Learning strategies mediated by technology: students’ perception

Estrategias de aprendizaje mediadas por tecnología: percepción de los estudiantes

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Abstract

Nowadays, the incorporation of technology in the educational field has transformed the scenario of the teaching-learning process, generating a change in the role of its actors, where it determines the vertices of the perfect triangulation between teachers, students, and content (Coll, 2011). Therefore, it is crucial to explore the virtual universe and implement technology-mediated learning strategies that promote the appropriation of knowledge and assess students' perceptions to contribute to new virtual teaching proposals. This research aims to explore the students' perceptions of the Regional Enrique Cabrera Barroso High School, BUAP, regarding the use of strategies applied in the Schoology platform to promote Biology learning. For this, a descriptive quantitative study was carried out in a focus group using a Likert-type scale questionnaire, obtaining the following results: the students demonstrated a high level of satisfaction with the virtual course evaluating virtual strategies as an ad hoc complement to achieve the learning objectives. They also stated that the assimilation and appropriation of knowledge depend on those technology-mediated strategies, contributing to a highly positive perception.

Resumen

La incorporación de la tecnología en el ámbito educativo ha transformado el escenario del proceso de enseñanza aprendizaje en la actualidad, generando un cambio en el rol de sus actores, donde los vértices de la triangulación perfecta entre docentes, alumnos y contenidos está determinada por esta (Coll, 2011). Por ende, es crucial explorar el universo virtual e implementar estrategias de aprendizaje mediadas por tecnología que contribuyan a la apropiación del conocimiento; además de valorar las percepciones que poseen los estudiantes para contribuir a nuevas propuestas de enseñanza virtual. Esta investigación tiene como objetivo explorar las percepciones de los estudiantes de la Preparatoria Regional Enrique Cabrera Barroso de la BUAP con respecto al uso de estrategias utilizadas en la plataforma Schoology para promover aprendizajes de Biología. Para ello, se realizó un estudio cuantitativo descriptivo en un grupo focal utilizando un cuestionario de escala tipo Likert, obteniendo los siguientes resultados: los estudiantes demostraron un alto nivel de satisfacción con el curso virtual evaluando las estrategias virtuales como un complemento *ad hoc* para alcanzar los objetivos de aprendizaje y afirmaron que la asimilación y apropiación del conocimiento dependen de las estrategias mediadas por la tecnología, contribuyendo así a una percepción altamente positiva.

Learning strategies mediated by technology,
Perception, Virtual environment

Estrategias de aprendizaje mediadas por tecnología,
Percepción, Entorno virtual

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Introduction

Currently, it is impossible to glimpse the learning process without the presence of technological tools, which requires a modification to the educational scenario, specifically in the dynamics and interaction of its actors (Sigalés, 2002).

That change contributes to the development of virtual learning environments and the way of producing and socializing knowledge by experimenting with different alternatives for information management and learning as well as modifying the time and space within educational systems (García, 2015).

In addition to the above, the applications used in the virtual environments advances and renewed by leaps and bounds, taking different nuances, and on few occasions, the way students live and face changes are valued or considered (Blocher & Sujo, 2002; Peña & Nicholls, 2004). Moreover, making decisions to guide the online teaching process and differentiate between meaningful and mechanical learning is vital to solving problems regarding the implementation of educational technology at schools.

At this point, the Regional Enrique Cabrera Barroso High school requires to evaluate a techno-pedagogical course to design or redesign it according to students' demands. Thus, it is fundamental to investigate the perception that students have regarding the use of strategies on the Schoology platform and identify their benefits and difficulties.

Based on the above, the present study seeks to answer the following research question: What are the perceptions that students of the biology subject have regarding the use of operable strategies on the Schoology platform?

Literature review

The following section addresses the key concepts that give theoretical support to the study.

Learning strategies mediated by technologies

The selection and implementation of strategies are necessary to define a teaching model for a specific area like biology and conceptual change to achieve the learning process in a virtual modality.

There are different definitions of the term learning strategy. However, for the present study, it is a tool that promotes the deconstruction of knowledge to guarantee meaningful long-term learning.

Types of learning strategies.

According to Monereo & Castelló (1997), there are cognitive strategies that let students analyze, classify, distinguish, and synthesize during their learning process. For Pozo & Postigo (2000), instructional strategies are to search, analyze and choose whereas, for Mayer (2014), learning strategies are classified based on learners' purpose as to recover, systematize and integrate information. Moreover, Oxford (1990) considers the metacognitive strategies that regulate students' learning process by planning, monitoring, and self-evaluating.

Taking into account Dembo et al. (2006) and Ally (2004), self-regulation strategies are essential in the virtual learning context because they foster students' autonomy, organization, and responsibility to accomplish their work. Finally, Osses (2007) distinguishes the metacognitive strategies as the actions that guide students at knowing their mental processes.

The previous conceptions are neither antagonistic nor exclusive. On the contrary, they interact in the learning process according to the students' purposes. That is why incorporating technologies in teaching is another strategy to actively engage students in the learning process through the use of applications, which help them to learn concepts by visualizing new information.

Perceptions towards implementing technology for the teaching-learning process

Due to the time that we are experiencing, online learning has become the principal medium of teaching. Then, all levels of education are investing time in designing courses, developing teachers' and students' ICTs knowledge and skills, looking for new applications or digital tools to provide a suitable learning process according to students' needs and demands.

Besides, there are different studies which point out the outstanding results of using platforms and a big variety of apps to teach, as well as methodologies and approaches to do so (Flores-González, 2019; Dorup, 2004; Flores-González, & Fernández-Crispín, 2019).

Other studies state that the prosperity and effectiveness of integration and implementation of technology through online learning or blended learning modality depend to some extends on teachers' attitudes and decisions of how to use it in or outside their classrooms (Van Reijswoud, 2009; Jackson, 2013; Roach, 2010; Bullock, 2004).

The following lines describe perceptions of technology implementation in education.

Perceptions	Authors
The inclusion of technology in education is related to the teachers' attitudes towards computers.	(Yuen & Ma, 2001)
Implementation of technology motivates and engages students in their learning process.	(Halat, 2013; Godzicki, Godzicki, Krofel & Michaels, 2013; Heafner, 2004)
Students use technology for educational purposes.	(Ehrlich, Spote, & Sebring, 2013)
The use of technology and social networking sites promote learning not only in students' mother tongue but also in a foreign language at students' pace.	(Flores-González, Castelán-Flores, Zamora-Hernández & Flores-González, 2019)
Technology, in its multiple varieties (platforms, applications, digital tools, web pages, and in general web 2.0 and 3.0 tools), allows teachers to innovate their teaching process.	(Eckstein, 2009; Zimlich, 2015; Mulrine, 2007)
Technology is seen as a medium to promote inclusive education.	(Futurelab, 2009; Floyd & Judge, 2012)

Table 1 Perceptions of technology implementation in education

However, what happens when students and teachers face the change of moving their traditional classroom and their face-to-face sessions to virtual or blended learning modalities?

There are many aspects to work on to achieve meaningful learning, which is one of the final purposes of the teaching performance since there are many studies based on educational technology, but an enormous gap in the research related to students' adaptability towards online education.

At this point, various factors are essential to make decisions regarding instructional designs. For instance:

- What to include in an instructional design.
- How to implement it.
- What resources are necessary to work on this modality.
- What strategies are suitable to guide the instructional model.
- The most important, what the students' perceptions are towards the use of such modality so that students' characterization of perceptions provide the guidelines for improving, designing, and redesigning it.

Virtual environment

Virtual learning spaces are knowledge management networks that contribute to the comprehensive training of students. They are considered scenarios with a formative and active purpose that contributes to face-to-face, online, and blended learning (Silva, 2011).

According to Benítez (2000), the virtual environment must take into account a techno-pedagogical design that contributes to the mobilization of conceptual (thematic contents), attitudinal (behavior, and values that the student possesses), and practical knowledge (skill development).

Besides, the active role played by educational actors in virtual education privilege the construction of learning from interactive processes.

Therefore, the objective of a virtual environment is to promote an ideal environment for interaction between educational actors, evaluation, and monitoring of the learning process that guarantees the achievement of the purposes of a study program.

This space favors the mobilization and socialization of knowledge efficiently and at low cost since the economic value of traditional (face-to-face) training is significant compared to the virtual one (Chan, 2004).

All in all, a virtual learning environment offers a space for accessing secure information (it has a username and password), where interactions between educational actors, strategies, and resources take place (Bustos & Coll, 2010; Belloch, 2012). Then, this space contributes to tasks developed in class thanks to the availability of tools, which displace face-to-face environment adaptable to the users' needs.

Methodology

The present educational research is based on a quantitative approach with a descriptive scope since it investigates the students' perceptions about the use of technology-mediated strategies on the Schoology platform.

This methodology provides clear answers to specific questions and allows us to understand the object of study from the subjects' perspective and their interaction in a given context (Flick, 2015).

Instrument

In this case, Casal's instrument (2010) was recovered and analyzed to select and adjust items to the context and needs of the research. Based on it, the questionnaire for collecting data in the present study consisted of 10 closed-response items with a Likert-type scale to identify the perceptions regarding the quality of the learning strategies operable in the Schoology platform and their impact on behalf of students. Moreover, this focussed group took a treatment that comprises an instructional model based on technology-mediated strategies for three months. After it, they answered a questionnaire to measure their perceptions towards such an instructional model.

Sample

The target population was second-grade students from the Enrique Cabrera Barroso Regional, BUAP.

The sample consisted of 36 students whose ages were between 16 and 17 years old, and they share interesting crucial specific features for the present research like:

- Lack of scientific previous-knowledge in biology.
- Alternative ideas or mistaken concepts about the evolution of biology.
- Lack of scientific knowledge.
- Similar socio-cultural context.

The next section analyzes the results based on each item from the questionnaire.

Results

Thirty-six subjects answered the questionnaire to know their perception regarding the use of strategies to promote conceptual changes in Biology on the Schoology platform. It allowed not only to identify the results of the application of these strategies but also to characterize subjects' perception as followed.

Item 1

Virtual strategies are a complement that helps to achieve learning objectives
N=36

Graphic 1 Virtual strategies as a complement to achieve learning objectives

As can be seen in graphic 1, the majority of the sample evaluates it with a high perception since subjects affirm that virtual strategies are a complement that helps them a lot (44.4%) or quite enough (30.6%) to achieve their learning objectives.

Besides, any student perceives the use of virtual strategies as a means or complement not useful, so this corroborates what several authors have concluded regarding their usage and recommend them as potential learning tools (Hernández, 2015; Nóbile, 2015; Castevich et al., 2015). The subjects' perceptions also match with the Marqués' assumptions (2000), who conceives virtual strategies as a means for the appropriation of knowledge and development of skills that contribute to achieving learning objectives.

Item 2

Graphic 2 Appropriation of knowledge

61.1% state that virtual strategies contribute a lot and (25%) quite enough to the appropriation of knowledge. Additionally, 13.9% mention that it only helps them medially. These findings corroborate what Flores-González et al. (2019) concluded in their study by describing learning strategies as generators of discussion, reflection, and analysis for the apprehension of knowledge.

Item 3

Graphic 3 Quality of strategies in comparison to subjects' economic investment

It is essential to mention that due to the geographic region and location of the sample while implementing this project, it implies an economic students' investment regarding access to the platform and commuting from their house to an internet center and vice-versa.

That is why it is crucial to know if the quality of the strategies and work on the platform compensated for such economic investment.

As can be seen in the graphic, 47.2% are satisfied and equate the investment made as acceptable due to the quality of strategies and work on the Schoology platform.

It corroborates Chan's affirmations (2004), who considers that appropriate knowledge through an instructional design mediated by technology has a real and accessible economic value. Besides, 38.9% perceive it as something acceptable, 5.6% as quite acceptable, 5.6% as very unacceptable, and finally, 2.8 as not acceptable at all. However, more than half of the sample perceives it as something positive and valuable.

Item 4

Graphic 4 Variability of strategies implemented in the virtual space

The activities hosted on the platform foster the appropriation of subjects' new knowledge through the implementation of a great variety of strategies.

It also allowed them to develop autonomy, self-regulation of their pace learning through their alignment of their learning styles and practices in immediate contexts, obtaining meaningful learning.

To the extent of maintaining the previous parameters, the activities demand the use of different strategies, which was perceived by the subjects as positive. Indeed, 72.2% of the sample recognized them as quite enough or extremely versatile, while 25% not entirely different.

These results are favorable because Sangra (2001) mentioned that the use of different strategies provides a symbiotic regulation with the way students assimilate the concepts in the learning process, contributing to long-term learning and avoid rote learning.

Item 5

Graphic 5 Promoting conceptual changes

72.2% of the sample considers that the strategies do promote conceptual changes. Proof of this is the deconstruction of erroneous concepts or alternative ideas that guide to the understanding and assimilation of acceptable scientific concepts in biology. Therefore, conceptual clarity is decisive for metacognition by permitting subjects to migrate into an active and prepared scenario to build new knowledge.

It also confirms the information from different studies where strategies are an elementary component in the design of the educational process because they generate conceptual structures with relationships of meanings. Besides, they detonate subjects' interest to explore, access to prior knowledge, and comparison patterns, privileging the associative learning through readings and hosted material on the platform.

Item 6

Graphic 6 Promoting interactive activities

As can be seen in the graphic, more than half of the sample (66.7%) identifies that the strategies do promote interactive activities. It means that said virtual strategies allow the development of exercises or practical assumptions where students actively interact in tasks applying their knowledge to transfer them into something operative and dynamic in their immediate contexts (García, 2001).

Applying strategies in interactive activities guides and organizes subjects' learning process by reaching and consolidating what they learned. Furthermore, they review outstanding aspects of the unit, self-regulate their learning, assimilate new ideas by integrating them with their previous ones, favoring the transfer of what they had learned in other situations critically.

Item 7

Graphic 7 Clarity and accuracy in the learning process

In the following graphic, the results show that 83.3% perceive that virtual strategies provide clarity and accuracy to their learning process.

It implies that subjects consider those virtual strategies as a guide in their process of building knowledge because they help them to plan and organize their time, space, and interaction according to the resources they have.

The results also show that this techno-pedagogical design leads students' learning process because of its essential features to promote conceptual changes that are the following:

- Definition of purposes.
- Specification of generic and disciplinary competencies.
- Identification and implementation of cognitive, metacognitive, and self-regulatory strategies mediated by technology.
- Elaboration of instruments to evaluate according to the interactive activities.
- Selection of a virtual environment.

It is essential to mention that these results corroborate what different authors have concluded regarding the importance of virtual strategies in terms of their impact on the appropriation of knowledge (Alarcón, 2014; Lozano, 2010).

Item 8

Graphic 8 Learning styles

Taking the above into account, 66.6% of the sample affirms that the didactic methodology used in the platform match their learning styles due to the flexibility of the instructional design in terms of schedules, distance, scenarios, and ways of learning.

According to Díaz and Hernández (2001), a didactic methodology based on the variability of virtual strategies allows satisfying different learning styles, content structure, and the relationship between materials and activities.

Moreover, the learning patterns in online teaching provide visual and audiovisual activities, motivational and comfortable environment to reinforce or acquire new concepts, and biology contexts to practice what they learned by participating actively and interacting with the teacher to solve doubts or get feedback.

Item 9

Graphic 9 Active learning

In the following graphic, 75% of the sample indicates that the techno-pedagogical model based on strategies mediated by technology promotes active learning, and therefore, a conceptual change, which implies that the subjects' performance allowed great actively communicational interactivity between the variety of digital resources and their learning process.

Besides, virtual scenarios generate a change in the student's role that encourages active learning because the design of the activities demands characteristics as the ones mentioned below.

- Deep content analysis.
- Collaborative word.
- Socialization of knowledge.
- Critical and scientific thinking.
- Decision making.

- Critical and reflective argumentation.
- Knowledge for life.
- Management of resources, space, and time.

It is crucial to mention that active learning fosters a link between what subjects' experience while working with the platform and the concepts that the teacher wanted to convey (Díaz, 2005).

Item 10

Graphic 10 Constructive learning

78% of the sample states that the technopedagogical model with virtual strategies promotes learning based on constructivism, which means that the subjects achieve situated learning, building their knowledge through cognitive interaction with virtual learning activities.

On the one hand, 19% consider that this methodology and strategies promote constructive learning to some extend.

On the other hand, 3% say that only a little. However, it is concluded that the technopedagogical proposal does promote constructive learning because more than half of the sample indicates this.

According to Nóbile (2015), this happens because both the methodology and the activities demand from the subjects multiple representations of reality, reflection, authentic tasks, generation, and construction of their knowledge.

Conclusions

The instrument used to collect the data provides a model to characterize subjects' perceptions towards the strategies used in the Schoology platform from which theoretical modifications could be made in the classroom to achieve positive learning, where subjects' expectations, learning styles, and cognitive demands met.

Based on the findings, it is concluded that virtual strategies help learners to achieve their learning goals and appropriation of knowledge.

In the activities hosted on the Schoology platform, subjects found the variability of strategies that let them develop autonomy and self-regulation by making the learning strategy come to their lives across their whole organization. These findings match results from other authors who pointed out that they also foster responsibility (Dembo et al., 2006; Ally, 2004).

Another conclusion is the affordability of this proposal since subjects expressed their satisfaction due to two main features: the quality of strategies and work.

Subjects also recognize strategies as mediators during their learning process in virtual environments because of the following reasons:

- Those strategies helped them to understand, integrate, and monitor their cognitive process through reflection and evaluation.
- They are resource managements and control guides to organize students' time, space, context, and interaction.

The use of this instructional design based on learning strategies operable on the platform influences subjects' interest and motivation. Indeed, students assure that it lets them manage their time, solve activities autonomously, participate in asynchronous and synchronous performances, which contributed significantly to their self-regulation for the apprehension of knowledge in biology. These findings corroborate what Chiecher, Donolo, and Rinaudo (2005) affirm about the high acceptance of virtual modality among students.

Finally, this new alternative of administering and managing the subject of biology implies a change in the traditional dynamics during on-site sessions as it shows new paths for learning, taking into account students' expectations and needs to provide them with ideal learning scenarios and rich in materials.

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