



Research and ICT Mediated Learning Styles

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Abstract. Taking into account technology goes ahead quickly and the teaching-learning processes for each person are different and the way to carry out this process should be at vanguard, Information and communications technology (ICT) play a role very important because they allow to create virtual objects for learning through software platforms, where they make knowledge is captured in a way more interactive, also making investigative process more dynamic and efficient.

By an autonomous learning, a building critical thinking and well-structured forming purposeful, creative and innovative professionals who contribute suitable solutions to their environment.

Besides all above, the professor also takes technological knowledge and developing new strategies and group dynamics, not only inside the classroom, but outside too, thus building a strong string between knowledge and working in site.

Regarding above, it is made a study with a focus group to watch how ITC contributes to develop knowledge and investigative processes, concluding the students use these artefacts as a complementary tool to make their knowledge stronger.

Keywords: Knowledge · Teaching · ITC · Investigation

1 Introduction

The challenges of current education propose learning environments that overcome traditional methodologies and break the physical and geographical spaces to propose students new ways of learning, resources on virtual platforms and access to web resources that make learning an experience with multiple options for autonomous work and also for student-professor and student-student interaction, proposing from the teaching person's novel planning and didactic forms that carry off the student to multidisciplinary environments; in such a way that autonomous learning is encouraged using and applying friendly technologies where the professor or virtual tutor becomes a mediator and companion of the student for the development of skills and the study of content allowing with the use of ICT to intervene the formation of reflexive, ethical, critical and competent people in an increasingly diverse and changing environment [1].

Taking into account that learning through ICTs as proposed by Grasha and Riechmann (1,974) the users of virtual platforms and websites learn individually or in

groups in three dimensions: autonomous/dependent, collaborative/competitive and participatory/non-participatory [2]; it is necessary a professor prepares for new ways of proposing content, tools and learning resources and also to become a virtual environment into a classroom, a research space, throughout with technological advances to modify significantly the paradigms of teaching-learning.

ICT-mediated learning implies a careful process of selection and organization of resources and contents, considering that the virtual environment can be accessed by people with different learning rhythms and styles, it is necessary to use different content managers and content platforms in a way that allows synchronous and asynchronous connection and provides all resources for deepening, exploring and applying knowledge; turning the ICT-mediated learning environment into a research space where the student can access to contents, but also build explanations, reasoned approaches to knowledge advancement and novelties that can modify and make products, processes, designs and in general speaking, academic productions that prove they have researched and applied knowledge.

1.1 Reference Framework

When talking about learning, it is necessary to know that all human beings have different ways of learning, which makes us have different ways of communication. The foregoing is so complex that several thinkers, psychologists, pedagogues and even at these times, coaching leaders have been concerned with understanding the way in which human beings learn.

There are several authors who have been working and generating theories about what is estimated as learning style: Witkin (1954), “cognitive styles”, authors such as Holzman and Clein (1954); Eriksen (1954); Golstein and Scheerer (1951), Dunn or Dunn, and Price, for whom learning styles reflect “the way in which basic stimuli affect the ability to a person to absorb and retain information”; for Hunt (1979: 27), these “describe the conditions under which a student is in the best situation to learn, or what structure the student needs to learn better”; Claxton, and Ralston (1978) learning style, “is a consistent way to respond and use stimuli in a learning context” [3].

Taking Ingrid Mosquera’s article entitled “Learning styles: sensory classification and Kolb’s proposal”, he presents two differentiated learning styles: sensory and Kolb’s. The sensory learning style is based on the human brain being divided into two hemispheres, the right hemisphere and the left hemisphere. The left hemisphere of the brain is focused on observation, analysis, experience and language. While the right hemisphere has the capacity to synthesize information, to understand images, it is where imagination and creativity develop [4]. According to this, the way in which each one learns, is based on which hemisphere we develop the most, hence the sensory language as the name implies has to do with the experienced sensations becoming the sense of preference that leads the baton at the time of learning; this is why the sensory learning style is classified as: visual, auditory and kinetic. If the sense of preference is sight, it means that they will learn much more through images, maps, drawings, photos, among others; in the same way if the auditory is preferential, the learning will take place through the actions of speaking and listening, it should be noted that the knowledge will be appropriate through talks, recordings, films, round tables and other actions that generate they need

an auditory exchange; in kinetic learning, the development of concepts will be carried out with the sense of touch, of experience, in doing, therefore activities such as comparing and interpreting everyday situations, laboratory practices, field trips, and other tasks that involve contact, sense of relationship and belonging [3].

In addition to the learning styles shown by Kolb is the proposal by Fariñas, G. (1995), who presents 4 basic dimensions for learning through a holistic conception of it: "(1) The approach of objectives, tasks and the temporary organization of its execution through steps or stages. (2) The search for information and its understanding. (3) Communication about your performance. (4) The solution or problem statement." [1].

Once you have understood some of the learning styles that have been studied and developed, you can talk about research and its relation to learning in students at different stages of it; Therefore, according to the dictionary of the Royal Academy of the Spanish Language, the research is that it aims at expanding scientific knowledge, without pursuing, in principle, any practical application [5]. Hence, the research is based mainly on the observation of the environment and the identification of any problem in any aspect, whether social, technical, technological, environmental, educational, among many others. As Tamayo (2003) quotes in his text: "the process of scientific research" to Arias Galicia "[...] research can be defined as a series of methods to solve problems whose solutions need to be obtained through a series of operations logical, based on objective data." [6].

Given the above, research becomes a systemic process that leads to achieve concrete results to "To see the reality that others have not seen" [6]. So that the investigation has the rigor that it deserves, it is leveraged in the scientific method, which gives it a rigorous character in terms of the observance of reality and the theoretical construction that allows it to generate objective conclusions; through the following steps: The approach to the problem, stage in which the observation and discovery of the situation or situations that are inconsistent in relation to knowledge are made, allows the problem question to be formulated. A theoretical model that allows the selection of variables and the generation of hypotheses. Test of the hypothesis, at this stage a series of procedures are generated for the design and performance of tests that will lead to data collection, classification, evaluation and analysis. Finally - The Conclusions that give rise to the verification and/or denial of the hypotheses raised for the solution of the problem found [7]. With this, it could be said that research is implicit in each of the learning styles of individuals due to whatever form of appropriation of knowledge the same process is always carried out: observation, through the senses; identification of a problem, the way in which the observed thing is related to the environment; hypothesis generation, questions that student is asked about the subject being treated; Test of the hypothesis, when student tries to solve those questions through consultations and class activities and finally the conclusions, they are established when student to appropriate the knowledge. This demonstrates the relationship between learning and research.

It should be borne in mind that when talking about a learning environment, in addition to the tools that exist today to carry out the teaching-learning process, terms such as: M-Learning, E-Learning and Learning. According to the author's research Aguirre [8], where he quotes that: "The technological resources that currently allow teaching proposals supported by virtuality are based on two fundamental concepts, M-Learning and

E-Learning. The first one joins the proposals of the information society to support the learning proposal throughout life and especially its continuity in adulthood; the concept of e-Learning is a teaching-learning modality that consists in the design, implementation and evolution of a course or training plan developed through computer networks”.

Based on the foregoing and according to the studies carried out in the research, it can be concluded that the described technologies have been and are directly or indirectly involved in the teaching-learning processes. In the article of [9], they highlight “The impact of technologies on education” and recognize the importance of having them as main tools in the classes, to allow student to interact, to experience, to associate and to recognize the knowledge that is abstract to them when it is only explained to them from the theoretical; with this, the information is brought within their reach, allowing them to reflect, observe and understand to put it into practice in their personal and working environment.

As a complement to the above, at this moment the Information and communications technologies are indispensable for the good development not only of the different learning processes but also in the implementation of the research in the classroom and strictly speaking; in such a way that it is evident that there are few investigations in Colombia about this subject, some of them are based on the EVAS (Virtual Learning Environments) those are a type of virtual education based mainly on the permanent internet connection and online software. In this perspective of virtual training, Spanish authors stand out who are at the forefront such as: (Fernández 2015), Professor of Didactics and School Organization at the University of Castilla la Mancha and Julio Cabero Almenara of the University of Seville (2008). Additionally, there is the research conducted by (Vera 2014) of the University of Malaga entitled. “Virtual reality and educational possibilities”, where it raises the theme of Virtual Reality in the classroom as a research challenge; it revolved around the question. “What can Virtual Reality technology bring to current training environments?”; concluding that Virtual Reality is a technology applicable to the context of education, mainly for its ability to visualize the processes under study, regardless of the discipline to be treated. That way, students can appropriate artificial scenarios that show them processes under study that would otherwise be unaffordable for them.

However, it is important to highlight that these technological developments have been managed in students for entertainment purposes and to generate communication networks between their contacts and friends, but when incorporating these technologies and others such as chat, video conferences, educational games with virtual reality, social networks or guided tours with augmented reality, they do not recognize them as academic resources, and although they have the ability to navigate and consulting digital media, they do not recognize them in class and they have difficulties in interactions, this identified in one of the experiences commented in the book of Cortes and Murcia [10], where a workshop held to students of engineering programs, the theme developed was focused on scalar magnitudes, this to know the physical dimensions of objects and spaces, using virtual reality as a technological resource, where the results were a better remembrance of the different magnitudes, greater interest in the class, more participation of the groups and more assimilation of concepts. It was also found that they show

difficulty in handling the technology with the device (VR goggles) and the software, they were accompanied and advised by the professor, to achieve the objective of the classes.

Other research found, it is Alicante University's research, in Spain, they designed a remote laboratory with virtual technology for the robotics area, this in order to mitigate access problems such as unavailable schedules, limited times, laboratory equipment not available [11].

2 ICT, Virtual Environments and Research

2.1 New Information and Communication Technologies as a Teaching Tool

ICT-mediated learning environments are today a constant before educational practices, these environments involve leaving the paradigm of traditional education to take on the challenge of interacting with students through the web [2]; Information and Communication Technologies allow both students and professors, not only the use of platforms, software to manage content and the combination of educational media preload on virtual platforms, but the combination of these ones with social networks options to be used on an open and informal communication for supporting formal educational strategies such as courses and contents of a syllabus and propose new ways to access and building knowledge.

Current professionals require a communicative skills that allows them to interact with people in a synchronous and asynchronous way, establishing feedback and an effective communication, making the use of ICTs promote autonomous learning, comprehension skills, construction, disseminate knowledge in a wide and diverse context which is constantly changing. For the professor they constitute an alternative mechanism in their educational action, through which they can boost the learning styles mentioned above, generating both individual and group educational proposals; developing cognitive styles mentioned by Grasha and Riechmann (1974) propose educational experiences in three dimensions: autonomous/dependent, collaborative/competitive and participatory/non-participatory [9].

ICTs have advanced by leaps and bounds, where in addition to platforms, content controllers, the web and social networks; new empathy technologies have appeared that seek to propose the game as a learning tool; they apply softwares and tools that make use of augmented reality, virtual reality, tangible programming, 360 environments, to explore content, discover and share knowledge, through the game, interaction and exploration of realities intentionally proposed by the professor to achieve learning objectives. Becoming another challenge for higher education, where new educational experiences open paths that were visualized since the incorporation of new computers in Universities and as Adell (1977) had already predicted, digitalization is the main support of knowledge and the fact itself to know [2, 12].

In addition, several authors agree that the use of technology makes learning a holistic process Jonassen, Campbell and Davidson (1994), and also integrating and acquiring knowledge is a constructive process according to Viejo, Cabezas and Martínez (2013) which is achieved through ICT, also in a collaborative way, therefore it means technology is also considered a cognitive tool, because its use falls on the student's learning who generates autonomously knowledge [13].

That generation of autonomous knowledge in the student, developing step by step, a methodology that allows him/her to advance in the research area, because he/she begins to contextualize and conceptualize his/her environment in a more concrete way, with his/her own criteria, which leads to build a critical and well structured thinking, which results in a proactive, innovative, creative professional who shows appropriate solutions in accordance with social, economic, political and business environments. Likewise, ICTs have forced professor to change the way to teach knowledge, nowadays more than standing in front of a whiteboard and conducting a master class it is about being a guide in the route of appropriation of student's knowledge, using new strategies and new group dynamics inside and outside of the classroom.

2.2 Research as a Process in Virtual Learning Environments

In the context of higher education, one of the most controversial aspects is scientific research, and in virtual environments this process requires to be prepared and also scheduling those strategies that motivate significant moments for student to relate the study of content and the building of knowledge, with the practices of learning to investigate and professor with the methodology to research and proposing to the student approaches with science (Hernández 2005).

Higher education Institutions are making progresses in recognizing and appropriating strategies and methods so that students, through the use of ICTs have access to content designed in such a way that they propose cognitive imbalances, problematic and casuistic situations that lead them to delve into the subjects, to the search of reliable sources of information and contents and therefore to the investigative development to excuse of the disciplinary contents.

However, the practice of teaching is still conditioned by the low motivation to develop demanding projects, based on real needs and also conditioned by the gaps between schools and higher education (Aponte 2005 and Vasco 2006) that do not allow a true research in a Colombian University [14]. This before the reality that teaching staff were not either formed for scientific research. Researching in ICT-mediated environments implies access to digitalized content as part of teaching and research and as a strategy to generate academic-scientific trajectory [14].

The interaction between student and professor in the virtual environment implies, as mention before, the use of ICT to communicating, interacting, learning and teaching, all this is extended to the vision of supporting a culture of research, which exceeds the access to information and contents to propose transformations in the classroom, the educational context. (See Fig. 1)

ICTs are tools that make science possible through animations, simulations, videos, three-dimensional models that connect student with nature, technological environments and all of this constitutes supporting elements for scientific education [15]. These technological tools allow the professor to prepare the instructional design of the virtual environment and propose diverse web resources that give student an opportunity to access a multitude of concepts, themes, visions, experiences, experiments and digitized contents that motivate critical and analytical thinking. In addition to proposing activities that promote meaningful learning from the design of forums of analysis and purposeful forums, tasks such as blog, communication wall, designs such as timelines, infographics,

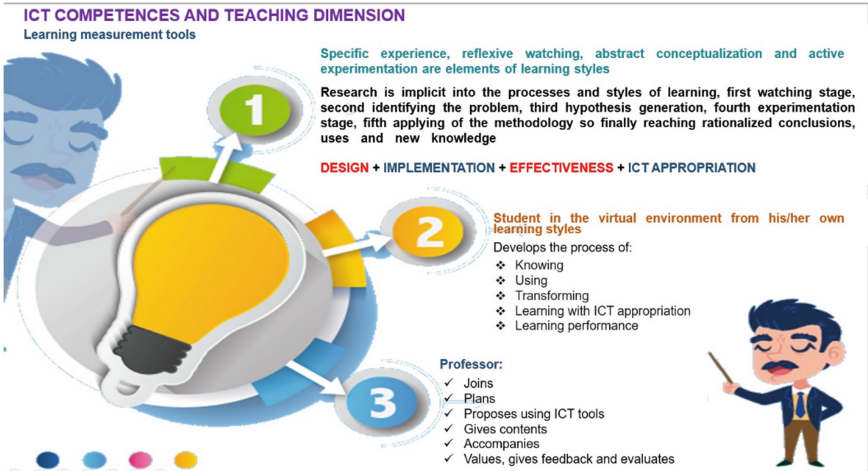


Fig. 1. Learning and research styles. Source: self made

voice notes, recordings, animations, projects, applications; all of them in an entertaining way allow to transmit what you have learned, expand content, showing research and conclusions or scientific approaches; all of this in the context of an open classroom university, transformer and enhancer of research skills.

3 Methodology

The current study is analytical-descriptive; for its development, the first stage was the documentary review of the theories incident on ICT-mediated learning and learning styles; then it is defined to apply the qualitative method and the combination of techniques: direct watching from the teaching role, in a group of higher education students and the online survey to subsequently analyze the data and describing the results contrasting them with the theories of base for the investigation.

4 Results and Discussion

For the study, the behaviors of a group of 39 higher education students were analyzed, in relation to the use and technological preferences in learning, learning styles and investigative behaviors in the mentioned process; finding the following results (Figs. 2, 3, 4, 5, 6, 7, 8, 9):

Watching the 39 students of the selected sample, the results of the strengthening of education with the use of ICT and the incursion of virtual reality, show that students using virtual classrooms focus on sending activities such as homework and forum with a result of 79.5%, showing less interest in classroom’s e-mail and its syllabus and general speaking students prefer more the individual activities (61.5%) than collaborative and autonomous development of content (94.9%); which is an educational paradigm and of

Do you know the resources of a virtual classroom and have used them to strengthen your education? Mention the most frequent.

40 answers

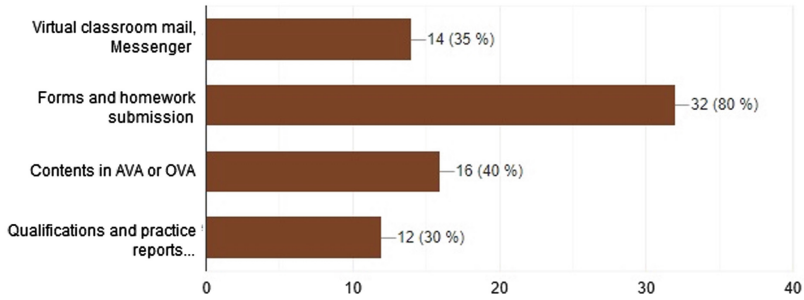


Fig. 2. Knowledge and use of ICT in learning.

In a virtual classroom, what are the activities of your choice?

40 answers

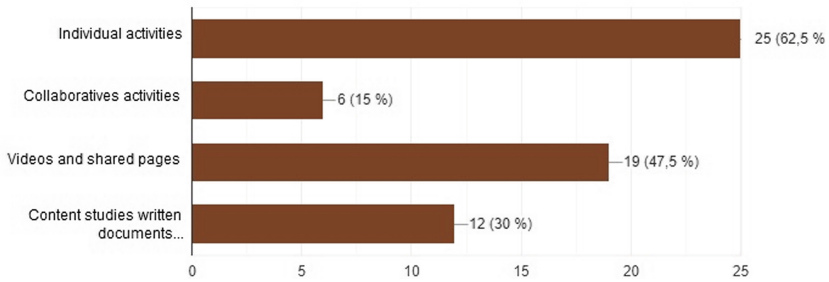


Fig. 3. Preferences in the use of ICT in education.

His activity in a virtual classroom is:

40 answers

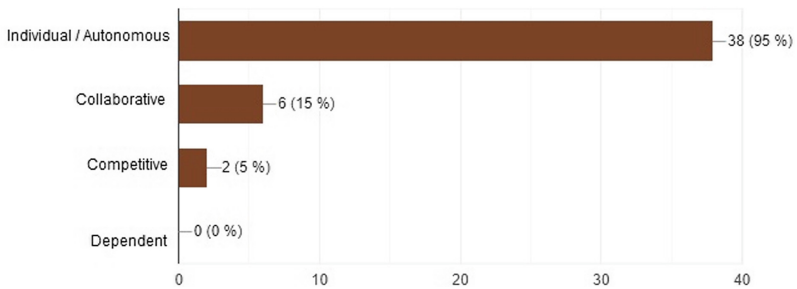


Fig. 4. Learning styles according to Grasha and Riechmann (1,974).

In a virtual classroom, look for learning through:

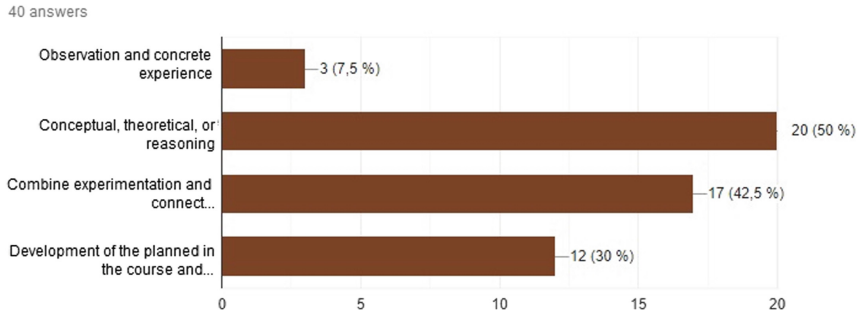


Fig. 5. Learning styles Mosquera (2,017) Kolb analysis (1,970).

In a virtual classroom, you can research on a topic of interest or content:

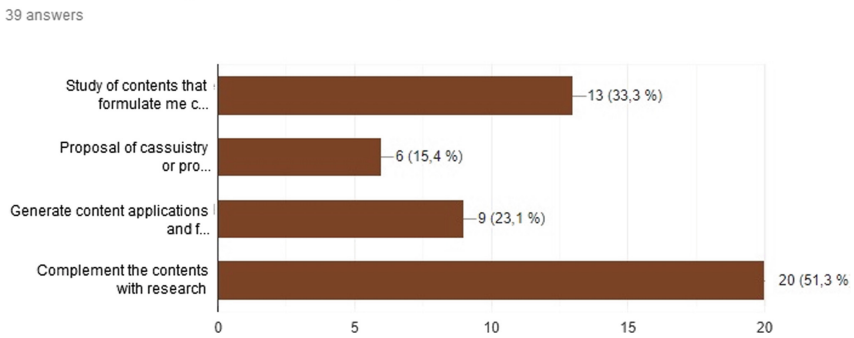


Fig. 6. Research in TIC-mediated learning.

the same design of the activities and the learning environment in the virtual classroom; it must be planned from the teaching role.

It is also observed that the students surveyed are drawn to the learning process through the implementation of virtual reality (52.6%), taking into account that the majority of respondents have had contact with this technology through video games (80%) and their experience in the use of it has been satisfactory (60%). In addition to this, some subjects were chosen in which learning can be made through virtual reality, watching most of them would find it easier to learn subjects based on technical drawing. using this technology (50%), due to the visualization of objects and structures dimensioning and projecting their forms.

From the above, it can be concluded that the support of ICTs through virtual classrooms allows student to adopt their own learning style in which he/she can visualize and appropriate in an independent way the knowledge, generating a habit of permanent consultation associated with a research process of the topics proposed in the subject by professor; likewise, the implementation of virtual reality tools in some subjects, increases the student’s cognitive processes by creating skills and abilities by virtual interacting with the elements of study. In fact, it has been possible to show that students who use virtual classrooms or virtual reality for their learning, not only improve their grades but also their capacity for analysis, critical thinking showing innovative proposals in the classroom.

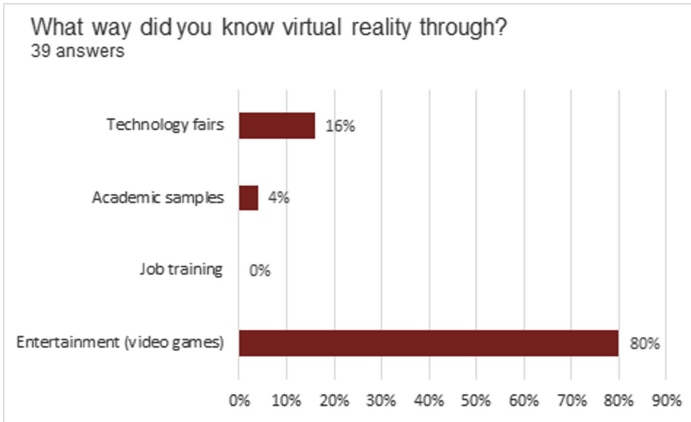


Fig. 7. Ways to know virtual reality.

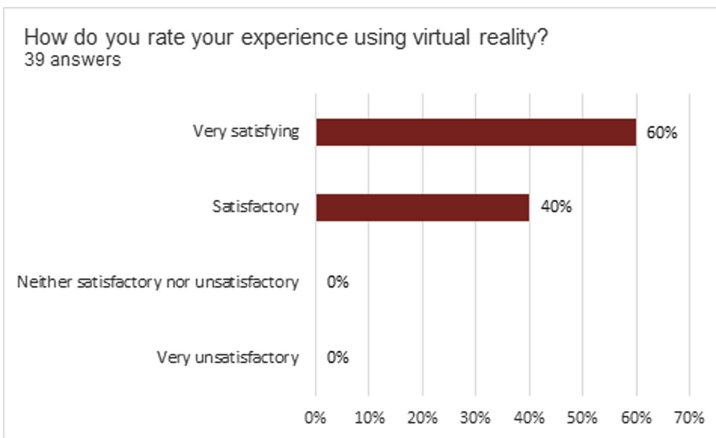


Fig. 8. Experience using virtual reality.

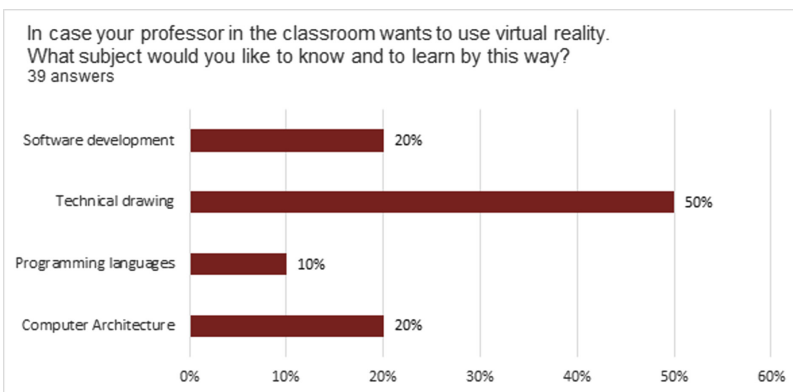


Fig. 9. Thematic for learning through virtual reality.

5 Conclusions

Student's learning process is in itself a dynamic, permanent and sequential process; the student is building, generating and expanding knowledge as the same time he/she receives the motivation and mediation from professor; with the use of technologies this mediation and accompaniment in the learning process becomes more striking and implies the use of a large number of methodological strategies that help student to access knowledge through the web, media and communication tools, the new software and diversity of pages and resources for knowledge creation; in such a way that according to their own learning style, the use of ICTs and the intentional proposition of teaching strategies and teaching by teaching staff achieve a significant learning, which according to Ausubel [14] make use or retake the concepts and learning that student already brings and expands with new learning that he/she later manages to appropriate and apply.

The learning process with the use of ICT and augmented reality becomes more autonomous, reflective and with a high research component, since in the mediated learning by the range of technologies to which we now have access, professor is a companion and engine of the process and student is an investigator whose action is depth, so that the learning action is carried out by itself, this is how he/she builds and proposes elaborations, creations, adaptations and understandings of concepts, processes, prototypes, procedures where the cognitive, the procedural and the knowledge application are put into action.

On the other hand, in relation to the diagnosis made to students of different academic programs of higher education, it could be evidenced that they definitely only handle the technology for entertainment and leisure spaces, and when making use in these fields, they consider it assertive since it allows them to interact and because it is a dynamic way to play alone or online with a group of students, and they are constantly updating the latest trends in these resources, from software to hardware; on the other hand, they stated that if in institutions they implement technology such as virtual reality for learning, the area that had more interest or more acceptance was technical drawing, due to interacting with spaces and objects, it allows them to have a better approach in aspects of dimensions, perspectives of design and setting of the places, for later students to be able to project them with their own proposals.

It is necessary that both educational institutions and students, receive advice on how to make use of technologies different to conventional ones, so that there is more appropriation of knowledge and more collective participation by the study groups, thus in this way classes and subjects, be more enriching and with more learning.

References

1. Martínez, N.: Pedagogía: Currículo y uso de TIC para cursos virtuales. Revista ED Experiencia Docente. Universidad ECCI. Bogotá Colombia. IOP Web (2016). <http://experienciadocente.ecci.edu.co/index.php/experienciadoc/article/view/43/30>
2. Martínez, N.: Influencia de la red social Twitter en la interacción, comunicación y nivel académico de los docentes de un curso de actualización. Editorial Académica Española (2014). ISBN: 978-3-639-67097-4

3. Cabrera, A., Juan, S., Fariñas, L.G.: El estudio de los estilos de aprendizaje desde una perspectiva vigostkiana: una aproximación conceptual. *Revista Iberoamericana de Educación. UNIR* (2019). (ISSN: 1681-5653). IOP Web: http://www2.udec.cl/~hbrinkma/estilos_de_aprendizaje_perspectiva_vigostkiana.pdf
4. I. Mosquera G., Estilos de aprendizaje: clasificación sensorial y propuesta de Kolb UNIR (2017). IOP Web: <https://www.unir.net/educacion/revista/noticias/estilos-de-aprendizaje-clasificacion-sensorial-y-propuesta-de-kolb/549201749973/>. Accedido el 28 de julio de 2019
5. Investigación| Definición de investigación - Diccionario de la lengua española - Edición del Tricentenario (2017). IOP Web: <https://dle.rae.es/?id=M3YxV5t>. Accedido el 30 de julio de 2019
6. Tamayo y Tamayo, M.: and Instituto Colombiano para el Fomento de la Educación Superior., *La investigación*. Icfes. (1999)
7. Bunge, M.: *La Ciencia, Su Método Y Su Filosofía*. Laetoli (2013)
8. Aguirre, C.: Desarrollo de competencias de investigación en estudiantes de educación superior con la mediación de herramientas de m-learning & e-learning. *Revista de Inclusión y desarrollo – Uniminuto*, pp. 68–83 (2017)
9. Yang, X., Cheng, P.-Y., Yang, X.: The impact of three types of virtual reality scene on learning. *International Conference of Educational Innovation through Technology (EITT)* (2017). ISBN: 978-1-5386-0629-2
10. Cortés, J., Murcia, C.: *REALIDAD VIRTUAL EN LOS PROCESOS DE ENSEÑANZA EN LA EDUCACIÓN SUPERIOR*. Bogotá: Corporación Universitaria Minuto de Dios-UNIMINUTO (2019)
11. Candelas, F., Fernando Torres, P.G.: *LABORATORIO VIRTUAL REMOTO PARA ROBÓTICA Y EVALUACIÓN DE SU IMPACTO EN LA DOCENCIA*. Alicante (2004). https://rua.ua.es/dspace/bitstream/10045/4609/1/CandelasA-Laboratorio_Virtual_remoto_para_robotica_y_evaluacion-Riai1-2.pdf
12. Martínez, N.: *Evaluación del aprendizaje en ambientes mediados por TIC: Influencia de las rúbricas en el rendimiento académico en educación superior*. Tesis doctoral Universidad internacional de la RIOJA. España (2018)
13. Steve, F.: *Bolonia y las TIC: de la docencia 1.0 al aprendizaje 2.0*. Universidad Politécnica de Madrid (2009). IOP Web: <http://polired.upm.es/index.php/lacuestionuniversitaria/article/view/3337/3402>. Accedido el 30 de julio de 2019
14. Aparicio, O.: Las TIC como herramienta cognitiva. *Revista interamericana de Investigación, educación y pedagogía*. Universidad Santo Tomás, vol. 11, no. 1, pp. 67–80 (2018). IOP Web: <http://www.redalyc.org/articulo.oa?id=561059324005>. Accedido el 30 de julio de 2019
15. Rojas, M., Méndez, R.: *Cómo enseñar a investigar. Un reto para la pedagogía universitaria*. *Educ*. Universidad de la Sabana Universidad Industrial de Santander. Escuela de trabajo social. Bucaramanga. Colombia, vol. 16, no. 1. (2013). <https://dialnet.unirioja.es/servlet/articulo?codigo=5468365>. Accedido el 30 de julio de 2019
16. Lemke, J.: *Investigar para el futuro de la educación científica. Nuevas forma de aprender, nuevas formas de vivir. Enseñanza de las ciencias: revista de investigación y experiencias didácticas*, vol. 24 no. 1, pp. 5–12. (2006). <https://www.raco.cat/index.php/Ensenanza/article/view/73528> Accedido el 30 de julio de 2019
17. Ausubel, D.: *Adquisición y retención del conocimiento. Una perspectiva cognitiva*. Editorial Paidós. Barcelona. España (2002)
18. Kolb. *Fundamentos teórico-metodológicos de la educación distancia: Estilos de aprendizaje*. Universidad autónoma del Estado Hidalgo. Sistema de universidad Virtual (1970)
19. Del Carmen Avendaño, V., Rangel Ibarra, R., Chao González, M.M.: *Paakat : revista de tecnología y sociedad*, vol. 1, no. 1. Universidad de Guadalajara (2011)