An Overview Study of the Skills Development in Distance Education at the Higher Education Level in the Area Of Information Technology in Public Universities During COVID-19.

Lilia Claudia Cortés Faz, José Antonio Juárez Covarrubias, Leticia Neira

Facultad de Ingeniería Mecánica y Eléctrica, Universidad Autónoma de Nuevo León
Niños Héroes, Ciudad Universitaria, San Nicolás de los Garza, N.L.
lilia_cortes@my.uvm.edu.mx
jose.juarezcvr@uanl.edu.mx
leticia.neiratv@uanl.edu.mx

Abstract. It has been widely discussed that the change to distance learning, due to COVID, will affect the student learning, which will be level off over a period of several months. The following article aims to demonstrate whether engineering students have acquired knowledge and skills in modality change, based on the definition of learning, traditional and contemporary education theories, teaching strategies, assessment models, and instructional design models. The distance learning modality has its origins since 1850 in Berlin, which began via correspondence, this modality has undergone changes due to technology and the evolution of humanity itself, but has remained through the years so I consider its effectiveness, it has been given other names such as online modality, online, and today remote modality. Graduates of systems engineering careers from both public and private universities need to acquire certain skills, which are soft and hard. Hard skills are acquired through education and training, taking into account the knowledge and skills related to the work that a person needs to perform well in technical functions. On the other hand, soft skills are developed throughout life thanks to the experiences that one is having, however they can be reinforced with courses or in classrooms and identifying the behavior and personal qualities that allow you to thrive in the workplace, although they were not acquired 100%, based on the research we can conclude a significant degree of learning.

Keywords: Learning, learning theories, skills, online education, information technologies.

Introduction:

The global pandemic of COVID - 19, which is currently being experienced in Mexico as of March 2020, has forced all levels of education to migrate to the distance learning modality, (Kyungmee 2022).Parents, students and some teachers consider that they do not acquire the same knowledge and skills as the face-to-face modality.

This situation according to IISUE-UNAM: Instituto de Investigaciones sobre la Universidad y la Educación (Institute of University and Education Research). Whose central mission of IISUE , *(ISUE,* 2018) ,is to generate and disseminate original knowledge about the university and education in all its modalities and levels; safeguard and manage the Historical Archive of the University and this evidenced us complaints regarding bringing school to the house, nonconformities were seen in social networks expressing problems with the difficulty of continuing the school cycle at all levels, this due to the large amount of work without feedback in a timely manner, excessive reading or videos, monotonous platforms because they saw it as information storage. (Ruíz, 2020)

There are countless unknowns about the learning of students, there are works that try to demostrate the challenges that all educational institutions experimented in their technological

structure, and that both teachers and students in a large percentage lack technical knowledge for the management of LMS platforms. (Per Warfvinge,2022).

Methodology:

This research is organized in five axes, which are learning, learning theories, contemporary pedagogical models, learning assessment, soft and hard skills.(Figure 1), these axes will help validate the hypothesis.

It is important to consider all the currents of learning and evaluation, since the pedagogical models are based on the oldest theories, the environment in which the students are developing must also be considered, which affects their psychological state, so the role that motivation plays in learning must be considered.
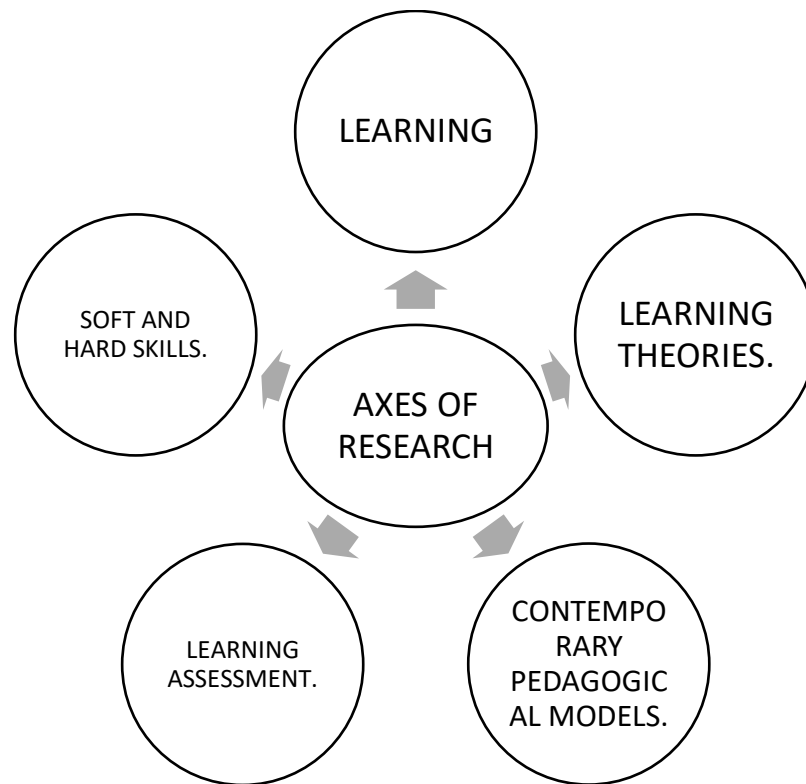
Fig. 1.- The five research axes represent the learning theories.

a) Learning.

Learning involves building and modifying our knowledge, as well as our skills, strategies, beliefs, attitudes and behaviors, (Schunk D. , 2012)Learning theories have different approaches as they are oriented to basic or applied learning.

Learning is defined as lastingly modifying behavior or behavioral capacity in a set way, which results from practice or from some acquired experience. (Shuell T. , 1986). Or learning is to modify the human disposition or capacity, with a lasting character and that is not only attributed to the development process. (Gagné R. , 1985).

Emotions put us before a reaction or response to given situations, these emotions are anger, fear, happiness, love, surprise, disgust, sadness, etc. In this pandemic have highlighted the negative emotions so it is important to develop and strengthen emotional intelligence because it allows us to be more responsible, have greater ability to concentrate, greater self-control, improve empathy, improve listening skills as it directly influences interpersonal relationships, (Ferreyra, 2007) which directly affects learning.

Anxiety, worry and fear are evolutionary adaptations that help us to survive, these emotions are being experienced with the confinement and the unknown of the COVID -19 virus, in addition to changes in sleeping or eating patterns, difficulties in sleeping or concentrating.

Anxiety can affect positively or negatively depending on the degree, because it is a protective mechanism, as the level of anxiety rises interest and attention rises but it reaches its optimal level and the decrease in interest and attention begins which impedes performance. (Smith, 2019).

b) Learning theories

There are different learning theories that are the basis for pedagogical models which should be analyzed to see which one is adequate for online learning, the most important representatives starting from behaviorism that starts from an empirical concept of knowledge, waiting for a response to a stimulus, as it mentions (Pavlov I. , 1972) is a conditioned reflex of an agent that provokes a certain unconditioned reflex, which in turn is a way of understanding and learning, being a sequence of stimulus-response for which there are no mental processes, the approach is the response to a stimulus and it is more likely that the same response is repeated if there is a reinforcement and not a punishment. (Skinner B. , 1969). This theory postulates that in order to see if a student has acquired a learning process, it is observable in the behavior, so behaviors are indicators that can be observable and measurable. (Hoic-Bozic N. , 2009)In this theory, students should be examined to see if they met the objectives set out in the learning guide, so it is important that they receive adequate feedback in a timely manner, so that they can improve and successfully meet the expected learning.

The Gestalt theory is important to consider because it is focused on problem solving as people face them and the strategies they adopt, this theory considers the previous experience which can influence the ability to solve problems in a more creative and understandable way, is one of the learning strategies used in the business area is problem solving or cases, it is also important to consider the theory of information processing that its study is based on solving problems that do not represent great difficulty and is selected rationally applying heuristic (Cerezo F. , 2011) applicable to problem solving.

The cognitivist theory is one of the traditional ones in which learning is perceived as a mental process that involves thinking, reflection, abstraction and meta-cognition. (Ally, 2004)In this theory, learning is seen as an active process where experience is converted into organized concepts, but individually as each learner possesses different abilities and motivations.

There are different types of memory during learning, the learner processes and stores the information in a long-term memory, the quantity and quality of that information will be according to the processing if it is deep and meaningful (Hoic-Bozic N. , 2009). The limitation of cognitivism is that it focuses on cognitive processes and neglects the personality that influences learning. (Ortiz, 2013).

The constructivist theory considers that the individual must play an active role in constructing his or her learning and making it his or her own. A learner who has a passive attitude will not be able to have knowledge acquisition, which is necessary for discovery and exploration.

Although it is pointed out that despite the rise of constructivism, it has limitations. (Pozo J. , 1997) He comments that not all learning is constructivist, since much of the learning is implicit, linked to an informal and daily development, and this is based on associative processes. (Castejón, 2010).

c) **Contemporary pedagogical models.**

In order to update these models it is necessary to consider them from different points of view such as sociology, ecology, communication and to analyze the relationship between them in order to renew the pedagogical models.

When pedagogical model is mentioned, it is synonymous, according to some authors, with strategy, development style, curriculum or field of study. (Ortiz, 2013).

Contemporary models distinguish between two main groups: the traditionalist and the humanist.

The traditional or also known as externalist or passive school we find Ignatius Loyola that has its antecedents in the ecclesiastical pedagogy with Jesuit main figure. This model results from the influence of external factors such as the teacher, the family, the social environment and the group. The student assimilates and reproduces these influences, whether positive or negative.

Humanistic, also called developmental or active school. The student occupies the foreground in the educational process. The internal factors of the personality are active in education, especially their motivations and admits all possible responses to external influences. The student self-educates by recreating reality, participates in it and transforms it, so there is no single model but a combination of the social and the individual. (Ortiz, 2013).

There is no doubt that we must be prepared for these changes, as Salman Rushdie has written: "We do not know what the future will bring, but we can, if we move in the right direction, take it to a better place". (Quiñones, 2012).

It is important to consider the ADDIE model, whose name comes from the acronym: Analysis, Design, Development, Implementation and Evaluation. (Maribe, 2009)ADDIE is used today for instructional design in order to plan, create and use teaching and learning environments that are effective and efficient, especially for technology-based education, (Salas, 2018).

d) Learning assessment

There is a diversity of techniques and instruments for the evaluation of learning. Assessment refers to the criteria, techniques and instruments used to measure the performance achieved by students, either in terms of knowledge or a systematic learning process. (Saavedra, 2001).

It is important to have the specific objectives well defined in the learning guides in order to carry out the evaluation, which is divided into three domains that can occur simultaneously. They are the psychomotor, which is composed of physical skills, resistance, strength, weakness, agility or capacity to execute a specific skill; cognitive, which is composed of knowledge, comprehension, application, analysis, synthesis and evaluation; and affective or emotional response, which is composed of receiving, responding, valuing, organizing and characterization by value. (Woolfolk, 2006)

e) Soft skills / hard skills (Soft skills / hard skills)

Skills are important according to the Stanford Research Institute and Scarnegie Mellon Foundation, among 500 CEOs they found that 75% of long-term job success depended on people skills and only 25% on technical skills. (Rao, 2010).
One of the classifications of competencies according to the notoriety in performance and evidential behavior are soft and hard skills or competencies (González, 2001).
Soft skills are those required in the social environment. They include those necessary for the communication process and interpersonal influence that are not tangible or visible but can be distinguished and recognized in people's performance. Examples of these are convincing, persuasion, negotiation, active listening, willingness to change, problem solving, time management, proactivity, leadership, etc.
Hard skills refer to technical or operational competencies to perform a specific activity. They include both labor and professional skills, the latter being more focused on technical knowledge, e.g., operating a machine, installing equipment, etc. (Lozano, 2013)The latter are more focused on technical knowledge, e.g., operating a machine, installing equipment, using software, drawing diagrams, diagnosing a situation, designing proposals.
The difference between them is that some of them are directly observable and can be measured in order to develop a successful professional career, whether it is to develop in a position, be an entrepreneur or simply interact in a social framework, however, it is necessary to have a balance of the two competences. (Lozano, 2013).
There are several classifications of transversal or general competencies, such as Bunk's classification (Tejada Fernández, 1999), technical, methodological, social and participative competencies. (Fernández, 2016).
Instrumental competencies are cognitive, methodological, technological and linguistic skills. Interpersonal competencies integrate social skills such as interaction and cooperation. Systemic competencies consider a combination of understanding, sensitivity and knowledge.
After study the five axes ,is necessary to consider online platforms for evaluating students, that includes to design new platforms suitable for conducting examinations, this action represent a potential solution for effective use of the technologies, at the same time, faculty members must be trained on using the online platforms for teaching. Is also importantly, to have an stable internet connections that ensured for both teachers and students for effective and smooth e-learning, (Sourav, 2021).

Conclusions:

The question is whether students have acquired soft and hard skills during the forced migration to online or remote mode, much has been questioned if this time from March 2020 students at all levels have not met the objectives set for each level, according to Vázquez (2007) a certain vocational maturity is needed for this mode, so we could assume that undergraduate students who selected a professional area of interest if they acquired skills.

According to Shuell's (1986) definition of learning, the students acquired some knowledge which will change their behavior in the long run, even if they did not acquire the desired objectives, they acquired some other skill because their behavior after this transition will not be the same, at least they will have acquired knowledge of the use of technological tools which is a necessary skill for employability.

According to Schunk (2012) Learning is applying, constructing and modifying our knowledge, which unless students were not in contact with their teacher would be the only way of not having acquired any knowledge, no matter how minimal.

As commented in IISUE (2020:26, 48, 120, 143) they were saturated with work so it was necessary to use soft skills such as problem solving, critical and reflective thinking, communication and time management.

The traditional and humanistic models mention that external and internal factors affect the pandemic.

According to Woolfolk (2006) the skills that should be evaluated are psychomotor, they would be difficult to evaluate without adequate educational technology, it is important to perform the psychomotor evaluation, since it visualizes the disadvantage or delay of the person to achieve the expected motor, affective and cognitive skills according to their age, impacting personal, school and social performance. In the cognitive evaluations of different types were performed with which you can check their level of achievement, and in emotional much depends on the way the teacher teaches the class.

The hard skills according to Lozano (2013), are the use of equipment, in information technology careers it is common to require a significant degree in the use of specific machinery, in the case of software and special methodologies if their use and application can be validated virtually.

In conclusion, according to the learning theories of cognitivism, it could be said that it was possible to evaluate by means of questionnaires, while in the theories of behaviorism the evaluation was through a process of several months following a routine of teaching and learning, for which they had stimuli and obtained a reward or punishment according to their evaluations; in constructivism, according to the distance learning models, self-learning was handled with the assignment of tasks to be performed independently. According to the Gestalt theory, students had to use their knowledge and experiences acquired in the past to build their new knowledge and solve problems. Although the acquisition of skills was not as originally planned, it was due to the fact that the objectives were set in a face-to-face modality and it was not planned with an adequate distance model with synchronous and asynchronous activities. Another problem that was not considered according to the humanistic model was the need to use an active role of the student in order to learn, so due

to the emergency there was no timely follow-up or training for both teachers and students to maintain motivation and willingness to learn. As for the emotional aspect, although anxiety levels were produced according to the referenced research, a level of anxiety combined with motivation can achieve the objective, it has been demonstrated that it would generate interest and attention, but at a high level it would be the opposite.

Suggestion and recommendations according to what was investigated if an acquisition of both soft and hard skills was achieved, but more could be achieved if proper planning is used according to the model of remote or distance education, likewise the teacher plays an important role regarding motivation and feedback, and the student should be given training to explain the differences between the modalities so that he/she can understand and self-manage his/her time and learning. These findings provide the basis for proposing new research in which hybrid learning models are proposed.

Bibliography:

Castejón, J. (2010). Psicología de la educación. Spain: Editorial Club Universitario.

Cerezo, F. (2011). Psychology of thought. Barcelona: Editorial UOC.

Lozano, A. (2013). Design of competency-based educational programs. Eidtorial Digital Tecnológico de Monterrey.

Hoic-Bozic, N. (2009). A blended learning approach to course design and implementation. Education, IEEE Transactions On.

Ally, A. (2004). Foundations of educational Theory for Online learning. Athabasca, Canada.

Fernández, B. (2016). Development and evaluation of competencies in higher education. Madrid: Narcea S.A. Ediciones.

Ferreyra, H. (2007). Teorías y enfoques psicoeducativos del aprendizaje. Mexico: Noveduc.

Gagné, R. (1985). The Conditions of Learning and Theory of Instruction. New York: CBS College Publishing.

Maribe, R. (2009). Instructional Design: The ADDIE Approach. Georgia, USA: Springer.

Ortiz, A. (2013). Pedagogical models and learning theories. Bogotá: Ediciones U.

Pavlov, I. (1972). Conditioned reflexes. Oxfor University Press.

Pozo, J. (1997). Change on change.

Quiñones, A. (2012). El futuro que no fue. review of Salman Rushdie's lecture delivered at pen World Voices Festival, New York.

Rao, M. S. (2010). Soft Skills - Enhancing Employability: Connecting Campus with Corporate. New Delhi: International Publishing House.

Ruíz, E. (2020). Virtual mobility of educational experiences. Mexico: SOMECE ICAT UNAM.

Schunk, D. (2012). Theories of learning: an educational perspective (6th ed.). Pearson Education.

Salas, R. (2018). Use of the ADDIE model during the construction of the game for the educational process. Alicante: Editorial Ärea de Innovación y Desarrollo, S.L.

Saavedra, M. (2001). Evaluacion Del Aprendizaje. Mexico: Editorial Pax Mexico.

Shuell, T. (1986). Cognitive Conceptions of Learning.

Skinner, B. (1969). The Selection of Behavior: The Operant Behaviorism of B. F. Skinner.

Smith, M. (2019). Students' emotions and their impact on learning. Narcea Ediciones.

Woolfolk, A. (2006). Educational psychology. Mexico: Pearson.

Anáhuac Puebla. (2022). Soft and hard skills: what is their difference?

Government of Mexico (2021). The distance education system, pandemic and gender inequalities. Gob.mx.

Bahamonde, E. (2021, June 2). 8 reasons to implement an LMS in your school.

Psychomotor assessment in CPAL (2023). Cpal.edu.pe.

IISUE (2018). Misión y visión. Unam.mx. https://www.iisue.unam.mx/nosotros/

Kyungmee Lee, Mik Fanguy, Brett Bligh & Xuefei Sophie Lu (2022). Adoption of online teaching during the COVID-19 Pandemic: a systematic analysis of changes in university teaching activity. Educational Review.

Per Warfvinge, Jennifer Löfgreen, Karim Andersson, Torgny Roxå & Christina Åkerman (2022). The rapid transition from campus to online teaching – how are students' perception of learning experiences affected? . European Journal of Engineering Education.

Sourav Mohan Saha, Sadia Afrin Pranty, Md. Jaber Rana, Md. Jahurul Islam, Md. Emran,Hossain, Issue 1,(2022). Teaching during a pandemic: do university teachers prefer online teaching?, Heliyon,Volume 8.