of users, making the costly process of introducing changes once the general curriculum is designed "for some" unnecessary (Rose & Wasson, 2008).

Iolanda Nieves and Ana Alberola say that these reflections present us with many challenges, one of which is the need to look for other frames of reference such as the UDL (Universal Design for Learning) universe, which offers us a new vision of the teaching-learning process for the 21st century. It proposes an education based on evidence (neuroeducation), respectful of human diversity (cognitive psychology), and offering a multiplicity of options for learning (active pedagogy, etc.). In conclusion, they state that, in addition, the ULD is based on a humanistic vision of education and on the evidence that we are all different and unique, combining our strengths and weaknesses. The norm is that beautiful and powerful variability (Nieves & Alberola, 2021). As we commented earlier, Universal Design for Learning is a concept that refers to the design of teaching materials and activities that enable learning objectives to be achieved by individuals with wide differences in their abilities" (SEP, 2018).

Universal design for learning constitutes a perspective through which it is possible for learners to experience greater well-being, confidence and personal fulfilment during their learning process.

Therefore, various examples of universal design for learning can be promoted in educational institutions to ensure that there are no major differences in the educational resources and learning strategies used with students.

Universal Design has seven principles:

1. Principle One: Equitable Use: Design is useful and marketable to people with diverse abilities.
2. Principle Two: Flexible Use: The design accommodates a wide range of individual preferences and abilities.
3. Principle Three: Simple and Intuitive Use: The use of the design is easy to understand, regardless of the user's experience, knowledge, language skills or level of concentration.
4. Principle Four: Perceptible Information: The design conveys the necessary information effectively to the user, regardless of environmental conditions or the user's sensory capabilities.
5. Principle Five: Error Tolerance: The design minimises risks and adverse consequences of unintended or accidental actions.
6. Principle Six: Minimal Physical Effort: The design can be used comfortably and efficiently while minimising fatigue.
7. Principle Seven: Adequate: Size of Approach and Use: Provides adequate size and space for approach, reach, manipulation and use, regardless of the user's body size, posture or mobility.

Undoubtedly, talking about Universal Design automatically leads us to think about inclusion (Secretaría de Educación Pública, 2016).

Educational Inclusion

It has been insisted in the official sector that in order to achieve growth within our country there is a series of basic elements, education, since through it we acquire knowledge, enrich our culture and develop our capacities, regardless of our condition.

Thus, inclusive education means that all children and young people, with and without disabilities or difficulties, learn together in the various regular educational institutions (pre-school, college/school, post-secondary and universities) with an appropriate area of support.

The word inclusion means "action and effect of putting something in" and is lexically composed of the prefix in meaning inwards, claudere meaning to enclose and the suffix -sion of action and effect.

In turn, the word educational composed of Latin roots means "relating to the action of directing to develop a child's faculties". It is composed of the lexicons ex meaning outward, ducere (to guide) and the suffix -tive meaning having an active or passive relationship.

The Diccionario de la Real Academia de la Lengua Española (2001) defines diversity as: "Variety, dissimilarity, difference". Similarly Abbagnano (Abbagnano, 1992), defines diversity as: "All otherness, difference or dissimilarity. The term is more generic than these three and can indicate one, any of them or all of them together. Diversity, in this sense, is everything that being real is not identical.".

Within the pedagogical reflection on studying the sense and meaning of an education that is clearly evolving from a pedagogical perspective of integration towards one of social and educational inclusion. As a result of the analysis, it is highlighted that this conceptual evolution is extremely positive in the university environment and that it is necessary to articulate new discourses and teaching practices that project and illuminate the idea that inclusive education is a process of permanent change (Fernández Herrería & López López, 2007).

The precursor of inclusion in the area of education is St. Joseph Calasanz (1557-1648), a European religious and pedagogue who founded the first free public school in Rome in 1597, known as the Pious School, giving extraordinary importance to education as the main means of improving moral aspects, social promotion and the reform of customs.

This revolutionary innovation radically broke with all those class privileges that kept large masses of the population at a disadvantage, marginalised and poor, which is why he is attributed as the pedagogue of social, racial or religious non-discrimination, giving the opportunity in these popular, public and free schools for the generalisation of education and its universalisation. (Domènech i Mira, 1993).

Rather than treating these individual differences as discrepant, irrelevant (or even annoying) sources of error, the SAD treats them as the main facts; they are fundamental to understanding and designing effective teaching. Consequently, to achieve high levels of performance the SAD maintains the criterion of flexible design with options adaptable to individual needs. CAST therefore ensures that such options must be strong and varied enough to optimise teaching for diverse learners, which are, by the way, found in all classrooms (Rose & Wasson, 2008).

Teaching strategies involved in SAD

Many authors have insisted on teacher training in SAD in order to promote inclusion. Through the creation of discussion groups, strategies such as cooperative learning, learning workshops, working in corners and centres of interest based on SAD principles have been tested. The conclusions reveal the need to orient the training of Early Childhood Education teachers towards the use of active and participatory methodologies (Navarro-Montaño *et al*., 2022).

These authors found that, in cooperative learning, effort and persistence, followed by self-regulation are the most important variables, with multiple options and interest being less valued. In the Learning Workshops, the most highly rated variables were comprehension and multiple choices, while the least rated were interest and executive functions. In the Corner Work, the most valued pattern is perception and the least valued are interacting with information, comprehension, effort and persistence, and self-regulation. With regard to the centres of interest, interest is the variable that stands out, and expression and communication are poorly valued. Diaz states that teaching strategies are "procedures and resources used by the teacher to promote meaningful learning, intentionally facilitating a deeper and more conscious processing of new content" (Díaz Barriga Arceo and Gerardo Hernández Rojas, 2002).

Another definition of teaching strategy is provided by (Tebar Belmonte, 2003) when he mentions that it consists of procedures that the teacher uses in a reflexive and flexible way, promoting the achievement of significant learning in students. Under this conceptualisation, teachers in charge of the teaching process must be competent in the design, planning, implementation and evaluation of classes.

There are two types of teaching strategies: teaching strategies used by the group teacher to promote and facilitate meaningful learning of the students and learning strategies used by the learner to recognise, learn and apply what has been learned. Therefore, strategies are directed towards the fulfilment of educational purposes in certain contexts where both strategies are put into practice.

It is necessary to allude to the fact that didactic strategies contribute positively to the development of competences in students; it is up to the teacher to decide on the didactic strategies to be used in animation situations, in each of their moments (beginning, development and closure).

Diaz continues (op. cit.) mentioning that two types of strategies are identified considering the teaching, didactic or animation sequence, classifying them in pre-instructional strategies as those that are developed at the beginning of the teaching process, which allow to promote previous knowledge, achieving the contextualisation of the students' learning; constructional strategies are those that are carried out during the teaching-learning process supporting the curricular contents, promoting the improvement in attention, codification and conceptualisation of the expected learning (Diaz Barriga & Hernández Rojas, 2002).

Post-instructional strategies are presented at the end of the process, allowing students to have a synthetic and integrative vision and sometimes a critical one, which promotes the valuation of their own learning.

Attention to diversity has been, is and will continue to be a concern of teaching, traditionally this process diversity is seen as a problem and not as a source of learning, given its own characteristics.

It is evident that the teacher has at his disposal a wide range of strategies, resources and materials that allow him to attend to the learner, facilitating the teaching-learning process. It is also true that the concept of strategies to cater for diversity varies in meaning between authors and the educational community. Among other authors who contextualise the subject, Joaquín Gairín (1998) presents didactic and organisational strategies that educational institutions can carry out in order to educate in diversity, recognising the existing differences among school students. In the first part, he presents a conceptual analysis of diversity. He then reflects on the functionality of school organisations, analysing the different stages of these institutions, and gives an overview of possible ways of dealing with diversity within schools. The author provides organisational measures to manage student diversity, which affect institutional approaches, structures and the relational system of schools. In conclusion, it is suggested that there is no single organisational model for dealing with diversity, but that different modifications must be introduced in the organisational dynamics of schools in order to respond to this educational diversity (Gairín Sallán, 1998).

Similarly, he mentions the organisational strategies that occupy a greater structure in relation to decision-making, physical spaces in order to provide better accessibility to materials, such as corners, flexible groupings, workshops, support classrooms, dual plans, etc. In order to build inclusive schools and classrooms that integrate learners regardless of their particular condition, Article 24 of the Convention on the Rights of Persons with Disabilities recognises their right to education without discrimination, with equal opportunities to promote their academic and social development. This leads to the application of specific and diversified strategies that, in addition to responding to the needs of each individual, ensure their access, permanence and graduation from Basic Education.

Specific strategies are methodological and didactic resources that favour the learning and participation of people with disabilities, as they respond to the basic learning needs in various aspects: use of language, mathematical problem solving, use of Information and Communication Technologies (ICT), creative expression of ideas, aesthetic awareness and establishment of social ties.

Diversified strategies encourage the development of actions that respond to diversity in the classroom, through which it is possible for teachers to use didactic-creative and innovative resources, adapt spaces and collaborative work, manage materials and time, and use methodological proposals that represent a challenge for students (Secretaría de Educación Pública, 2012).

From the above, it is necessary to analyse the Universal Design for Learning Model in the context of its practice in the classroom, with the purpose of enriching it from the teaching practice in its concordances and differences, as well as in conjunction with other strategies that are preferred by teachers.

In the approach of the present research, reference was made to three axes that are didactic strategies, inclusion and the learning process that integrate the teaching practice in reality, focusing clearly on each of its characteristics to distil variables of importance for the study seeking the enrichment of the DUA Model. Likewise, orienting them to the educational attention of the population that faces barriers to learning and participation, due to presenting a condition of disability, outstanding abilities and aptitudes or difficulties in the development of the competences of the training fields of the Curriculum.

The problem

The problem has two aspects to be analysed, the first one lies in knowing in what way and to what extent teachers are implementing strategies in accordance with the UDL, and on the other hand, which of the strategies that teachers use in their daily practice could enrich it. From the Guide for Universal Design for Learning Version 1.0, it is mentioned that this model is based on Principles and each of them contains guidelines for its application, and this has been maintained in many schools. This classification contains the following, according to (Rose & Wasson, 2008):

Principle I. Provide multiple means of representation

Guideline 1. Providing options for perception

Guideline 2. Provide options for language and the use of symbols

Guideline 3. Providing options for comprehension

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Principle II. Provide Multiple Means for Action and Expression Guideline 4.

Guideline 4. Providing options for physical action

Guideline 5. Provide options for expressive skills and fluency Guideline 6.

Guideline 6. Provide Options for Executive Functions

Principle II. Provide Multiple Means for Motivation and Engagement in Learning

Guideline 7. Provide options for arousal of interest

Guideline 8. Providing options for sustaining effort and persistence

Guideline 9. Provide options for self-regulation

Methodology

An exhaustive review of the literature was made to obtain the relevant research variables, to be applied in Primary Level schools located in the Southeast Region of the State of Coahuila, as a quantitative, randomised, prospective, cross-sectional, comparative, observational research with relational and explanatory scope.

The variables were distilled from the selected axes and operationalised in a digital questionnaire composed of five sections made up of 146 questions, mostly closed and organised as follows:

Section I General Data. Basic information about the respondent

Section II Characterisation: Professional contextualisation information.

Section III Universal Design for Learning Axis and its principles.

Section IV Educational Inclusion Axis, with information about the basic conditions of inclusion (access, permanence and learning achievement).

Section V Didactic Strategies Axis with information related to specific strategies, diversified strategies and curricular adjustments.

The 146 variables obtained were coded with keys to allow their inclusion in the statistical programme.

The instrument was applied digitally online to teachers selected from a population of approximately 12,557 teachers (with annual movements), so that the sample was set at 373 teachers according to the formula of Stephen Isaac and William B. Michael. The inclusion criterion is that they work as regular group teachers or as pedagogy teachers at the Primary Level in educational institutions in the Southeast Region of Coahuila. The exclusion criterion is for those classroom teachers who do not include in their classes students who face some kind of barriers to learning and participation or Outstanding Students.

Data were entered into Excel spreadsheets and Statistica, where Cronbach's alpha: .969036; Mean inter-item corr.: 0.00001; Mean=1101.53; Dv. Std.=75.8462.

Descriptive statistics were obtained and an exploratory factor analysis was performed. Factor analysis is an exploratory technique designed 1) to reduce the number of variables and 2) to detect the structure of the relationships between variables, i.e. to classify the variables. Therefore, factor analysis is applied as a method of data reduction or structure detection. The relationship of inclusive teaching strategies related to SAD was sought orthogonally, so the Principal Axis technique with Varimax rotation was selected.This rotation of the factor loadings is useful because it is aimed at maximising the variances of the squared raw factor loadings between the variables for each factor; this is equivalent to maximising the variances in the columns of the matrix of the squared raw factor loadings. This is necessary to concentrate in Factor 1 most of the variance, a phenomenon used since Spearman in 1904, in his classic work on intelligence, where he distinguishes a general factor (factor G) and a number of specific factors (Spearman, 1904). Finally, the results were plotted and read and conclusions were drawn.

Results

The extraction of 11 factors with the Principal Axis method and varimax rotation concentrated 27.22% of the variability in the first factor as shown in Table 2.

From the selection of the 38 variables of factor 1, we proceeded to read their intrafactorial relationships and to construct a graph Figure 1, with their factor loadings shown in Table 3.

Graphing the result of Factor 1 data and its variables, we find that the most important variables of the inclusive teaching practice model shows that the core structure is supported by 7 variables, namely: Providing alternatives for visual information, Clarifying syntax and structure, Illustrating through multiple media, Activating or providing prior knowledge, Guiding information processing and visualisation, Maximising transfer and generalisation of learning to new contexts, Guiding students to appropriate goal setting.

In addition, it is noted that there is a small group of variables consisting of: Follow-up regarding activities, Acceptance, Integration, Inclusion, and Student interests. Linked to the core structure by the variables: Guiding information processing and visualisation, Maximising transfer and generalisation of learning to new contexts, and Guiding learners in setting appropriate goals.

Two variables are isolated but associated with Optimising autonomy (learner independence) with individual choice of learning expected by learners, and the variable Optimising relevance, value and authenticity of activities and as an appendix to Promoting expectations and beliefs that optimise motivation, Fostering collaboration and community (learning groups, peer tutors), Incorporating reminders of goals and objectives and Varying demands and resources to optimise challenge.

Isolated from the Model without being associated are: Minimising threats and distractions in the learning environment, Promoting cross-language understanding, Cross-cutting learning, The extent to which students in your classroom are purposeful and motivated, The extent to which students in your classroom are resourceful and knowledgeable, and The extent to which students in your classroom are strategic and goal-directed. This can be seen in Figure 1.

Annexes

Variables integrated into the instrument	Code
Optimising autonomy (learner independence) and individual choice of learning expected by learners	OptAutonomía
Optimising relevance, value and authenticity of activities	OptRelevancia
Minimising threats and distractions in the learning environment	MinAmenazas
Incorporating reminders of goals and objectives	IncorpMetas
Promoting expectations and beliefs that optimise motivation	OptMotivación
Varying demands and resources to optimise challenge	OptDesafío
Encourage collaboration and community (learning groups, peer tutors)	FomentarColaboración
Increasing mastery-oriented feedback	IncremRetroalim
Facilitating personal coping skills and strategies	FacilHabyEst
Develop self-assessment and reflection	DesarrollAutoev
Offering ways to personalise the display of information	VisualizacionInf
Offering alternatives for auditory information	Infaudi
Offer alternatives for visual information	Infvisual
Clarify vocabulary and symbols	Vocabulario
Clarify syntax and structure	Sintaxis
Support decoding of text, mathematical notation and symbols	Decodificación
Promote cross-language comprehension	CompIdiomas
Illustrate through multiple media	Ilustrar
Activate or provide background knowledge	ConocPrevios
Highlight patterns, critical features, big ideas and relationships (key ideas, learned skills, schemas)	Patrones
Guide processing and visualisation of information	ProcesamientoInf
Maximising transfer and generalisation of learning to new contexts	GeneralizApdje
Vary response and navigation methods (hand-held, voice, switch, adapted keyboard)	Metodos
Optimising access to assistive tools and technologies (alternative keyboards, touch screens, software)	HerramYTec
Use multiple media to communicate	MMComunicacion
Use multiple tools for construction and composition	MMconstruccion
Develop fluency with graduated levels of practice and performance support	Independencia
Guide learners in setting appropriate goals	EstabMetas
Support planning and development of strategies to achieve the goal	PlanifYEstrategia
Facilitate information and resource management	GestiónInf
Enhancing capacity to monitor progress	MonitorearProgreso
Applying standards that promote attention to diversity	NormasDiv
Distribution of classroom space conducive to attention to diversity	EspacioAula
Adapting furniture to meet the needs of all learners	AdecuarMob
Change work routines to encourage peer interaction.	CambRutinas
Making abrupt changes in activities	CambiosAct
Create a high level of classroom discipline.	DisciplinaAula
Lighting	Iluminación
Sound	Sonido
Cleanliness	Limpieza
Pace of learning for all students	RitmoApdje
The Learning Style of all students	EstiloApdje
Adjusting the Teaching Style	AjustarEnseñanza
Adjust the Methodology of work	AjustarMetodología
Follow up on activities	SeguimAct
Conduct Observations in congruency with the Plan and Programmes	ObservaPyP
Make curricular adjustments	AjustesCurr
Diversify learning	DiversificarApdje
Transversality of Learning	Transversalidad
Types of intelligence	TiposInteligencia
Make use of alternative communication systems (e.g. gestures, body language, sign language, communication board. Braille)	SistemasAlternativos
Acceptance	Aceptación
Integration	Integración
Inclusion	Inclusión
Overprotection	Sobreprotección
Attention	Atención
Student needs	Necesidades
Student Interests	Intereses
Being Welcome	SerBienvenidos
Students support each other	ApoyoMutuo
Students are valued equally	ValoradosIgual
Reject all forms of discrimination	RechazanDisc
Admit all students from the community	Admision
Use alternative means and language of communication	LenguajeAltern
Attend school daily	Asistencia
Select the percentage of achievement in fundamental learning at the classroom level. Level Requires Support	NivelRA. Nivel Requiere Apoyo
Select the percentage of achievement in the key learning outcomes at the classroom level. Level Developing	NivelED. Nivel en Desarrollo
Select the percentage of achievement in fundamental learning at the classroom level. Expected Level	NivelE. Nivel Esperado
Observation Guide	GuíaObserv
Anecdotal Record	RegAnecdotico
Classroom diary	DiarioClase
Attitude scale	EscActitudes
Questions about the procedure	PreguntasProc
Students' notebooks	Cuadernos
Graphic organiser	OrgGráfico
Portfolio	Portafolio
Rubric	Rúbrica

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Checklist	ListaCotejo
Discussion	Debate
Essay	Ensayo
Written tests	PruebaEscrita
Evaluation Record	RegistroEv
SiSAT Results System (Early Warning System)	SisAT
Examination Results	ResultEx
Fact Sheet	FichaDesc
Report card	Boleta
Student production	ProdAlumn
To what extent does your group achieve the key learning outcomes of the SiSAT Strategy at the Expected Reading Level?	NELect
To what extent does your group achieve the key learning outcomes of the SiSAT Strategy in the Expected Level of Text Production?	NEProdTex
To what extent does your group achieve the key learning outcomes considering the results of the SiSAT Strategy in the Expected Level of Mental Calculation?	1 NECalcMen
Learning activities are planned with all learners in mind.	ActvsApdje
The learning activities encourage the participation of all students.	ActApdzjePartic
Students' critical thinking is promoted	PensamCritico
Students are actively involved in their own learning	PropAdzje
Students learn from each other	TrabajoColab
Lessons develop an understanding of similarities and differences between people	ComprSimilYDif
Assessments encourage the achievements of all students	Ev FomeLogros
Discipline is based on mutual respect	Respeto
The educational team plans, teaches and reviews collaboratively.	EqEducativo
The educational team develops shared resources to support learning.	EqEdRec
Support teachers assist the learning and participation of all students.	ProfApApdje
Homework assignments are designed to contribute to each student's learning.	Tareas
After-school activities are available to all students.	ActExtracurr
Local resources are known and used.	RecursLocales
Mexican Sign Language	LSM
Braille system	Braille
Kramer Abacus	Kramer
Communication board	Tablero
Place student in front of the blackboard	FrenePizarr
Speak in front of the student with deafness	Gesticulacion
Articulate words using expressive resource	RecExpresivos
Macrotext	Macrotextos
Cognitive scaffolds	AndamCogn
Concrete material	MatConcreto
Information Technology and Application	TIC´S
Videos	Videos
Simple concrete explanations	Explicaciones
Alternative Communication Systems	SistAltern
Adapt the purposes for the class	AdapPropositos
Adapt learning activities	AjuActApdzje
Adapt the assessment of learning	AdapValApdzje
Adapting the curriculum	AjCurrículo
Adapt teaching materials	AdapMatDid
To what extent are the students in your classroom purposeful and motivated?	DecididosMotivados
To what extent are the students in your classroom resourceful and knowledgeable?	Ingeniosos
To what extent are the students in your classroom strategic and goal-directed?	Estrategicos

Table 1 Variables of the instrument and their codes
Source: Own Elaboration

Thematic axes	Conceptual definition	Operational definition	Categories of analysis
Universal Design for Learning	The design of teaching materials and activities that enable learning objectives to be achieved by individuals with wide differences in abilities" (SEP, 2018).	Methodological tool used to cater for diversity, multiplying the resources available.	Principles
Educational Inclusion	Educational inclusion is defined as "a process based on the principle that assumes diversity as an inherent characteristic of social groups, which must be used to the benefit of each of its members, so that the educational system and programmes must be designed and implemented in accordance with this diversity, in order to identify and respond to the needs, characteristics and capacities of all students". Operational rules of the Programme for Inclusion and Equity (2016)	Integration of all pupils in classes according to their needs, interests and abilities..	Types of Barriers: Attitudinal Organisational Methodological Indicators of educational inclusion: Accessibility Permanence Learning achievement
Didactic strategy	Useful tools that help teachers communicate content and make it easier for students to understand. (Flores Flores, *et al.*, 2017)	Procedures and resources used by teachers to facilitate learners' learning.	Diversified strategies Specific strategies Curricular adjustments

Table 1 Conceptualisation of variables
Source: Own Elaboration

Factors	eigenvalue	% Overall Variance	Cumulative Eigenvalue	% Cumulative
1	34.30	**27.22**	34.30	27.22
2	5.09	4.04	39.39	31.26
3	5.01	3.97	44.40	35.24
4	4.07	3.23	48.46	38.46
5	2.39	1.90	50.85	40.36
6	1.93	1.54	52.79	41.89
7	1.80	1.43	54.58	43.32
8	1.49	1.18	56.07	44.50
9	1.37	1.08	57.44	45.58
10	1.17	0.93	58.61	46.51
11	1.14	0.91	59.75	47.42

Table 3 Extracted factors, with their eigenvalues and percentage of variance explained.
Source: Own Elaboration

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Axis	Variable selected	Code	factor loading	No. Correlations
Learning Axis: Universal Design for Learning	Optimising autonomy (learner independence) and individual choice of learning expected by learners	OptAutonomía	0.41	1
	Optimising relevance, value and authenticity of activities	OptRelevancia	0.46	1
	Minimising threats and distractions in the learning environment	MinAmenazas	0.39	0
	Incorporating reminders of goals and objectives	IncorpMetas	0.49	1
	Promoting expectations and beliefs that optimise motivation	OptMotivación	0.53	8
	Varying demands and resources to optimise challenge	OptDesafío	0.50	1
	Encourage collaboration and community (learning groups, peer tutors)	FomentarColaboración	0.51	1
	Increasing mastery-oriented feedback	IncremRetroalim	0.61	4
	Facilitating personal coping skills and strategies	FacilHabyEst	0.55	5
	Develop self-assessment and reflection	DesarrollAutoev	0.55	7
	Offering ways to personalise the display of information	VisualizacionInf	0.56	9
	Offering alternatives for auditory information	Ofrecer alternativas para la información auditiva	0.58	9
	Offer alternatives for visual information	**Infvisual**	**0.58**	**10**
	Clarify vocabulary and symbols	Vocabulario	0.58	7
	Clarify syntax and structure	**Sintaxis**	**0.64**	**11**
	Support decoding of text, mathematical notation and symbols	Decodificación	0.62	7
	Promote cross-language comprehension	CompIdiomas	0.40	0
	Illustrate through multiple media	**Ilustrar**	**0.56**	**10**
	Activate or provide background knowledge	**ConocPrevios**	**0.60**	**12**
	Highlight patterns, critical features, big ideas and relationships (key ideas, learned skills, schemas)	Patrones	0.55	5
	Guiding information processing and visualisation	**ProcesamientoInf**	**0.56**	**13**
	Maximise transfer and generalisation of learning to new contexts	**GeneralizApdje**	**0.57**	**17**
	Develop fluency with graduated levels of support for practice and performance	Independencia	0.30	2
	Guide learners in setting appropriate goals	**EstabMetas**	**0.49**	**10**
	Support planning and development of strategies to achieve the goal	PlanifYEstrategia	0.40	3
	Facilitate information and resource management	GestiónInf	0.45	5
	Improve capacity to monitor progress	MonitorearProgreso	0.46	9
Educational Inclusion	Pace of learning for all learners	RitmoApdje	0.31	1
	Follow-up on activities	SeguimAct	0.32	7
	Mainstreaming of learning	Transversalidad	0.33	0
	Acceptance	Aceptación	0.30	5
	Integration	Integración	0.38	3
	Inclusion	Inclusión	0.38	5
	Student interests	Intereses	0.36	3
	Student production	ProdAlumn	0.38	2
Axis Teaching	Extent to which students in your classroom are purposeful and motivated.	DecididosMotivados	0.41	0
	Extent to which students in your classroom are resourceful and knowledgeable	Ingeniosos	0.36	0
	Extent to which students in your classroom are strategic and goal-directed.	Estrategicos	0.30	0

Table 4 Variables selected by factor analysis for Factor 1, with factor loadings ≥0.294 and the number of correlations between them, selected by sigmatic cut-off N+1=0.588, where the most important variables are in bold
Source: Own Elaboration

Conclusions

The 7 variables of the resulting model come from the Universal Design for Learning (UDL) Axis and are the basis for the pedagogical activity of teachers, namely Provide alternatives for visual information, Clarify syntax and structure, Illustrate through multiple media, Activate or provide prior knowledge, Guide processing and visualisation of information, Maximise transfer and generalisation of learning to new contexts, Guide learners to set appropriate goals, Maximising transfer and generalisation of learning to new contexts, Guiding learners in setting appropriate goals, while the group of variables of Following up on activities, Acceptance, Integration, Inclusion, and Learner interests correspond to the Educational Inclusion Axis which is integrated to the core structure by the variables: Guiding information processing and visualisation, Maximising transfer and generalisation of learning to new contexts and, Guiding learners to appropriate goal setting.

The above denotes an acceptable but not full adoption of the Universal Design for Learning Model, enriched by own initiatives, but without the specific strategies such as Mexican Sign Language, Braille System, Kramer Abacus, Communication Board, Placing student in front of the blackboard, Face-to-face talk to the deaf learner, Articulating words using expressive resource, Macrotexts, Cognitive scaffolds, Concrete material, Information Technology and Application, Videos, Simple concrete explanations, Alternative Communication Systems, Adapting the purposes for the class, Adapting the learning activities, Adapting the assessment of learning, Adjusting the curriculum, and Adapting the didactic materials, Elements that need to be incorporated in a significant way in the Model.

The variables that are considered in teaching practice and that should be strengthened in relation to others in the SAD model are Guiding information processing and visualisation, Maximising transfer and generalisation of learning to new contexts, and Developing fluency with graduated levels of support for practice and performance.

These findings provide options for improving the DUA Model, especially in teaching practice, to generate inclusive pedagogy.

References

Abbagnano, N. (1992). *Diccionario de Filosofía*. Fondo de Cultura Económica.

Díaz Barriga Arceo y Gerardo Hernández Rojas, F. (2002). *Estrategias docentes para un aprendizaje significativo, Una interpretación constructivista*. Editores Mc Graw Hill.

Domènech i Mira, J. (1993). JOSÉ CALASANZ. *Perspectivas: Revista Trimestral de Educación Comparada*, XXIII(3–4), 808–821. http://www.ibe.unesco.org/sites/default/files/calasanzs.PDF

Fernández Herrería, A., & López López, M. del C. (2007). La inclusión del componente emocional en la formación inicial de maestros. Una experiencia para el desarrollo de la conciencia sensorial. *Revista Iberoamericana de Educación*, nº 43(3), 1–12. https://rieoei.org/historico/deloslectores/1714Lopez.pdf#:~:text=a%29 La conciencia %28o atención%29 sensorial no es,obstaculice el desarrollo de una conciencia sensorial intensa.

Gairín Sallán, J. (1998). Estrategias organizativas en la atención a la diversidad. *Educar*, 22(0), 239–267. https://educar.uab.cat/article/view/360

Navarro-Montaño, M. J., Piñero-Virué, R., Jiménez Navarro, P., & Mateo Navarro, V. (2022). ESTRATEGIAS DIDÁCTICAS INCLUSIVAS EN LA FORMACIÓN DEL PROFESORADO DE EDUCACIÓN INFANTIL CON APOYO DE TIC. In III Congreso Internacional de Innovación y Tecnología Educativa en Educación Infantil (Ed.), *III Congreso Internacional de Innovación y Tecnología Educativa en Educación Infantil* (pp. 471–476). Universidad de Sevilla. https://hdl.handle.net/11441/132514

Nieves, I., & Alberola, A. (2021, January 16). *DUA Diseño Universal de Aprendizaje*. Ined21. https://ined21.com/diseno-universal-de-aprendizaje/

Rose, D. H., & Wasson, J. (2008). *Universal Design for Learning (UDL) version 1.0*. https://www.uco.es/aforac/media/recursos/Diseno_Universal_de_Aprendizaje.pdf

Secretaría de Educación Pública. (2012). *Estrategias Específicas y Diversificadas para la atención educativa de alumnos y alumnas con discapacidad*. https://educrea.cl/wp-content/uploads/2019/03/DOC1-atencion-educativa.pdf

Secretaría de Educación Pública. (2016, June 17). *Hablemos de Diseño Universal*. Gobierno de México. Blog Del Consejo Nacional Para El Desarrollo y La Inclusión de Las Personas Con Discapacidad. https://www.gob.mx/conadis/articulos/diseno-universal

SEP. (2018). *Estrategia de equidad e inclusión en la educación básica: para alumnos con discapacidad, aptitudes sobresalientes y dificultades severas de aprendizaje, conducta o comunicación*.

Spearman, C. (1904). General intelligence, objectively determined and measured. *American Journal of Psychology*, 15, 201–293. https://doi.org/10.2307/1412107

Methodology for the management of Academic projects requirements in Research calls for a requirements organizing system

Metodología para la gestión de requisitos de proyectos Académicos en convocatorias de Investigación para un sistema organizador de requerimientos

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Abstract

In this research work, a methodology for a requirements organizing system based on requirements engineering techniques and project management standards is proposed, which allows monitoring and supporting the planning and managment of the requirements of projects participating in different academic calls for proposals issued by sponsoring organization for academic projects. As a case study, the research calls of the PRODEP a program for the Teacher Professional Development of the SEP (Secretaría de Educación Pública), of México was selected. This system will allow to understand and satisfy customer needs, the designers, to monitor and control their projects, from the beginning to the end. The methodology of a requirements organization system allows the assimilation of good practices in the areas of requirements engineering, information quality, among others.

Project methodologies, Requirements organizer, Requirements engineering, Project management

Resumen

En este trabajo, se propone una metodología de un sistema organizador de requerimientos basado en las técnicas de ingeniería de requisitos y en estándares de la gestión de proyectos, que permita dar seguimiento y soporte a la planeación, y administración de los requerimientos de proyectos participantes en diversas convocatorias académicas emitidas por organismos patrocinadores para proyectos de tipo académico. Como caso de estudio, se seleccionó las, convocatorias del programa PRODEP para el Desarrollo Profesional Docente, de la SEP (Secretaría de Educación Pública), de México. Este sistema permitirá entender y satisfacer las necesidades de los clientes, los proyectistas, para el seguimiento y control de sus proyectos, desde su inicio hasta el fin. La metodología de un sistema organizador de requerimientos permite asimilar buenas prácticas en áreas de Ingeniería de Requisitos, Calidad de la información, entre otras.

Metodologías de proyectos, organizador de requisitos, ingeniería de requisitos, Gestión de proyectos

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Introduction

Projects have existed throughout history; however, project management started only a few decades ago, when companies and other organisations began to see the need to organise work in the form of projects and the advantages to be gained from doing it this way. The synchronised work of various disciplines required the construction of more complex systems, leading to the creation of new organisational methods.

This project-centred organisational landscape evolved further as organisations began to understand the fundamental need for their employees to communicate and collaborate with each other while integrating their work across departments, professions and, in some cases, entire industries (AIEPRO-IMPA NCB, 2009).

On several occasions, once a project has been completed and when it is believed that everything that needs to be done has been done, according to experience and the requirements of the client who requested it, users are often confronted with the fact that the result achieved is not what they expected. History shows a variety of failed projects for multiple reasons: unclear objectives, missed deadlines and budgets, functionalities that do not meet the needs of users, ineffective communication, with the consequent impact on organisations and businesses. (Vargas, L. *et al*, 2011)

Background

Other main problems in the development of a project are insufficient requirements management, problems affecting communication, undetected inconsistencies between requirements, design and programming, late validations of requirements, facing risks and uncontrolled change propagation. As a result of these problems, requirements are not met, delivery times are exceeded or costs are repeatedly increased. However, the main problem or error is the lack of agreement and formalisation of the customer's request, which refers to the detection, definition and formalisation of the so-called user requirements (Easterbrook, S. and Nuseibeh, B., 2000) (McDonald, B., 2005), (Vargas, L. *et al*, 2011), (Vargas, V., *et al*, 2022).

Among the various measures implemented to improve quality in higher education, the programmes for institutional strengthening, professionalisation of academic staff, training and strengthening of academic bodies and the integration of research networks stand out. An example of these programmes is PRODEP, which is the Programme for the Professional Development of Teachers (PRODEP, formerly PROMEP), and is an initiative of the Ministry of Public Education, whose purpose is to help teaching staff, technical teaching staff and staff with management, supervision, technical-pedagogical consultancy and academic bodies to access and/or complete training programmes, academic updating, training and/or research projects that enable them to strengthen their profile for the performance of their duties. The programme's support is activated on the basis of specific calls for applications. Currently, the programme's coverage extends to 730 public higher education institutions (HEIs) in the country (SEP, 2017), (SEP, 2019).

Some shortcomings that can be found in the PRODEP programme for secondary and higher education are the following (SEP, 2017), (SEP, 2019).

– Design. Weak theoretical and empirical justification of the intervention. The diagnosis is based on non-recent research and similar experiences, which, however, are not critically analysed.
– Operation. It is detected that not all the URs of the programme are updated and do not publish in their electronic portals the main results of the programme; as well as other deficiencies in the set of indicators to monitor the operation of each of the URs.
– Population Served. The programme consists of systematising the information compiled through available surveys and making it public knowledge, which does not consolidate the operational processes of the programme.
– Measurement and results. The programme has a Logical Framework Matrix (LFM) that contains the designation of indicators for all levels, but there are no technical sheets for all the indicators of "components" and "activities".

For this reason, several countries have developed programmes and incentives for the professional development of teachers and professors. Like the PRODEP Programme, implemented by SEP in Mexico, there are certain financial support programmes for academics in some countries.

On the other hand, referring to projects, they can produce products, components or a final component, perform services, or documents. There is a great variety and diversity of projects. Figure 1 shows the generic phases of the project development life cycle. In project management, there are two important management models that are being implemented:

Predictive or Classical Project Management

Predictive or classical project management is a formal management discipline, based on planning, execution and monitoring through systematic and repeatable processes (AIEPRO-IMPA.NCB., 2009), (Gilbreath, D., 1986), (IIEP/UNESCO,2007), (PMI, 2017, 2018).

Agile or Adaptive Project Management

Agile project management is not a management of anticipation (requirements, design, planning and monitoring) but of adaptation (vision, exploration and adaptation), (Guzman, E., 2016), (Medina, R., 2016).

Requirements

A requirement is a description of a condition or capability that a project or system must meet, either coming from an identified user/customer need, or stipulated in a contract, standard, or other document formally imposed at the beginning of the process. When developing a project, one of the first phases is the definition of the project requirements. Requirements Engineering (RE) facilitates the understanding of what the customer wants by analysing the needs, confirming their feasibility, negotiating a reasonable solution without ambiguity, validating the specification and managing the requirements so that they are transformed into an operational system (Alvarado, G., *et al*., 2014). Identifying competencies for general project requirements covers (Easterbrook, S. and Nuseibeh, B., 2000), (McDonald, B., 2005):

–   Identify the Requirements of the project in question;
–   Analyse and Negotiate the project requirements with the users;
–   Specify the requirements identified;
–   Specify and Model the System Requirements of the project to be represented;
–   Validate the aforementioned Requirements;
–   Manage the visualised Requirements.

Scrum

A Scrum project involves collaborative work to produce a new product, service or other result. Projects are handicapped by constraints of time, cost, scope, quality, resources, organisational capabilities, among others, that make it difficult for them to plan, execute, manage and ultimately succeed. An important strength of Scrum lies in the use of cross-functional, self-organised and empowered teams that divide their work into short, concentrated work cycles called Sprints (Guzman, E., 2016), (Medina, R., 2016), (Palacio, J. and Ruata, C., 2011), (SCRUM, S., 2017).

Canvas Model

The Canvas model is a very useful tool for project management during the project initiation and definition stage. This model seeks to manage projects as business units and emphasises the entrepreneurial potential in project management. The Canvas model is simplified into four broad areas: customers, supply, infrastructure and economic viability in a box divided into nine modules; some companies that use this model are: IBM, Ericsson, Gasco and Movistar (Ferrera, D., 2016), (Flores, M., 2020).

Project management under international standards

The way of organising the efforts and experience of project management has been carried out through the power of the project manager. These reasons have meant that today there are several institutions dedicated to the study of projects such as: IPMA (International Project Management Association), PMI (Project Management Institute), ISO (International Organization for Standardization), OGC. (Office of Government Commerce).

State of the art of requirements management systems

In general, all Requirements Management tools are based on centralised database management systems to store the information corresponding to the requirements, which usually consist of free text paragraphs with a series of predefined attributes and to which most tools allow new types of attributes to be associated by the user. All tools assume that the structure of the requirements is hierarchical, so that a requirement can be formed by or have other lower-level requirements associated with it (Guzmán, E., 2016).

Within CASE (Computer Aided Software Engineering) tools are those specialised in requirements management. These tools focus on capturing requirements, managing them and producing a requirements specification, but almost all of them are focused exclusively on software development projects (IIEP/UNESCO, 2007), (McDonald, B., 2005). As an example of those mentioned, four of the tools that fulfil most of the functions are selected: IBM Rational RequisitePro, IRqA 3.0, CaliberRM, DOORS ERS, although these tools are oriented only to software projects. The requirements management tool ORMEX provides tracking and control of requirements for various types of projects, such as those already mentioned and is among the first of its kind in Mexico and abroad (Vargas, L. *et al*, 2011, 2014), (Vargas, V., 2014, 2018, 2020, 2021, 2022).

For now, we have not found any tool for the organisation of requirements that is exclusively dedicated to the management and evaluation of requirements for academic projects, nor in PRODEP programmes and calls; but we have found some tools for the management of requirements with an academic focus: Proyecto Educación en Línea (Angulo, L., 2009); Manual para el diseño de proyectos de gestión educacional (Castro, F. and Castro, J., 2013); Proyecto Educación en Línea (Angulo, L., 2009); Manual para el diseño de proyectos de gestión educacional (Castro, F. and Castro, J., 2013); Proyectos Educativos y sociales (Proyectos Educativos y sociales, 2013), 2013); Educational and Social Projects:

Planning, Management, Monitoring and Evaluation (Barbosa, E. and Moura, D., 2013); Educational Management Projects (Alvarado, G., *et al*., 2014); Design of a management system based on the Balanced Scorecard methodology for the Faculty of Chemical Engineering of the University of Guayaquil (Montiel, M. and Reyes, Y., 2015); Design of educational projects mediated by ICT (Pineda, J., 2016); The Logical Framework as an instrument for planning, monitoring and evaluation of educational projects, among others (Aliaga, S., 2018).

In this proposal, a different treatment is given to the projects, in order to manage them, following up on the requirements and evaluating their quality in use, once they are completed. A methodology of a project organiser system based on Requirements Engineering techniques and Project Management standards is proposed, which allows to be a support guide for the administration and structuring of projects, especially academic projects, participants in the programme for the Professional Development of Teachers (PRODEP). This methodology will allow the advanced description of different kinds of requirements and their traceability between all documents related to Software Requirements Engineering (RI); it has as a case study, the projects participating in programmes and calls of the PRODEP for the Higher Level, of the SEP in Mexico. Most of the tools are aimed at software development projects; very few, such as those mentioned above, are aimed at other types of projects. The proposal for a Methodology of a Requirements Organising System for the Management of Academic Projects in PRODEP Programmes, which is proposed for this research, has a different focus, as it seeks the management and monitoring of academic projects for their approval in PRODEP programmes and calls for proposals.

Methodology to be developed

This research is based on a mixed type of study and applies ad-hoc information gathering instruments, documentation and registration that allow the analysis and confirmation of the hypothesis, since the characteristics of the requirements engineering techniques are identified and evaluated, as well as the standards of project management mentioned above, which serve as a basis for developing and implementing a requirements organiser, in which the established assumption can be tested.

The variables identified and which will be used in this research are the following (independent variable: vi = identifier of each project; dependent variable: vd = are the other variables that will make up the various partial ratings of each item or factor of the project subject to evaluation, so that processed as a whole, they provide the final rating of the project in question).

An ad-hoc instrument was constructed, with which data was obtained for this doctoral research work. For the validation of this instrument, it was applied to a specific interest group of 15 experts, who are full-time ITCM professors who have participated in PRODEP programmes and calls for proposals. The invitation and background consultation was done by means of a Google Drive questionnaire sent to their emails.

According to the number of respondents obtained, by stratified sampling; a survey was conducted to 168 ITCM academics, through the application of Google forms. The survey consisted of 20 questions, but it should be noted that in this section we will only analyse the key questions of the survey, because they are related to the study variables, where the following results are obtained.

With the analysis of the 168 surveys carried out by ITCM academics, it is determined that 48% (80) of the respondents confirm that they have participated in PRODEP calls and programmes, while 53% (88) of the respondents have not participated in such calls.

As a result of the analysis of the various questions in the different surveys, it can be concluded that, of the 80 academics interviewed, who have participated in PRODEP calls and programmes, the following can be determined: 81% of the respondents confirm that they agree that they would be willing to try a requirements organiser tool to support the development and monitoring of their projects in this type of calls; 10% of the respondents state that they totally agree with this question; while 9% state that they neither disagree nor disagree with the question.

For the selection of the standards and methodologies mentioned above, a study of different research works on project management was carried out, among the research works can be found from the following authors: (Ferrera, D., 2016), (Fernández, K., *et al*, 2015), (Flores, M., 2020), (Guzman, E., 2016), (Medina, R., 2016), (Montiel, M. and Reyes, Y., 2015), (Palacio, J. and Ruata, C., 2011), (Rodríguez, Á., 2015), Vilora, S. (2019).

This research provided the basis for defining the following criteria for the evaluation of methodologies:

A.   Standard Criteria:

Certifications. -Maturity of the model. - Number of versions. - Year of last version. -Working Team. - Learning Curve. -Relevance and appropriateness. - Concern for project stakeholders. -Change Management. -Risk Management. -Alignment to Business Strategy. -Customer Satisfaction

B.   Knowledge Criteria:

Certifications. - Knowledge / Competence Project Leader. - Knowledge / Competence Team. -Specialised Consultants. -Training. - Information available. - Tools and techniques. - Software tools.

C.   Criterion Organisation:

Resistance to change - Customer involvement According to this evaluation, it can be concluded that the best standards and methodologies for the development of the research are: the SCRUM methodology and the PMBOK standard (ISO 21500). Both methodologies are not mutually exclusive, they can be combined to form a more robust hybrid methodology. The selection of these standards and methodologies is due to the fact that they are the most widely used approaches in project management and many of the new methodologies are derived from them due to their main characteristics, tools, projections, etc.

The objective of this stage is to determine which processes, practices and tools from the PMBOK and ISO 21500 will fit into the SCRUM framework.

In order to select the processes that will generate value within the framework of the new methodology, an evaluation of the phases and processes of the PMBOK, ISO 21500, Requirements Engineering and SCRUM methodologies was proposed. As a conclusion of this review and analysis, Table 5 shows how the framework was integrated by groups of processes or phases for the new academic project management methodology.

Life cycle of an academic project

The life cycle proposed for the development of an academic project is divided into five phases. In the proposed model, it will have the phases of Initiation, Planning, Execution, Monitoring and Control and Closure, as structured in the standards of project management, being a management process with sequential characteristics, but at the same time iterative during the development of projects.

The proposed methodology aims to provide a group of procedures organised by phases, which are implemented in the projects, allowing to simplify its management and generate added value to users and / or customers in less time as its development is simpler. Therefore, a better alignment will be obtained with the agile development teams according to the needs of users and sponsors and therefore to the organisational strategy of the companies. In this research, a diagram with the interaction of processes of an academic project is presented.

The proposed methodology aims to provide a set of procedures organised by phases, which are implemented in projects, thus simplifying their management and generating added value for users and/or clients in a shorter period of time, as their development is simpler. Additionally, it seeks to reduce or avoid the informality of agile methodologies by complementing them with project management standards.

Therefore, a better alignment with agile development teams will be obtained according to the needs of users and sponsors and therefore to the organisational strategy of the companies. In this research, a process interaction diagram of an academic project is presented. A proposed methodology is presented, where the methodology is based on a five-phase life cycle where 36 fundamental processes are distributed (Table 1).

Validation of the Methodology

The process and results of the validation of the Methodology of a Requirements Organising System for the Management of Academic Projects in PRODEP programmes by the expert judgement validation method are described.

The expert judgement validation method consists of verifying the reliability of a research that is established as "an informed opinion of people with experience in the subject, who are recognised by others as qualified experts in the subject, and who can provide information, evidence, judgements and evaluations" (Escobar, J. and Cuernavaca, J.). (Escobar, J. and Cuervo, A., 2008).

Phase		Processes
Project conception	1.	Develop the project charter
	2.	Identify stakeholders
	3.	Establish the project team*
Project planning	4.	Create user stories*.
	5.	Define the scope
	6.	Create the work breakdown structure
	7.	Define activities and tasks*.
	8.	Establish the sequence and duration of activities and tasks.
	9.	Create the time block* 7.
	10.	Develop the timeline
	11.	Estimate resources
	12.	Estimate costs
	13.	Determine budgets
	14.	Quality planning
	15.	Communications planning
	16.	Procurement planning
	17.	Identify and assess risks
Project implementation	18.	Daily Stand up
	19.	Refine the product backlog*.
	20.	Lead and manage project work
	21.	Develop the team
	22.	Manage quality
	23.	Procurement management
Monitoring and control	24.	Control and monitoring of project work.
	25.	Change control
	26.	Scope control
	27.	Schedule control
	28.	Communication control
	29.	Quality control
	30.	Cost control
	31.	Resource control
	32.	Monitoring and risk management
	33.	Procurement control
	34.	Demonstrating and validating the time block* 17.
Project closure	35.	Close the project or phase
	36.	Lessons learned *

Table 1 Proposed model of academic project management
Source: Own Elaboration with information from PMBOK (2017), SBOK (2017), ISO 21500 (21500)

The validation process of the ad hoc instrument to evaluate the proposed methodology was carried out with a group of twenty (20) experts who are full time professors at the ITCM, who have previous experience on the subject, having participated in PRODEP programmes and calls for proposals.

The next stage of the process consists of a questionnaire of 24 closed questions, following a Likert scale (with options from 1 to 5), which you select according to your degree of agreement with the questions, where: 1 = Strongly disagree; 2 = Disagree; 3 = Neither agree nor disagree; 4 = Agree; 5 = Strongly agree).

For the construction of the methodology evaluation questionnaire, the fundamental bases of the proposed methodology were examined, and a question was elaborated for each of them.

The main aspects, which were retained in the evaluation of the methodology, were the following:

–   Relevance of the methodology: this is related to the design of the methodology, i.e. the design of the methodology responds to the needs of the users.
–   Effectiveness of the methodology: this refers to the extent to which the methodology obtains the expected result and therefore achieves the specific objective.
–   Efficiency of the methodology: refers to the analysis in which the planned activities and tasks are managed and carried out optimising the means, resources and time available to produce the expected results.
–   Impact of the methodology: it is related to the effects that may be produced on the project or on the beneficiary participants of the project, as well as the indirect effects that may be produced in a specific sector or geographical area.
–   Sustainability of the methodology: this refers to the extent to which the impacts of the methodology intervention are likely to continue after the end of the project.

Interpretation of data from the evaluation of the Requirements Organiser methodology

For the evaluation of the proposed requirements organiser methodology, twenty experts, who are full-time professors Lázaro at the ITCM, and have previous experience in having participated in PRODEP programmes and calls, were sent (SEP, 2017, 2019).

The instrument consists of three stages, which are as follows:

–   In the first stage, general information about the Expert such as background and professional experience is questioned.
–   In the second stage, the level of expertise on the topic is asked to be evaluated.
–   In the third stage, the evaluation of a form with 24 closed questions, following the Likert scale, is carried out in order to evaluate the methodology proposed in the doctoral research work.

Results

The evaluation criteria with the most discrepant answers are those corresponding to the impact criteria with the questions: Does the proposed methodology support the evaluation of the effects and follow-up of the project, together with the beneficiaries, does the proposed methodology propose socio-economic valuation models for the projects, and the sustainability criteria with the question: Does the proposed methodology have evaluations of the capacity to maintain the positive impacts of the project over a long period of time? Taking into account that these criteria can be perceptible issues in project management and PRODEP programmes and calls, it was decided to dispel doubts by giving more detail and a better approach to the proposed methodology (functioning, mechanisms) to the experts, in view of the second round.

For the second round, once the doubts had been clarified and greater detail and function of the methodology had been provided, more positive results were generated than in the previous round. In this evaluation questionnaire, four experts used the space for notes and comments to clarify and complement their views.

Through the use of the evaluation instrument and the results obtained from it, the validation of the criteria of the designed methodology is achieved, which allow to follow up and support the planning and management of the requirements of the projects participating in the programme for the Professional Development of Teachers (PRODEP), in order to understand and satisfy the needs of the clients (PRODEP). Figure 1 shows the interaction of the academic project management process, from the application of this proposed methodology. This figure shows the interaction of the participating projects with the guidelines of the calls for proposals in which they participate, as well as the clients and suppliers (organisations) that determine the requirements to be met.
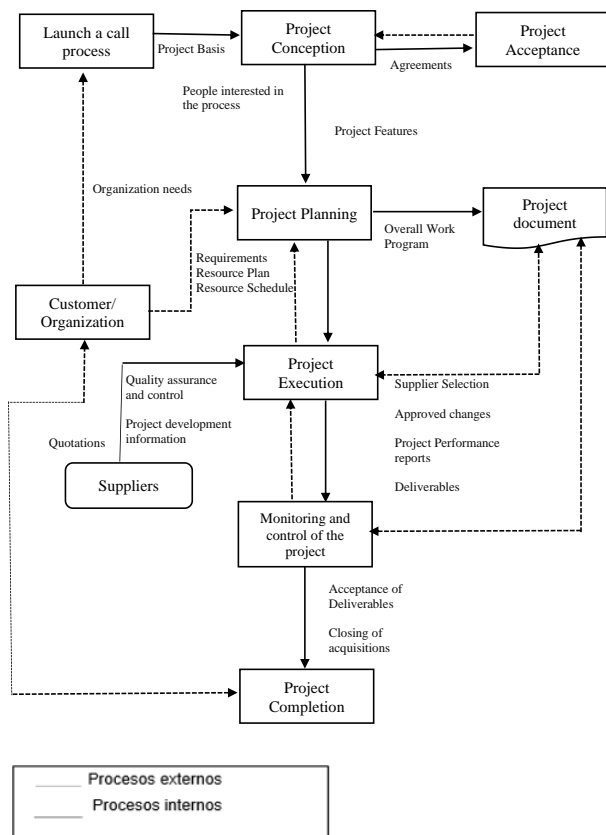
Figure 1 Interaction of the academic project management process
Source: Own Elaboration

Adjustment mechanisms

Once the methodology of a project requirements organiser has been validated by the group of experts and after examining the results obtained in the two rounds of evaluation where the validation instrument was applied based on the main criteria of the proposed methodology, the following adjustment mechanisms are proposed to be applied when starting the implementation process:

- The proposed methodology can be implemented as a technological application, which can be very user-friendly, concrete and fast, distributed in small sections, between which it is easy to move, so that it can really be used as a support tool to carry out monitoring, efficient resource management and finally the achievement of the objectives of each project.
- The requirements organiser should allow direct communication between PRODEP and the user.
- That the requirements organiser can allow the user access to its evaluation in PRODEP calls for proposals.

Conclusions

The present research work starts with the problem that project managers face when developing a project, which is the lack of information provided by the project participants, and the fact that they do not obtain an exact definition between what they want and what they need to do, resulting in a misinterpretation of the requirements. This results in a misinterpretation of the requirements and a failure to follow up the project objectives in detail.

The methodology of a project requirements organising system, as a model of innovation, arises from the combination of several methodologies such as: PMBOK, ISO 21500, SCRUM and the chosen Methodologies stand out for having great worldwide coverage and diffusion, they are also distinguished for being the most used approaches given their main characteristics, tools, projections, bodies of knowledge, instruments.

The proposal of a methodology for a requirements organising system is presented, which is the result of the combination of project management methodologies that stand out for their worldwide coverage, and its phases and processes are detailed. It was also demonstrated how this methodology favours project management as it allows to follow up and support the planning and administration of the requirements of a participating project, in this case of study, for the Programme for the Professional Development of Teachers (PRODEP) in order to understand and satisfy the needs of the users.

In accordance with the research work carried out and for the fulfilment of the objectives, a mixed approach was selected, as this is an exploratory study that seeks to address the phenomenon of project management in PRODEP programmes and calls for proposals for the creation of a methodology for a requirements organising system that supports participants in the creation, organisation and monitoring of the project, from their role as project administrators.

The various variables present in the case study were determined, which make up the PRODEP calls for proposals, which can be configured according to the academic levels, categories and priorities of the calls; as well as Standardised Indicators and Metrics, for the construction of the evaluation model. This objective is fulfilled with the proposal and development of the evaluation model of a requirements organiser methodology based on requirements engineering techniques and project management standards.

This proposed methodology will serve as a guide for the structuring of a project in a clear and effective way, which allows the detection of errors found, related to the requirements, increasing the satisfaction of the client and the leader in charge of the project, fulfilling the requirements that were agreed, respecting the standards and regulations to deliver the projects on time and budget, taking control of their specifications. The methodology of the requirements organiser system was validated by a group of experts through an ad hoc instrument, in which the different aspects that are part of the designed methodology were analysed and evaluated.

The fulfilment of the general objective defined for this research is corroborated: to design a methodology for organising academic project requirements, with its own methodology based on requirements engineering and project management techniques and standards. In Results, it is explained how the proposed methodologies complement each other to constitute a methodology for a requirements organising system: the points in common between both are detailed, as well as the contribution areas that make up the proposed methodology.

It also refers to the documentation and records for the development of the methodology, as well as the breakdown of phases, activities and process of the proposed model (Figure 2).
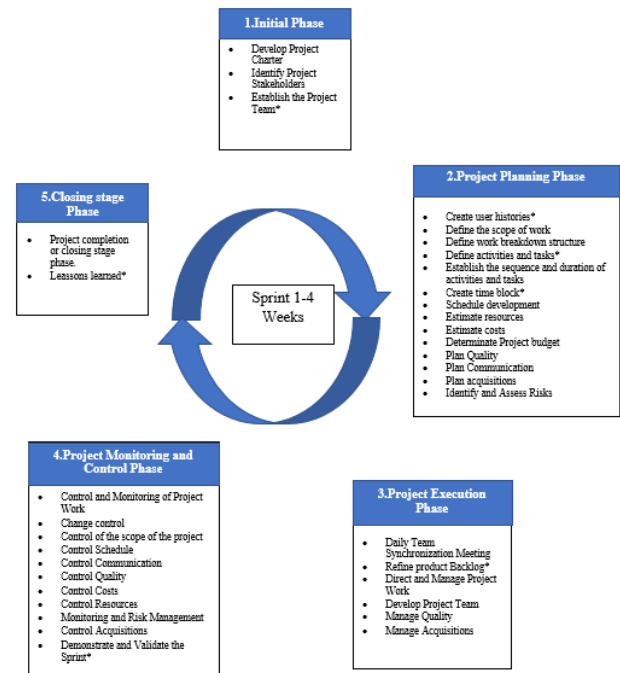

Figure 2 Model of the proposed methodology for academic projects
Source: Own Elaboration

The methodology presented in this article is focused on supporting academic projects participating in PRODEP calls for proposals and programmes; however, it is projected that this model, based on its criteria, can be adopted to other similar types of educational calls for proposals; as well as the methodological part of this requirements organiser is designed to monitor and control the requirements of the academic projects, so it is intended that, for future work, this methodology can be transposed to any type of project to make it more complete.

Acknowledgements

References

AIEPRO-IMPA.NCB.(2009). *Bases para la competencia en Dirección de proyectos*. Versión 3.1 Ed. UPV.

Aliaga, S. (2018). *El Marco Lógico Como Instrumento de Planificación, Seguimiento y Evaluación De Proyectos Educativos. (Tesis de pregrado).* Universidad Mayor de San Andrés, La Paz, Bolivia.

Alvarado, G., Álvarez, P., Arias, A., Beranal, A., Cardenas, M., Castellón F., Herrera, E. Larios, I. (2014). *Proyectos de Gestión Educativa.* Ecorfan México. Colección "45 años de Vida Universitaria". Universidad Autónoma de Nayarit. Tepic Nayarit, México. ISBN 978-607-8324-59-0. Recuperado el 20 de enero del 2020: https://www.ecorfan.org/manuales/manuales_nayarit/Proyectos%20de%20Gesti%C3%B3n%20Educativa%20V6.pdf

Angulo, L. (2009). *Proyecto educación en Línea.* Revista Electrónica Educare, vol. XIII, núm. 1, junio, 2009, pp. 123-133 Universidad Nacional Heredia, Costa Rica.

Barbosa, E. y Moura, D. (2013). *Proyectos Educativos y Sociales: Planificación, gestión, seguimiento y evaluación.* Madrid: Narcea SA DE Ediciones

Castro, F. y Castro, J. (2013). *Manual para el diseño de proyectos de gestión educacional.* Universidad del BIO-BIO. 1ª Edición. Concepción, Chile. Registro de Propiedad Intelectual N° 231.624 (DIBAM). Recuperado el 23 de enero del 2020:http://www.ubiobio.cl/miweb/webfile/media/378/MANUAL%20PARA%20EL%20DISE%C3%91O%20DE%20PROYECTOS%20DE%20GESTI%C3%93N%20EDUCACIONAL.compressed.pdf

Easterbrook, S y Nuseibeh, B. (2000). *Requirements Engineering: Roadmap*, Proceedings of the Conference on The Future of Software Engineering, ACM, 2000.

Escobar-Pérez, J. y Cuervo-Martínez, A. (2008). Validez de contenido y juicio de expertos: una aproximación a su utilización. En Avances en Medición, 6, pp. 27-36. Recuperado el 06 de octubre del 2021: http://www.humanas.unal.edu.co//psicometria/files/7113/8574/5708/articulo3_Juicio_de_expertos_27-36.pdf

Ferrera-Herreira, D. (2016). *El modelo Canvas en la formulación de proyectos.* Cooperativismo y Desarrollo, 23(107), xx-xx. Recuperado el 27 de agosto del 2021:http://dx.doi.org/10.16925/co.v23i107.1252

Fernández, K., Garrido, A., Ramírez, Y., y Perdomo, I. (2015). *Pmbok y Prince 2. Similitudes y diferencias.* Revista Científica, 23, 111-123.

Flores, M. (2020). *El Marco de Trabajo Scrum junto con la Guía Del Pmbok® y su Relación con la Eficiencia en la Gestión de Proyectos de Desarrollo de Software para Nuevas Líneas de Negocio MvP.* (Tesis de Posgrado). Universidad Nacional Federico Villareal. Lima, Perú. Recuperado el 05 de mayo del 2020: http://repositorio.unfv.edu.pe/bitstream/handle/UNFV/4336/FLORES%20TORRES%20MARCO%20ANTONIO%20-%20MAESTRIA.pdf?sequence=1&isAllowed=y

Gilbreath, D. (1986) *Winning at Project Management: What Works, What Fails, and Why.* Nueva York: John Wiley&Sons, Inc.

Guzman, E. (2016). *Propuesta Metodológica usando Scrum y Pmbok, para la Gestión de Proyectos de TI de La Jefatura de Informática de una Unidad Ejecutora del Sector Transportes.* (Tesis de grado de Sistemas e Informática). Universidad Nacional Mayor de San Marcos. Lima: Perú.

IIEP/UNESCO (2007). *Herramientas para la gestión de proyectos educativos con TIC.* Buenos Aires, Argentina. ISBN:978-987-20149-7-1.

International Organization for Standardization. (2012). ISO 21500- Guidance on project management. Recuperado el 12 de marzo del 2020: https://www.iso.org/obp/ui/#iso:std:iso:21500:ed-1:vl:en.

International Project Management Association (2016). *Individual Competence Baseline for Project, Programme and Portfolio Management.* Version 4.0. Netherlands: IPMA. Recuperado el 01 de marzo del 2020 :http://ipma.ch/resources/ipma-publications/ipma-competence-baseline/

McDonald, B. (2005). *Definición de Perfiles en Herramientas de Gestión de Requisitos.* Universidad Politécnica de Madrid. Madrid, España.

Medina, R. (2016). *Diseño de marco Ágil para la dirección de Proyectos de Desarrollo de Producto en una EBIT integrando las mejores Prácticas de PMBOK y Scrum.* (Tesina de Postgrado). Universidad Militar Nueva Granada. Bogotá Colombia.

Montiel, M. y Reyes, Y. (2015). *Diseño de un sistema de gestión basado en la metodología Balanced Scorecard para la facultad de ingeniería química de la Universidad de Guayaquil.* (Tesis de Pregrado). Universidad de Guayaquil. Guayaquil, Ecuador.

Office of Government Commerce OGC (20009). *Managing successful projects with PRINCE2* (5TH edicion). The stationery Office. PP.342. ISBN 978-0113310593

Palacio, J. y Ruata, C. (2011). *Scrum Manager Gestión de proyectos.* Revisión 4.0. España: Scrum Manager. Recuperado el 01 de marzo del 2020: http://www.scrummanager.net/files/sm_proyecto.pdf.

Pineda Acero, Julia Andrea (2016). *Diseño de proyectos educativos mediados por TIC: un marco de referencia.* Opción, 32(10),479-499.

Project Management Institute (2017). *Guía de los fundamentos para la dirección de proyectos. Guía PMBOK.* (6a ed.). Newton square, Pennsylvania: Project Management Institute Global Standard.

Project Management Institute. (2018). *Pulse of the Profession: Success in Disruptive Times | Expanding the Value Delivery Landscape to Address the High Cost of Low Performance.* Recuperado el 09de Julio del 2020: https://www.pmi.org/-/media/pmi/documents/public/pdf/learning/thought-leadership/pulse/pulse-of-the-profession-2018.pdf

Rodríguez, Á. (2015). *Análisis de Sinergias entre las principales metodologías para la Gestión de proyectos PMBOK, PRINCE2 e IMPA* (Tesis de Posgrado). Universidad de Sevilla. España: Sevilla. Recuperado el 27 de agosto del 2021: http://bibing.us.es/proyectos/abreproy/70666/fichero/TFMARSNov15v3.pdf

Scrum Study (2017): *Una Guía para el cuerpo del conocimiento de Scrum* (Guía Sbook). (3a. ed). ISBN: 978-0-9899252-0-4

Secretaria de Educación Pública SEP (2017), *Sistema Educativo de los Estados Unidos Mexicanos: Principales Cifras 2016-2017* [Educational System of the United Mexican States: Main Figures 2016-2017], Secretaría de Educación Pública (Secretary of Public Education), México City.

Secretaría de Educación Pública SEP (2019). *Reglas de Operación del Programa para el Desarrollo Profesional Docente PRODEP para el ejercicio fiscal 2019.* Diario Oficial de la Federación Decimoprimera Sección. Difundido el 28 de febrero de 2019. Recuperado el 30 de marzo: http://www.dgesu.ses.sep.gob.mx

Vargas, L., Gutiérrez, A., Riverón, E., y Peralta, J. (2011). *ORMEX: sistema organizador de requerimientos para proyectos con técnicas de ingeniería de requisitos.* La Incidencia de las Tecnologías de la Información en la Formación de Ingenieros. Simposio llevado a cabo en el XXXVIII Conferencia Nacional de Ingeniería ANFEI2011. Querétaro, México. Recuperado el 12 de marzo del 2020: https://www.researchgate.net/publication/271644739_ORMEX_sistema_organizador_de_requerimientos_para_proyectos_con_tecnicas_de_ingenieria_de_requisitos%20[accessed%20Oct%2002%202018]

Vargas, V., Vargas L., Peralta, J., Gómez, R. (2014). *Organizador de Requisitos de Proyectos Basado en los Estándares de Gestión de Proyectos.* Ciencias de la Ingeniería y Tecnología, Handbook T-Volumen VII, de septiembre 2014. ECORFAN-México. Universidad Tecnológica del Sureste de Guanajuato. ISBN-CL-978-607-8324-04-0, ISBN-V 978-607-8324-24-8, ISSN 2007-1582, e-ISSN 2007-3682 Recuperado el 13 de marzo del 2020: www.ecorfan.org/ revista@ecorfan.org

Vargas, V. (2014). *Propuesta de un sistema organizador de requerimientos de proyectos basado en técnicas de ingeniería de requisitos en la gestión de proyectos* (Tesis para obtener el grado de Maestría). Universidad Autónoma de Tamaulipas, Tampico, Tamaulipas.

Vargas, V., Vargas, L., Gutiérrez, A., Riverón, E., y Peralta, J. (2018). *Gestión de Proyectos: Fundamental en la formación ingenieril para vincular a los diversos sectores.* XLV Conferencia Nacional de Ingeniería ANFEI 2018 "La vinculación como estrategia en la formación de ingenieros en México". Campeche, Campeche, junio 6-8, 2018. Revista Electrónica ANFEI DIGITAL Año 4, Núm. 9, agosto-diciembre de 2018. ISSN 2395-9878.

Vargas-Pérez, Vanessa Atenea, Vargas-Pérez, Laura Silvia, Soto-Hernández, Ana María. (2020). *Una Propuesta de Solución los Problemas del Manejo de los Requerimientos, para la Formación de Profesionales Líderes de Proyectos.* Revista Electrónica de la Facultad de Matemáticas "Abstraction & Application". (2020). Universidad Autónoma de Yucatán. ISSN 2007-2635. 2020. Volumen 29. Pp 48.59. https://intranet.matematicas.uady.mx/journal/index.php

Vargas-Pérez V.A., Vargas-Pérez L.S., Gutiérrez-Tornés A.F., Soto-Hernández A. M., Felipe-Riverón E.M. (2021). *A Requirements Solution While Training Professional Project Leaders.* Proceedings of the Institute for System Programming of the RAS (Proceedings of ISP RAS). Trudy ISP RAN/Proc. ISP RAS, vol. 33, issue 5, 2021, pp. 205-218. DOI: 10.15514/ISPRAS-2021-33(5)-12. ISSN Online 2220-6426 Volume 33 Issue 5, ISSN Print 2079-8156 Tm 33. 2021:https://ispranproceedings.elpub.ru/jour/issue/current, https://ispranproceedings.elpub.ru/jour/article/view/1461.

Vargas, V., Vargas, L., Soto, A., Gutiérrez, A., Felipe, E. (2022). *Requirements Management: a Solution Proposal to your problems, for Project Leaders.* 20th LACCEI International Multi-Conference for Engineerig, Education and Technology "Education, Research and Leadership in Post-pandemic Engineering: Resilient, Inclusive and Sustainable Actions". Boca Ratón, Florida, USA. July 18-22, 2022. ISBN: 978-628-95207-0-5. ISSN: 2414-6390. http://dx.doi.org/10.18687/LACCEI2022.1.1.459

Vilora, S. (2019). *Diseño de una metodología para la gestión de proyectos de TI en el MinTIC.* (Tesis de Maestría). Universidad Externado de Colombia, Bogotá, Colombia. Recuperado el 26 de agosto del 2020: https://bdigital.uexternado.edu.co/handle/001/1885

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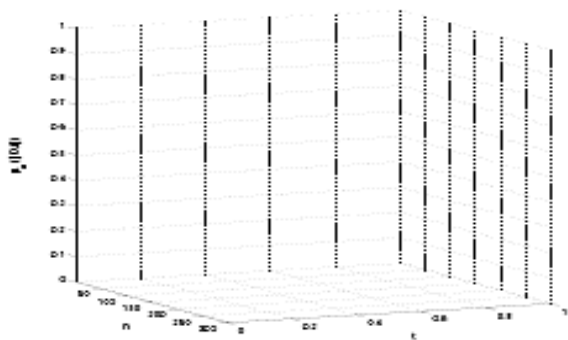
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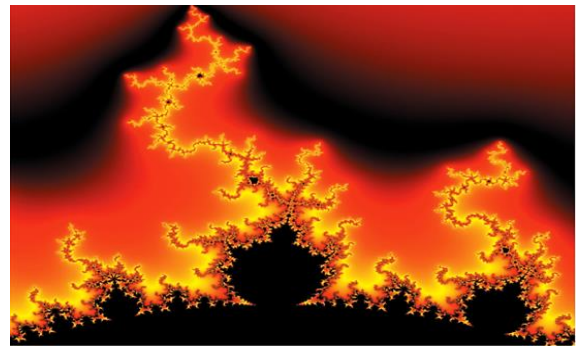Should not be images-everything must be editable.

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