

Análisis de la percepción de docentes, usuarios de una plataforma educativa a través de los modelos TPACK, SAMR y TAM3 en una institución de educación superior

Analysis of the perception of teachers, users of an educational platform, through the models: TPACK, SAMR and TAM3 in a Higher Education Institution

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RESUMEN

Palabras clave

Sistema de gestión del aprendizaje, TPACK, SAMR, TAM3, competencias digitales, formación docente

Este documento da a conocer los resultados de una investigación en la que analizamos la percepción del beneficio educativo de los docentes usuarios del sistema de gestión del aprendizaje (LMS) Blackboard utilizado en la Universidad Autónoma del Estado de Hidalgo (UAEH). El eje central del estudio fue la pregunta ¿cuál es el beneficio de utilizar un LMS como herramienta tecnológica en el proceso educativo de la UAEH? El análisis se basó en las dimensiones teóricas de los modelos TPACK de Mishra y Koehler (2006), el modelo SAMR, desarrollado por Puentedura (2006), y el TAM3, de Venkatesh y Bala (2008). Es un estudio de caso múltiple en el cual usamos varios casos a la vez para abordar y describir una realidad. En esta investigación participaron tres docentes del campus Tlahuelilpan de la UAEH, quienes recurrieron a una entrevista semiestructurada para la obtención de datos. Los resultados muestran la necesidad de una capacitación no solo en lo tecnológico, sino también en lo pedagógico y curricular; una adecuada infraestructura y la modificación en las políticas institucionales. Esto responde a los modelos teóricos mencionados. Es conveniente que las instituciones de educación superior (IES) tomen en cuenta lo anterior en el momento de implementar un sistema de gestión del aprendizaje como apoyo en el proceso educativo.

ABSTRACT

Keywords

Learning Management System, TPACK Model, SAMR Model, TAM3 Model, e-skills, teacher training

This paper presents the results of the research that analyzed the perception of the educational benefit of users of the Learning Management System (LMS) Blackboard that is used at the Autonomous University of the State of Hidalgo (UAEH), taking as a central axis the question: What is the benefit of the learning management system as a technological tool in the educational process of UAEH? For this, the analysis was performed based on the models: TPACK by Mishra & Koehler (2006), SAMR model developed by Puentedura (2006) and TAM3 developed by Venkatesh & Bala (2008). Methodologically it is a multiple case study, where several cases are used simultaneously to explore and describe a reality. Three teachers of the Campus Tlahuelilpan of the UAEH participated in the semi-structured interview, which constituted the technique for obtaining data. The results indicate the need for an adequate training, not only in the technological, but also in the pedagogical and curricular; adequate infrastructure and changes in institutional policies, among others. This responds to the theoretical models mentioned above. It is suggested that Higher Education Institutions take into account this results when implementing a Learning Management System as a support in the educational process.

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INTRODUCTION

Researchers related to knowledge and acceptance of information and communication technologies (ICTs) in the educational process, more specifically when professors include them in their teaching tasks, have multiplied given their rapid incorporation in teaching. However, Sancho and Alonso (2012) point out that the mere introduction or presence of ICTs in educational institutions does not suffice in improving the learning processes and results.

The growth in offer and demand of virtual learning settings shows that IES [Spanish acronym for Higher Education Institutions, HEI] are using ICTs as a resource to improve and expand the education offer. However, the development of virtual settings is being done intuitively, without a calculated analysis of educational factors that intervene in the process, situation that limits the potential of the learning technology (Herrera, 2002).

This study presents the results of the application of qualitative techniques as supplement to the use of quantitative methods to describe the perception of the educational benefit of the users of an LMS. It is worth mentioning that this research allowed us to address different educational contexts given that the UAEH [Autonomous University of the State of Hidalgo] has six institutes and nine higher education schools in several parts of the State of Hidalgo. Hence, we had the opportunity to conduct a comparative study between institutes and higher education schools; the socio-anthropological differences in every school have enriched our research. This has helped us determine how LMS, used as technological tool, benefitted the teachers in different settings.

ICTs have permeated countless sectors and education has not been the exception and the result has been the transformation of learning environments. Cabero et al. (2011) allege that university education is increasingly influenced by ICTs. At the beginning of the 21st century, HEI and enterprises were already using educational technology and online learning in their study and training programs, thus, the emergence of a large number of LMS and different educational modalities such as e-learning, which learning is totally remote and accessed through the Internet and supported by ICTs, more specifically in LMS, as well as blended learning or b-learning, which is a mixed learning that combines traditional classroom teaching with ICTs and is characterized by the combination of technologies, activities and different typologies of instructional situations (Cabero, 2009).

Ultimately, to speak of b-learning is to refer to communication, a communication mediated in very different ways which benefits from the richness of codes and is optimized with the use of technologies. In this wealth of technologies, HEI teachers have chosen LMSs as support in their

classroom activities; however, Mayta and León (2009) insist on the fact that the incorporation of LMSs in education is an extremely difficult process since it involves “grafting” a model rooted outside the teaching systems.

Perception of the educational benefit of technology through the TAM3 model

According to Rodríguez (2013), our perception is not determined only by our observations but also by an active search to attain a better data interpretation. Hence, “knowledge is not an objective truth but rather variable and verifiable. Therefore, it is marked by the willingness to question perceptions and expectations traditionally and socially accepted (p. 172).

The TAM model proposed by Davis in 1989 indicates that there are two important aspects when using a technology: the perceived utility and the perceived ease of use. This model has great importance in the field of educational technology since it has been used to measure and assess the different variables at play in its use. TAM2 included an extension of the aspects that influence the perceived utility while TAM3 focused on the aspects that affect the perceived ease of use (See Figure 1).

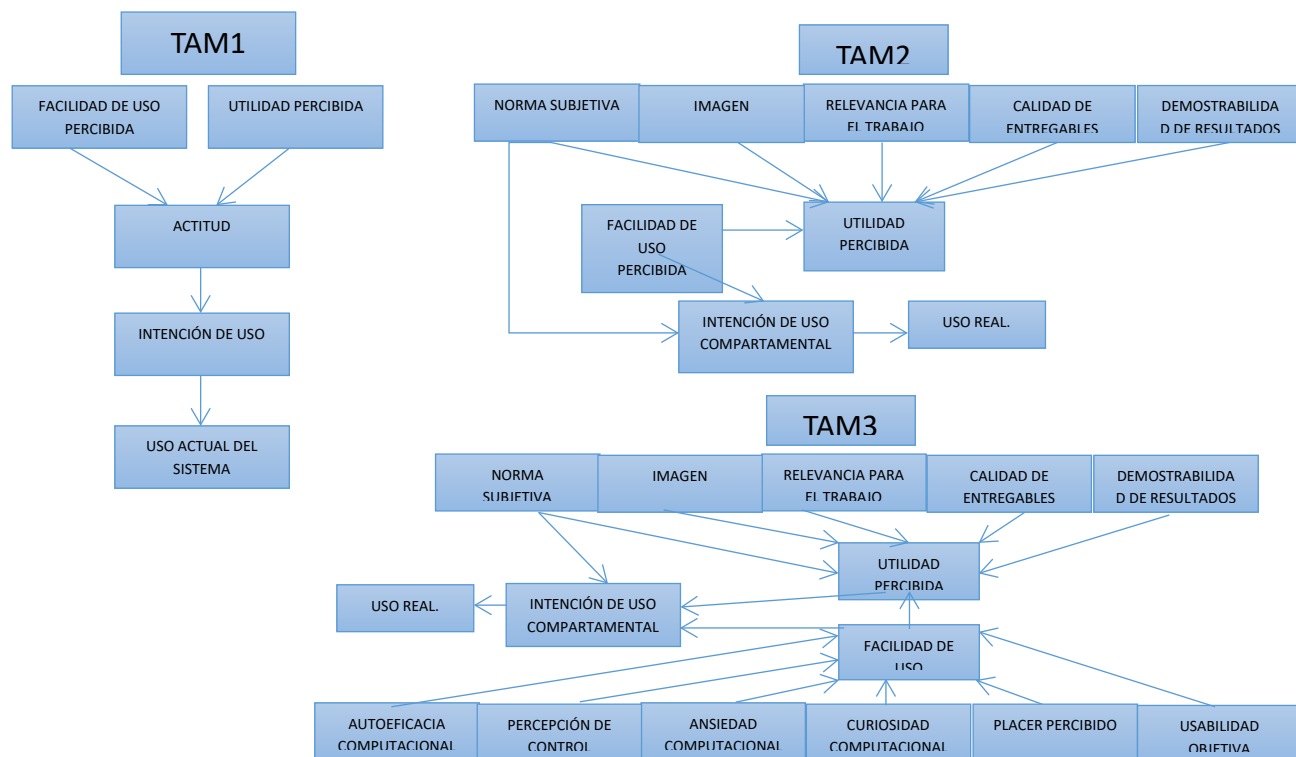


Figure 1. TAM, TAM2, TAM3 Models.

TPACK Model in the Learning Management Systems

The TPACK model (See Figure 2) was developed by Mishra and Koehler (2006), and it is based on the analysis of the pedagogic content knowledge (PCK) developed by Shulman (1986). This author points out that professors must be knowledgeable about pedagogy and content in order for them to implement programs. On the basis of this approach, Mishra and Koehler developed their TPACK model which aims at analyzing the different types of knowledge that professors must have to include ICTs effectively in their teaching activity in order for their students to achieve significant learning. According to this model, teachers must possess technological, pedagogical and content knowledge.

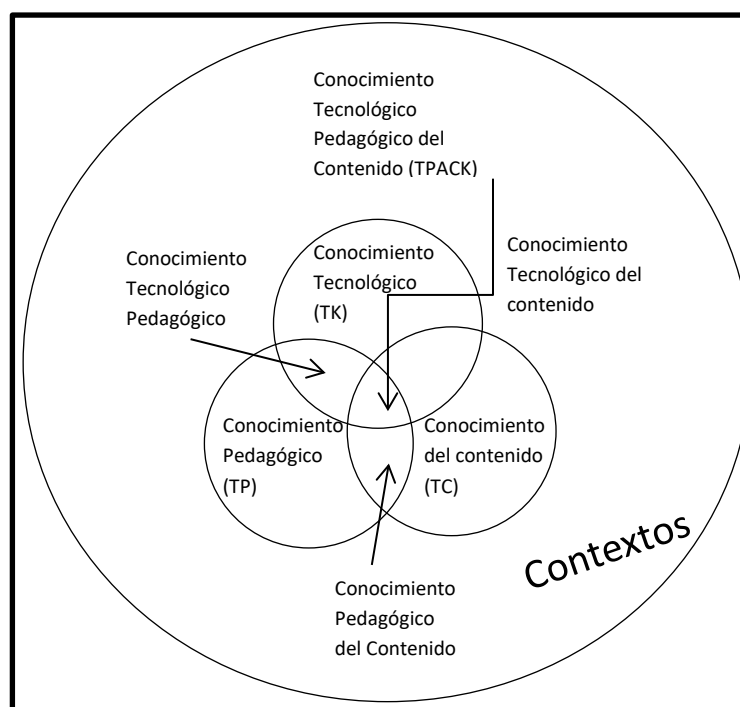


Figure 2. TPACK Model.

According to Cabero (2014), the most significant aspect of this model is that the teacher must have had the training to include ICTs in the educational context, not by comprehending the three components (CK, PK and CT) in isolation only but also understanding the importance of the intersections of each of them. The knowledge resulting from the intersections is as follows:

- Pedagogical Content Knowledge or PCK, refers to the knowledge of the use of technology applied to the teaching-learning process.
- Technological Content Knowledge or TCK), refers to the knowledge of how technology can influence the development of contents of a subject in particular.
- Pedagogical Content Knowledge or PCK), focuses on the knowledge of a subject in particular and involves teaching activities that allow improving the student's learning.
- Technological Pedagogical Content Knowledge or TPACK), refers to the knowledge teachers require to include technology in the teaching of a subject and promote the student's learning. (Mishra & Koehler, 2006).

Technological knowledge includes how ICTs work and how to use them. In this research, when talking about ICTs, we refer to the Blackboard educational platform.

The SAMR Model and the Teacher's Use of Technologies in the Classroom

The substitution, increase, modification and redefinition or SAMR model (See Figure 3), developed by Puentedura (2006), allow us to determine the way in which teachers and students use technology in class. This model consists of four levels that help teachers visualize how to use technology to transform the teaching-learning process.

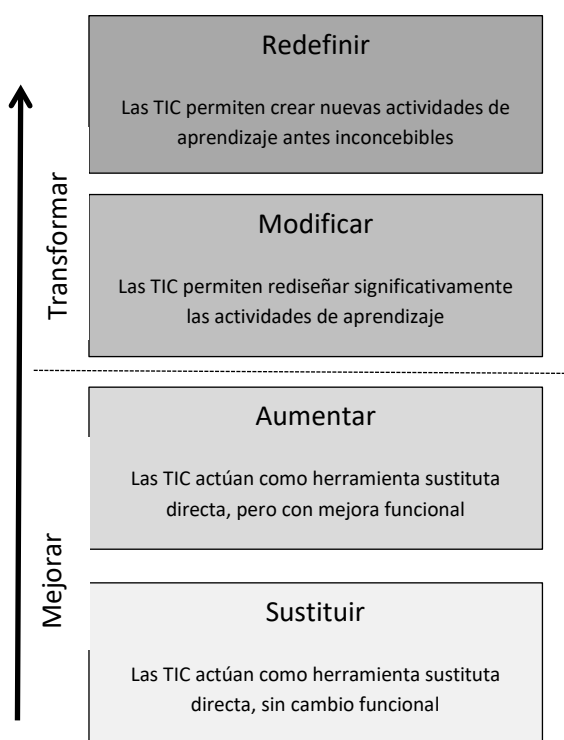


Figure 3. SAMR model adapted from Puentedura (2006).
Source: developed by the author.

The first two levels of the model define an improvement of the activities of the teaching-learning process with the inclusion of technology while the following levels, include a transformation through technology of their activities in the educational process. For García, Figueroa and Esquivel (2014), the SAMR model is set in the technological field; therefore, it is necessary that the teacher first achieve the learning objectives of his subject and the methodology he will use to subsequently select the technologies to be used as tools in his pedagogical activity.

METHODOLOGY

Based on the research question: What is the benefit of the learning management system as technological tool in the UAEH educational process? We set as objective to describe the educational benefit in the users of the Blackboard learning management system by applying the TPACK, SAMR and TAM3 models to encourage teachers in using the platform.

Therefore, in order to analyze the factors involving the perception of educational benefit, we identified the technological, pedagogical and disciplinary knowledge based on the TPACK models; we obtained information about the way in which teachers use the Blackboard educational platform as classroom support with SARM; and we identified the utility and ease of use perceived from TAM3. We resorted to the interpretive paradigm since we addressed the topic from the logic of the actors involved (Flick, 2002). It is a multiple case study, with several cases at once to analyze and describe a reality (Yin, 1993). The semi-structured interview became the method for collecting information.

We established the characteristics of the subjects participating in the research. For Taylor and Bogdan (1987), the selection of informants begins with a general idea of the subjects to be interviewed, and the number of interviewees has relatively no importance; the fundamental thing is the information potential that can be obtained. Based on the above, we adopted the following criterion: use or have used the Blackboard educational platform within the UAEH as support for the teaching activity.

With this criterion in mind, we proceeded to search subjects supported by the platform administrator. From the list provided, we chose three professors from the teaching staff of the UAEH Tlahuelilpan campus, one from the Bachelor's Degree in Administration and the other two from the Software Engineering department. We address the convenience criterion, i.e., we chose the most accessible cases under determined conditions (Flick, 2002): based on the teachers' available Schedule and their experience in the use of the platform.

In line with the interpretive paradigm approach, the semi-structured interview was established in the data collection strategy which allowed us to enquire about the teachers' technological and pedagogical knowledge

and their subject area. Moreover, we obtained information on how they use the Blackboard educational platform as support in their classroom and, finally, the utility and perceived ease of use. Figure 4 shows a diagram with the summary of the methodology.

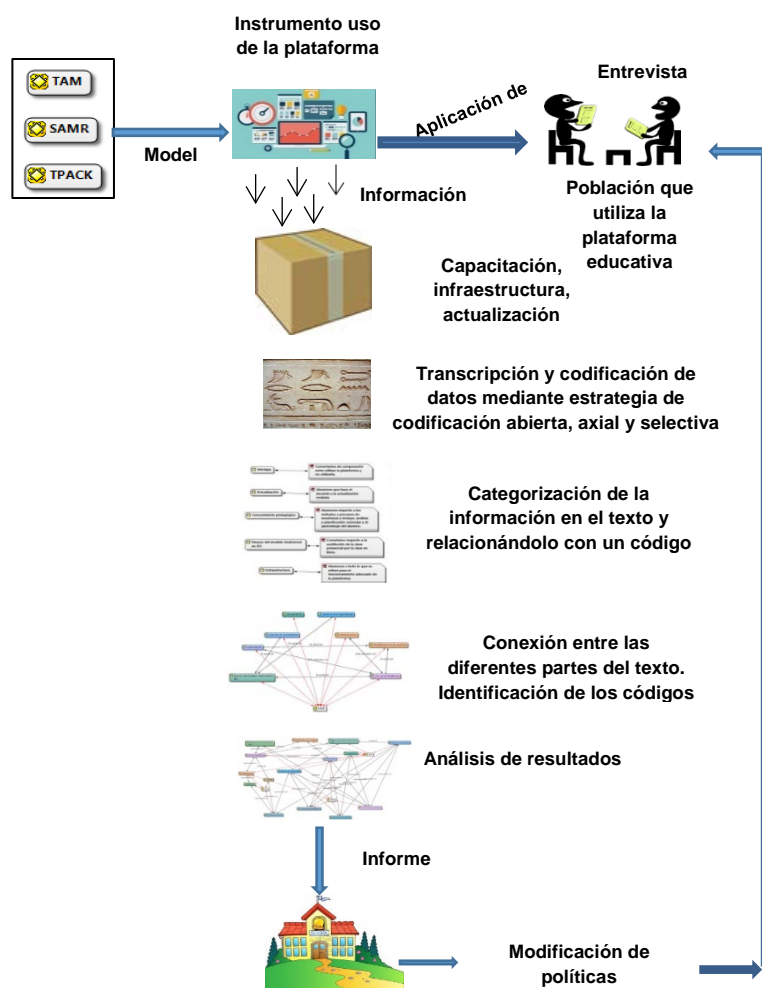


Figure 4. Diagram of the methodology.

RESULTS

The information qualitative analysis was conducted by means of the "thematic analysis" method of three in-depth semi-structured interviews and of the document of the UAEH comprehensive curriculum model, through the Atlas.ti 7.5.15 version computer-assisted qualitative analysis program. After gathering the information of the three UAEH professors of the Tlahuelilpan campus, we proceeded to transcribe the interviews and examine the information by means of the thematic analysis (See Figure 5).

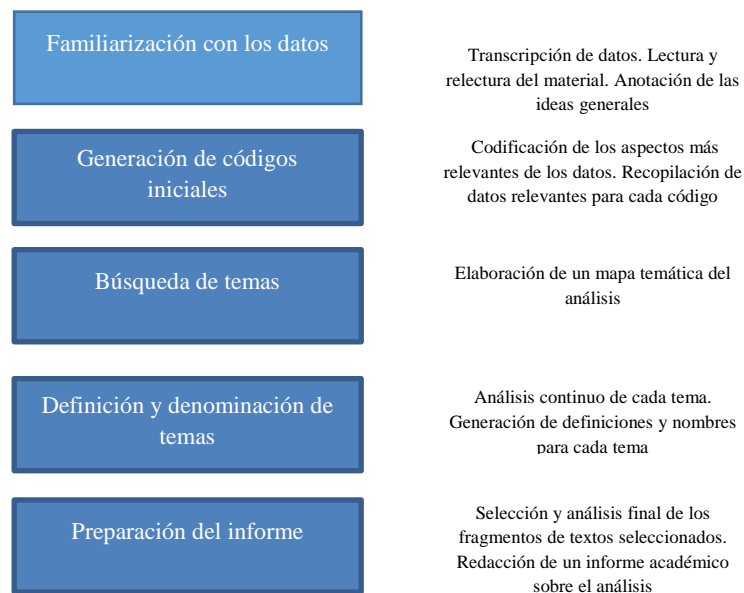


Figure 5. Adapted from V. Braun and V. Clarke (2006, p. 87).
Source: Developed by the author.

By means of the Atlas.ti program, we imported the transcription of the interviews and encoded the responses through the open, axial and selective coding strategy (Corbin & Strauss, 1990). We codified and categorized the information and compared parts of the text of the interview with the research topic and linked them to a code; we also made connections between the different parts of the text. Figure 6 shows the basic properties of the codes we obtained based on the TPACK, SAMR and TAM3 models.

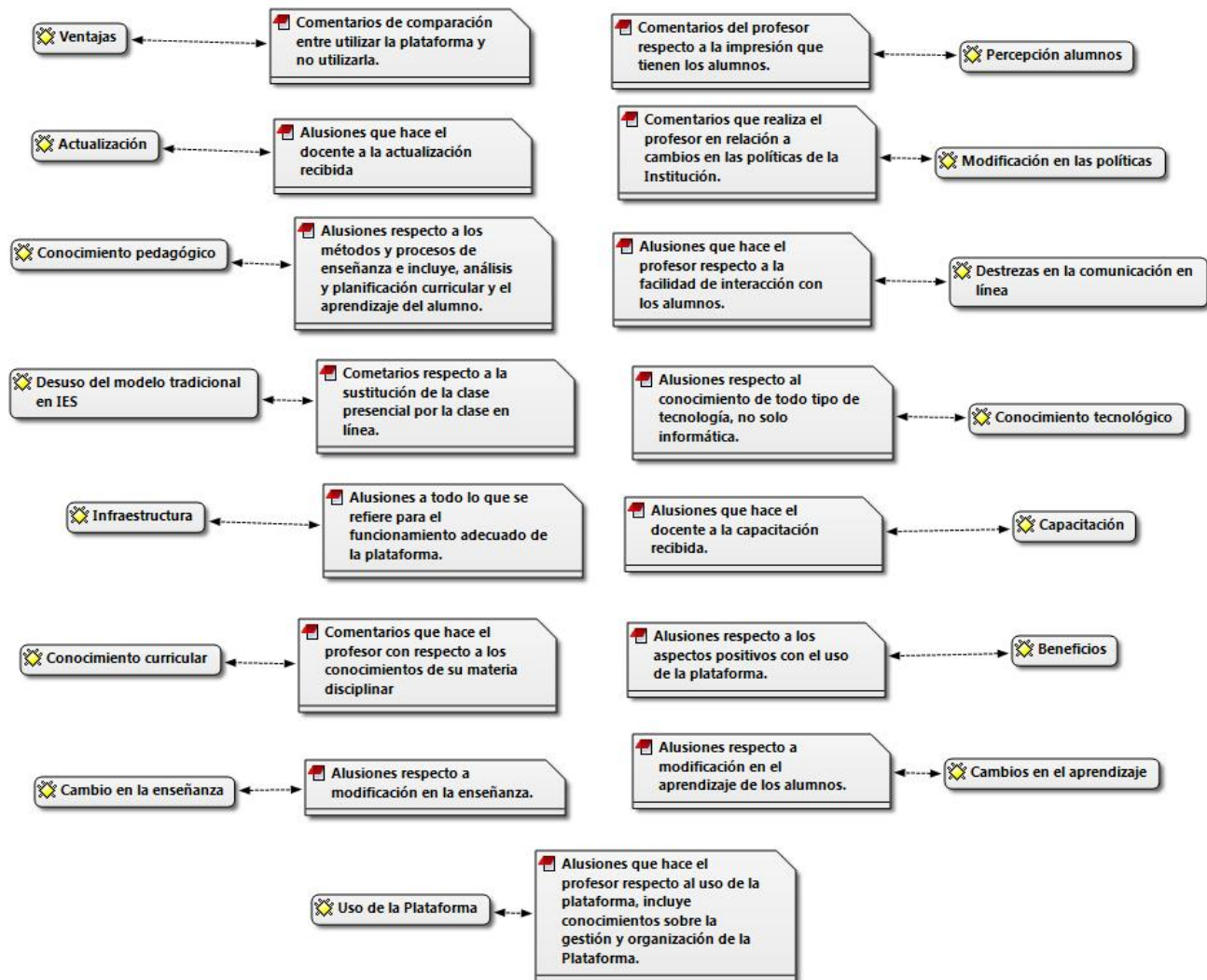


Figure 6. Categories Basic Properties

Source: Images of the results obtained through the Atlas.ti program

We created families and we assigned a code to indicate to which model each of them belongs. Figure 7 shows the codes that correspond to the SAMR model and the relationship between them. We observed that the disuse of the traditional model in a HEI is part of the change brought about by the use of the platform, which must be associated with an adequate training for users, a question consistent with the principles of the theoretical dimension of the SAMR model, that indicates that ICTs should act as a direct substitute tool, but with functional improvement, in addition to modifying teaching, learning, institutional policies and infrastructure.

In this way, ICTs allow the creation of new learning activities that were previously inconceivable (Puentedura, 2006).

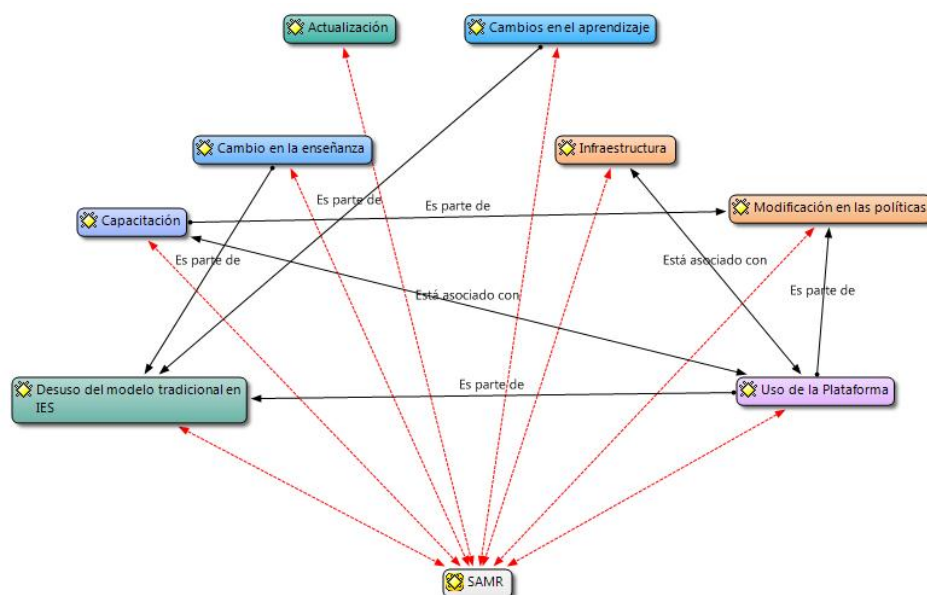


Figure 7. Relation between SAMR model and codes
Source: Images of the results obtained through the Atlas.ti program

Figure 8 includes the codes that belong to the TAM3 model and the relationship between each one of them. We observed that the perceived usefulness of the students is associated to the benefits and the advantages obtained with the use of the platform, as well as the infrastructure of the HEI to have access to it. The relation focuses on the TAM3 model that details the forces that influence the perceived ease of use (Loza & Buitrago, 2014).

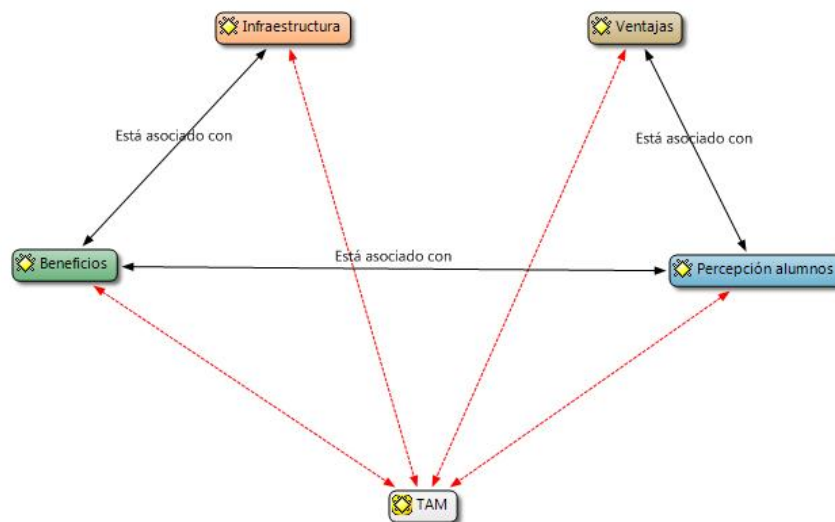


Figura 8. Relation between TAM3 model and codes.
Source: Images of the results obtained through the Atlas.ti program

Figure 9 shows the codes belonging to the TPACK model and the relationship between each one of them. The pedagogical knowledge refers precisely to the knowledge that the teacher has to modify the subject content and make it understandable to the students (Gewerc, Pernas & Varela, 2013). Teachers should master the technological and curricular knowledge in order to completely integrate ICTs in the educational context (Cejás, Navio & Barroso, 2016). This is the type of knowledge included in the TPACK model; they are associated with training, online communication skills and infrastructure to access ICTs. It is necessary to establish a priori the perceptions that teachers of these educational stages have regarding the knowledge explained in the TPACK model. These perceptions will serve as a guide to define the integration of ICTs in the classroom (Roig, Mengual & Quinto, 2015).

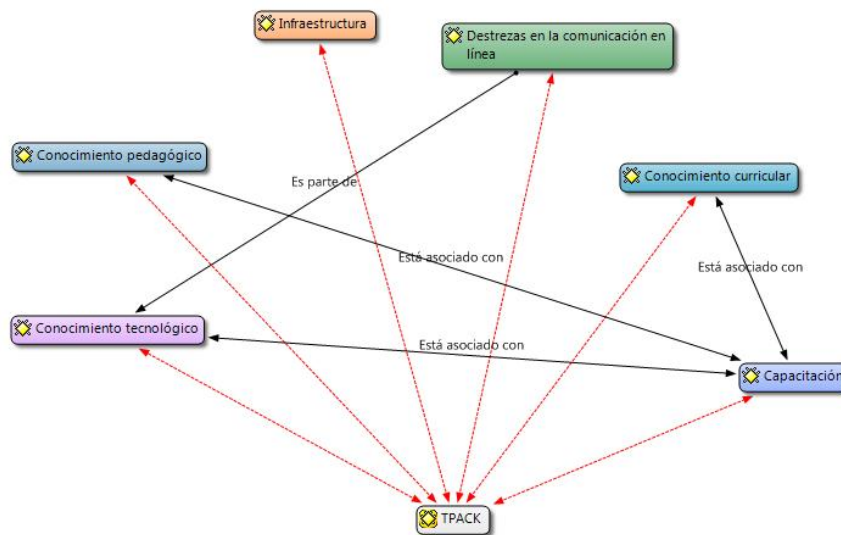


Figure 9. Relation between the Codes and TPACK model
Source: Images of the results obtained through the Atlas.ti program

RESULTS INTERPRETATION

Next, we will interpret the results and rescue the codes that had more relevance in the interviews of each of the models. For the SAMR model, the codes were: modification of policies, training and use of the platform; for the TPACK model: technological knowledge, pedagogical knowledge, training and infrastructure; for the TAM3 model: infrastructure and benefits.

After analyzing the data obtained in regard to the code modification of the policies, the interviewees agree that the institution requires changes in the administration of the platform, since the administrators of the LMSs not only delay the information or the students' registration but they also need to reload all their material at the beginning of each semester, situation that did not occur before. The dissemination by trained and enthusiastic personnel to encourage the use of this tool represents another relevant aspect. Likewise, we observe that these policies modifications are strongly linked to the use of the platform (See Figure 10).

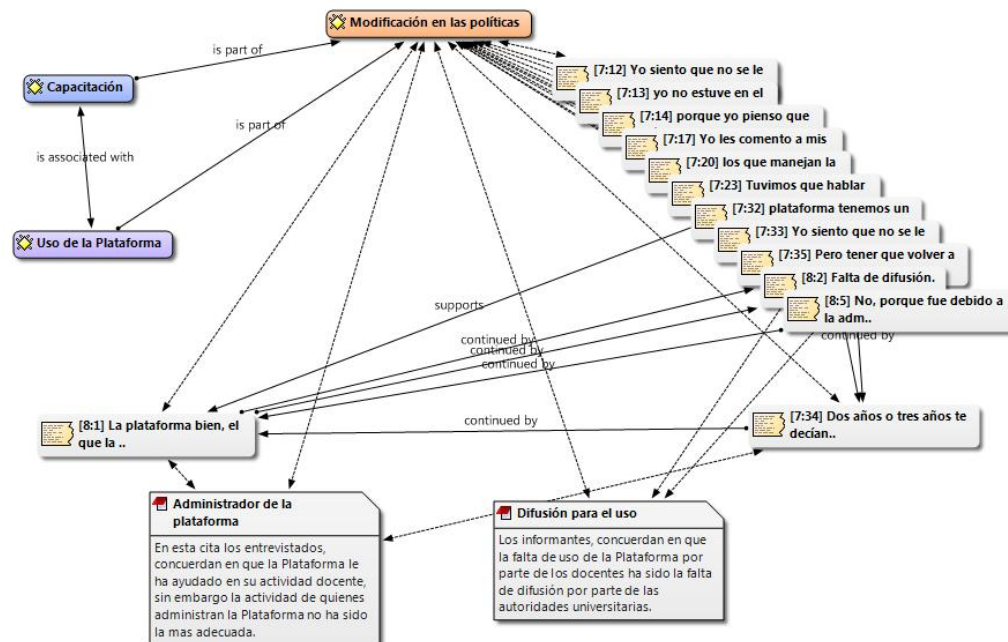


Figure 10. Policies Modification and their Support
Source: Images of the results obtained through the Atlas.ti program

The benefits category is associated with the infrastructure and the students' perception. According to the informants, when they start using the platform, the work is arduous, but at the end of the semester, the facility with which they registering information is a real benefit. They point out that the discussion forums are an important tool by means of which they can address some topics that would take a lot of time to discuss in the classroom. Likewise, they can save time in receiving, submitting and qualifying activities (See Figure 11).

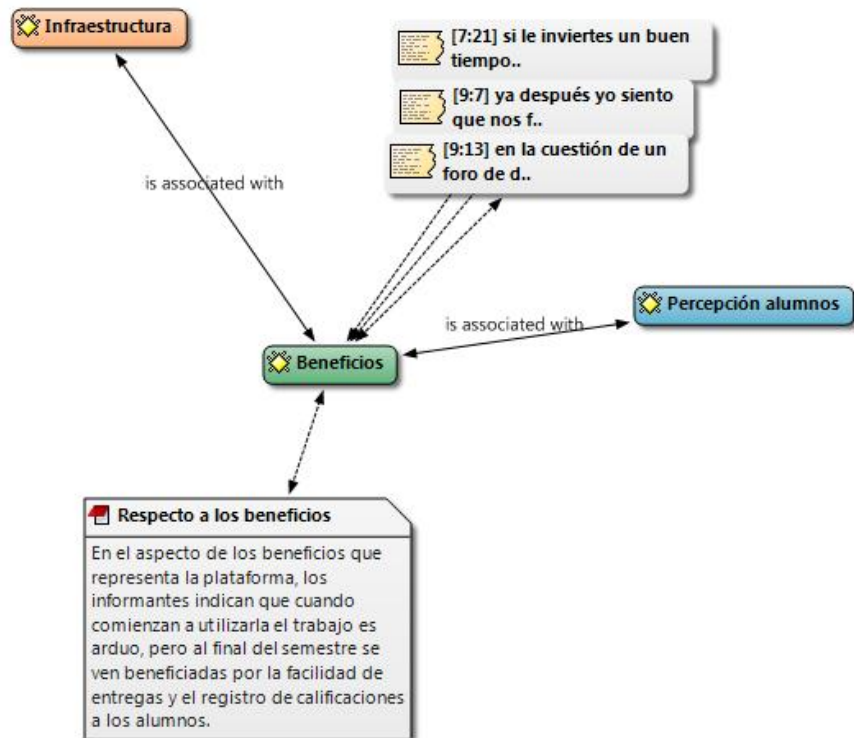


Figure 11. Benefits and their support
Source: Images of the results obtained through the Atlas.ti program

The technological knowledge is one of the aspects most cited by the people interviewed since they agree that the use of computer tools, technological platforms and the Internet is necessary for the appropriate teaching-learning process (See Figure 12). The previous comments are based on the curricular model established at UAEH concerning the incorporation of competences, including the use of technology.

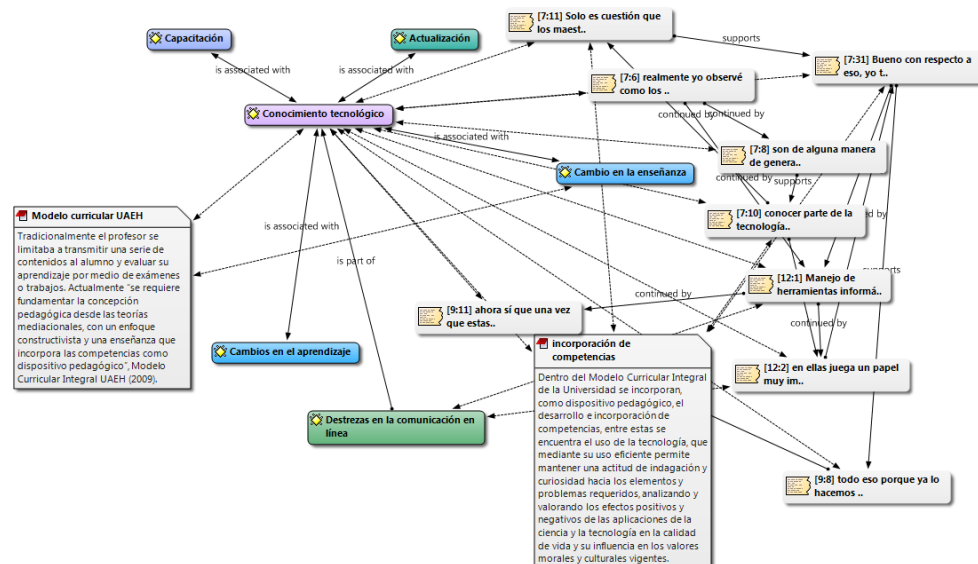


Figure 12. Technological Knowledge and its support.
Source: Images of the results obtained through the Atlas.ti program

La capacitación es un aspecto que está fuertemente ligado con otras categorías, como el conocimiento tecnológico, pedagógico, curricular y con el uso de la plataforma (ver figura 13); sin embargo, las entrevistadas coinciden en que no se ha brindado una capacitación integral para manejar la plataforma. Esta capacitación la tendría que impartir personal que en verdad disfrute la herramienta y sienta emoción al usarla, de tal manera que pueda transmitir ese entusiasmo, y no sea únicamente para los profesores, sino también para los estudiantes.

Training is an aspect strongly linked with other categories, such as the technological, pedagogical, and curricular knowledge and the use of the platform (See Figure 13). However, the interviewees agree that no comprehensive training has been provided to manage the platform. This training should be given by the staff that really enjoy the tool and are enthusiastic about using it; thus, they can convey that enthusiasm not only to teachers but also to students.

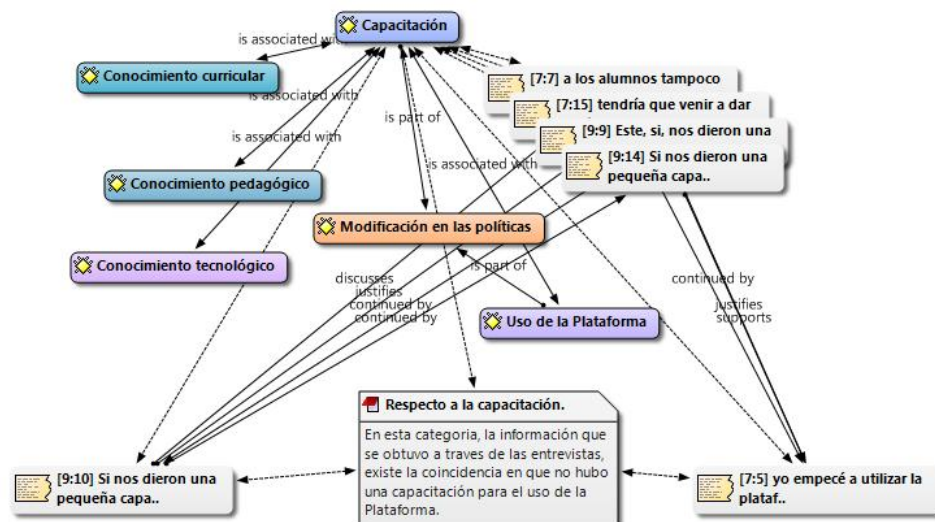


Figure 13. Training and its support.
Source: Images of the results obtained through the Atlas.ti program

In regard to the pedagogical knowledge, the statements of the interviewees are based on the UAEH curricular model, which indicates that it is necessary to base the pedagogical conception on mediation theories with a constructivist approach and a teaching that incorporates competences, more specifically the use of technology as a pedagogical device. According to the interviewees, professors prepare students for this technological world and, in turn, the students should dare look for this type of tools, try to understand them and with their experience, link them to the working world. Figure 14 shows each of the categories linked to pedagogical knowledge graphically.

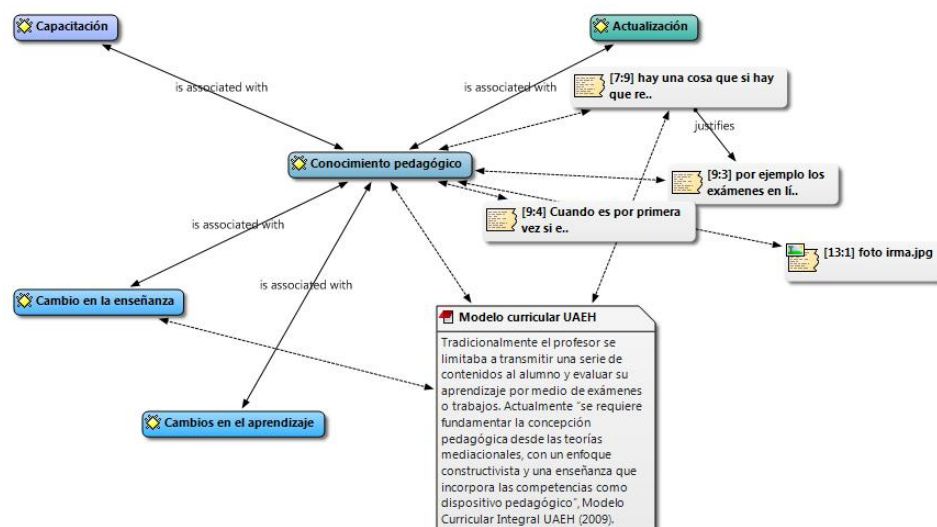


Figure 14. Pedagogical Knowledge and its support
Source: Images of the results obtained through the Atlas.ti program

The information expressed by the informants regarding the use of the platform is relevant since it is a category that has to do with infrastructure, training, advantages, policies modification, disuse of the traditional model and online communication skills. The interviewees said that they use it a lot and that the institutional authorities could, in some way, motivate the use of this tool; they also maintain that they would agree to promote the use as support for their teaching activity among their peers, a comment supported by the UAEH curricular model, which mentions the teachers' use of technology. Likewise, they are concerned that few professors are resorting to it and since the institution is paying for it, there is the risk that the university refuses to allocate more resources to it in the future. Figure 15 contains each of the categories related to the use of the platform.

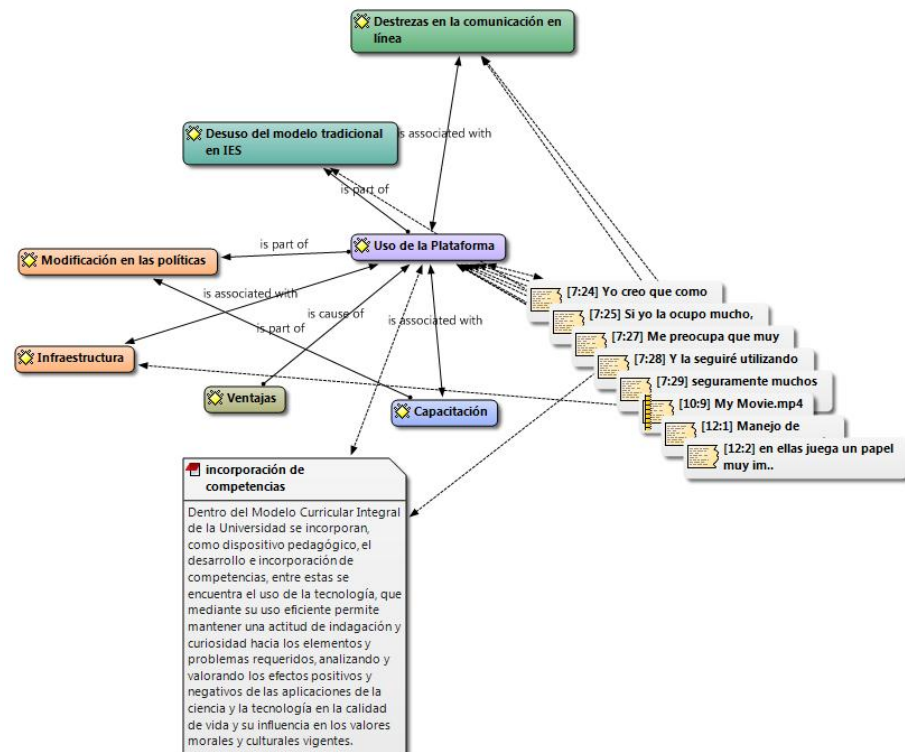


Figure 15. Use of the platform and its support.
Source: Images of the results obtained through the Atlas.ti program

CONCLUSIONS

Our study is a contribution to the use of qualitative analysis techniques to determine the perception of the users regarding the benefit of the learning management system as a technological tool used by professors in the UAEH educational process; the main objective of our research. The data were analyzed based on the theoretical dimensions of the models previously mentioned and we can infer that in general, the perception is good; however, one of the factors that influenced most the perception are the changes in the policies of the institution, more specifically the administration of the platform and the training for its use that the authorities must offer, especially in redesigning the organization of those who administer the platform in order for the teachers and students to manage this tool with greater facility.

According to Mishra and Koehler (2006), technology must be incorporated to educational contexts according to the pedagogical and curricular needs, but not the other way around. Likewise, it is required to disseminate its use in the community of the institution through trained

and committed personnel in order to spread the benefits and advantages that the use of the platform provides to the educational process. The above was frequently stated in the research by the informants.

Another conclusion refers to the various benefits provided by the educational platform: the facility by which students have access to extra-curricular activities designed by the teacher, feedback to students and forums, among others. However, the informants comment that it is not enough to include the platform in the educational process; adequate training is necessary to obtain technological, pedagogical and content knowledge that helps the user acquire the potential that this technological tool can provide to the students' learning, as well as an infrastructure that provides access to the platform at all times.

Durall et al. (2012) point out that digital literacy is increasingly important in any subject area and profession and that the great difficulties in incorporating educational platforms lie in the organizational models of universities, as these continue with traditional models that hinder the creation of education scenarios with ICTs.

The above corroborates the initial proposition of our research which is that a learning management system influences the educational benefit of the users through the modification of the policies of the educational institution, as set forth in the theoretical principles of the SAMR model, the adequate training, not only in technology, but also in pedagogical and curricular knowledge, as suggested by the TPACK model, and an infrastructure that generates a perception of ease of use by the students, a main aspect in the TAM3 model.

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