

Coaching Tutorial System: use case matter of degree seminar

Sistema coaching tutorial: caso de uso en un seminario de titulación

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ABSTRACT

Keywords

Coaching system;
Jonassen's model;
information technology;
communication
technology

Information and communication technologies play an important role in education. Coaching systems promote a new teaching method, based on the digitalization and automation of activities. This study presented the construction of a tutorial coaching system in the academic accompaniment of students of the Bachelor's Degree in International Commerce of the Centro Universitario Nezahualcóyotl, of the Universidad Autónoma del Estado de México. The research was divided into four phases: 1) development of instructional models for the design and selection of didactic materials, 2) system design, 3) system programming and 4) evaluation of the coaching system's functionality. The developed system is a potential tool, since it allows the inclusion of the materials best suited to the needs of the student, considering the different educational modalities, making it an innovative tool, easily accessible and suitable in the current digital era.

RESUMEN

Palabras clave

Sistema coaching;
modelo de Jonassen;
tecnología de la
información; tecnología
de la comunicación

Las tecnologías de la información y la comunicación desempeñan un rol importante en la educación. Los sistemas coaching promueven un nuevo método de enseñanza, basados en la digitalización y automatización de las actividades. Este estudio presentó la construcción de un sistema coaching tutorial en el acompañamiento académico de los alumnos de la Licenciatura en Comercio Internacional del Centro Universitario Nezahualcóyotl, de la Universidad Autónoma del Estado de México. La investigación se dividió en cuatro fases: 1) elaboración de los modelos instruccionales para el diseño y elección de los materiales didácticos, 2) diseño del sistema, 3) programación del sistema y 4) evaluaciones de funcionalidad del sistema coaching. El sistema desarrollado es una herramienta potencial, ya que permite la inclusión de los materiales mejor adecuados a las necesidades del alumno, al considerar las diferentes modalidades educativas, por lo que fue una herramienta innovadora, de fácil acceso e idónea en la era digital actual.

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INTRODUCTION

Using information and communication technologies (ICT) has changed the teaching practice. It has been enriched with all kinds of contributions, for example, approach during observation on the degree of compliance of the objectives proposed in curricular programs (Badia *et al.*, 2016). For this reason, it is important that incorporation thereof in selecting contents be proper, in addition to generating significant gradual learning on students (Moreira, 2017).

Fernandez & Fernandez (2016) sustain that teacher competencies in line with the use of ICT are important in the educational development of students. Authors define them as “the set of knowledge and skills necessary to use these technological tools, as integrated educational resources in their daily practice” (p. 98). In this sense, the teacher’s role changes continually and ought to be constantly adapted to students’ needs; this turns then into a learning facilitator, which requires the application of a continual and instructional evaluation, as well as adapting the learning environment (Cejas, Navio & Barroso, 2016).

The Organization of Ibero-American States for Education, Science and Culture (OEI, 2011) reports substantial advances in Ibero-American schools regarding infrastructure and technological equipment. Also, OEI (2013) works with instructional initiatives that foster the development of necessary competencies of teachers for the efficient use of ICT on classroom teaching. The purpose of the Ibero-American Institute of ICT and Education (IBERTIC, by its acronym in Spanish) is that of cooperating to the inclusion of digital culture in the educational systems of the region, within the framework of the 2021 Educational Goals. Therefore, as of 2016 and 2017, IBERTIC (OEI, 2017) has centered in supporting domestic and regional projects related with the use of ICT with pedagogic purposes.

One of the main problems of students who fully complete the syllabi they belong to is the lagging graduation process, which makes it necessary to have strategies established to facilitate these processes. The purpose of this article is to present implementation of technological tools to support teachers in the academic accompaniment of students in the Bachelor’s Degree in International Trade, of the Autonomous University of the State of Mexico, through a coaching system.

The chosen subject was a Research Seminar, the importance of which lies in the fact that during the development thereof a document is generated that may be employed for the graduation process, in this case, the thesis. The current problem in this item, is the absence of a proper form, and the lack of sections that comprise the structure of a formal thesis work, which delays students’ graduation and with an unfavorable impact on school-leaving indicators in this mode. The coaching system has the character of an online computing system which enables education under the personal learning style, flexibility of time and learner’s needs.

There are five sections in the work structure: in the first one, the elements employed for the article are described; in the second, the methodology is presented (Jonassen's instructional model); in the third one, the results are shown from the tests conducted on the users of the coaching system where several variables are considered; in the fourth one, discussion and conclusions from the system tests are developed, as well as conclusions, advantages and contribution of the system; and in the last section, the referred bibliography in this document is listed.

COACHING

One often sees that higher education is immersed in new pedagogic trends with the purpose of strengthening teaching-learning activities (Lopez Villafranca & Gomez de Travesedo, 2016). Coaching is a term employed, among others, in sports, in the entrepreneurial sector and in the family; currently, it has been implemented in aspects related to education (Silva *et al.*, 2018; Sandoval & Lopez, 2017). There is no specific definition available of coaching, although its characterization is established as a function of the context in which it is mentioned and in the end with which it is employed.

There are different world coaching instances, such as the International Coach Federation (ICF), which defines it as a continual and temporary professional relationship among all the members. On the other hand, the European Coaching School interprets this as the art of making questions aimed to help people, and as an approaching manner to attain set objectives (Sans, 2012). Whitmore (2003, quoted in Silva *et al.*, 2018) states that coaching *"consists of releasing the potential of an individual with the purpose of increasing his/ her performance to great levels, where learning replaces teaching"* (p. 173).

During the coaching process, communication is paramount (Gimenez, Fleta & Meya, 2016), therefore, the roles implied by coaching are to be differentiated, that is, whoever plays the role of a trainer, guide, professor or teacher; as well as the coachee, who represents the customer, user or student (Piñeiro, Martinez & Guillen, 2013).

EDUCATIONAL COACHING

Employing the term *coaching* in aspects related to education began with Joyce & Showers (1982), who established an analogy among teachers who learn how to teach and athletes who learn how to play competition sports. The authors conceptualize learning as a two-step process: in the first one, teachers and athletes must learn skills they may use outside their learning environment and athletes must learn skills they may use outside their learning environment –in this case, classrooms or areas where they carry out their competition events– in the second step, both ought to be capable

of learning how to “transfer” their new skills, therefore, the *coaching* process takes place.

Bou (2013) defines educational coaching as a discipline to foster a teaching alternative, with the result that this is a new way of understanding the concept of learning. In this sense, when an individual is taken from a holistic point of view, with talents, qualities, attitudes, competencies, paradigms, emotions, beliefs and values, it is relevant to establish how all of these elements may have a positive influence within the educational environment and in the learning process.

From the above, Bou (2013) determines three lines of interest:

- a) Establishing a new methodology in the classroom to foster a collaborative and associative learning environment among the students, as proper resources and tools are facilitated for a good academic performance.
- b) Providing appropriate instruction to people who partake in the educational system aimed to release their potential and increase their level of performance.
- c) Mediating among the different actors on likely conflicts that may take place in the educational system.

According to Lopez Villafranca & Gomez de Travesedo (2016), coaching consists of a transforming process towards an individual, where learning and pedagogy have a relevant and comprehensive role with every participant, as it is centered on improving the academic learning of students (Becart & Ramirez, 2016).

It is important to identify people involved in the coaching process to define their roles. Bayon, Cubeiro, Romo & Sainz (2006) define a coach as a person in charge of guiding and conducting the coaching process; hence his/her role as a teacher, strategist and, in any case, as a professor of the coachee; he/she is, in addition, responsible for analyzing, projecting strategies and monitoring advances in accordance with a specific objective. The role of the coachee within these processes consists of being the generator of his/her own knowledge. Thus, the coach is identified as a person who supports changes on learning and the acquisition of knowledge, which means that he/she supports teachers by means of descriptors, like planning activities, their execution, when to make an observation on the performance of the coachee, as well as the feedback processes within the teaching-learning process (Baldinger, 2018).

E-COACHING SYSTEMS

Within the teaching practice, computer coaching has a greater impact due to digitalization and automation of teaching activities; however, there is no consensus regarding what a pedagogic electronic coaching system is or what would be their differences in respect to other electronic training systems (Kamphorst, 2017). Therefore, it is important to be clear regarding instructional objectives of the course or the topic to be taught, as well as minimal technical specifications, with the purpose of being able to consider this as a tutorial coaching system.

Several authors have classified e-coaching systems as a function of three parameters: 1) data collection, 2) data analysis to determine the coaching strategy, and 3) the feedback module that would provide information in a convincing and motivating manner (Kool, 2014). Warner (2012, quoted in Kamphorst, 2017) described e-coaching systems based on pedagogic agents who worked by means of questions made to the coachee, where the behavior of the system in a reactive manner was determined by the selected answers.

To Wooldridge & Jennings (1995), teaching systems ought to work in an autonomous manner, as in this case, by means of using avatars. Van Wisen (2014, p. 255), characterizes e-coaching as performance supporting systems. This term was used for the first time in 2010 and suggests that a “change in performance, a change in behavior and a change of attitude comprise the archetypes of a change of behavior. Change in itself, is a result which instructs, alters or reinforces” (Oinas-Kukkonen, 2010, p. 6).

Pedagogic, electronic coaching systems work as self-training means, which generally work online and are enriched by a tutoring process provided by a mentor or coach by means of technologies, using a computer, for example. This implies the prevailing need of using ICT to provide an interactive environment mainly centered on the students, which ensures that the coaching process is done successfully (Van de Heyde, Stoltenkamp & Siebrits, 2017).

ONLINE INSTRUCTIONAL DESIGNS

Different from traditional courses, the development of materials or courses by using technologies implies a deeper work, because of the effort made to integrate it with ICT. In this process, it is important that the educator provides pedagogic strategies and methodologies to design these courses when wording theories (Belloch, 2017). In the virtual mode, not only the contents of the studies are to be considered but also learning theories and, above all, the technological means to be used, in a way that this creates the most proper learning environment for the student (Belloch, 2017).

Coll (2008) was the first person to coined the concept of *techno-instructional design*, which refers to the instructional process in the virtual mode, and identifies two particular characteristics: a) the technological dimension: selection of the most appropriate technological tools for the instructional process, from considering the possibilities and limitations of software, of hardware and multimedia resources, among others; b) the pedagogic dimension, which refers to the profile of users, competencies to be developed, the creation of contents and planning activities, focused on the use of ICT, which includes an assessment plan for the processes performed.

METHOD

Jonassen Model

As a methodology for the development of the coaching system of the Bachelor's Degree in International Trade of the Netzahualcoyotl University Center of the Autonomous University of the State of Mexico, the Jonassen Model (1999) will be used, which takes into account how to model the design of learning environments with a constructivist approach. Constructivist and systems theories are centered on the student, on the learning processes and on their creativity during the course in a holistic manner, since the student is the constructor and the generator of his/her knowledge through practice.

Jonassen's instructional model is comprised of the following six elements (Garcia Romero, 2018):

- 1) Questions/cases/problems/projects. The virtual learning environment must be oriented towards the resolution of the task assigned to the student, which may be a question, a case, a problem or a project. The coaching system includes a series of questionnaires related to the topic to be dealt with, in this case the Research Seminar of the Bachelor in International Trade of the Netzahualcoyotl University Center of the Autonomous University of the State of Mexico. These questionnaires are organized in the system from lower to greater complexity.
- 2) Related cases. The student is presented a series of related experiences, with the purpose of taking them as references. In the coaching system this feature is shown in the feedback option by means of examples, such as similar research works or thesis.
- 3) Information resource. This is information necessary for the student to construct his/her learning by means of a conducting hypothesis of the problem to be solved. These aspects to select relevant information, to identify and raise the problem, and become aware of mechanisms for the solution thereof, are the

capabilities a student develops during the whole course, because the system is directly linked to the coach, who monitors the performance of students by means of the computer system to guide them in their academic needs and lead them.

- 4) Cognitive tools. Cognitive materials with the purpose of achieving a better understanding of new knowledge. This feature is obtained in the feedback option of the coaching system with multimedia resources: PDF files, videos, links, among others.
- 5) Conversation/cooperation tools. To foster and support students during their learning process by means of using a computer. This feature is presented during the whole course, in the different coaching options and system feedback, as all the information is directly shown by means of the computer.
- 6) Social/context support. To adapt the social environment to the constructivist learning ambience. This methodology element may be seen in the coaching system by means of the interactivity with the coachee (see figure 1).

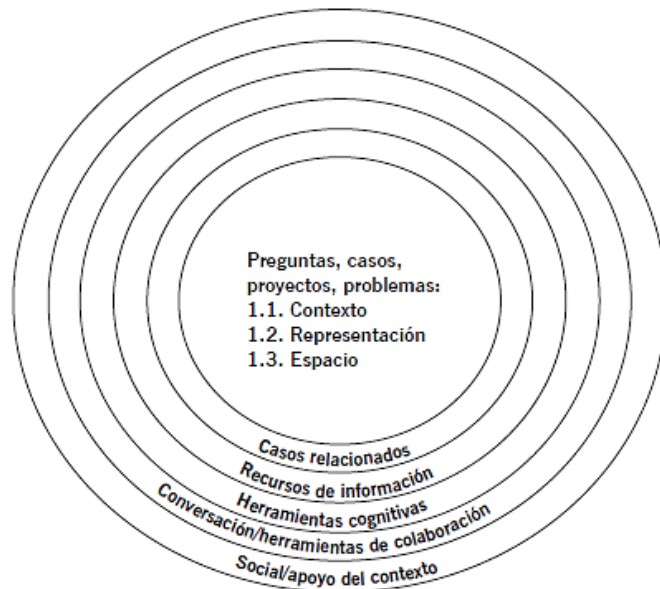


Figure 1. Jonassen Model

USE CASES

A use case is a notation of the Unified Modeling Language (UML) which defines the behavior of a system by means of a sequence of executed

actions, where the user –or users– interact with it. From the specific degree of the analysis, variations of the system behavior may be included to generate an observable result by the actor who interacts with it (Jacobson, Rumbaugh & Booch, 2007). This is exemplified in figure 2, a general use case of the coaching system and on the sequence table of the system flow (see table 1).

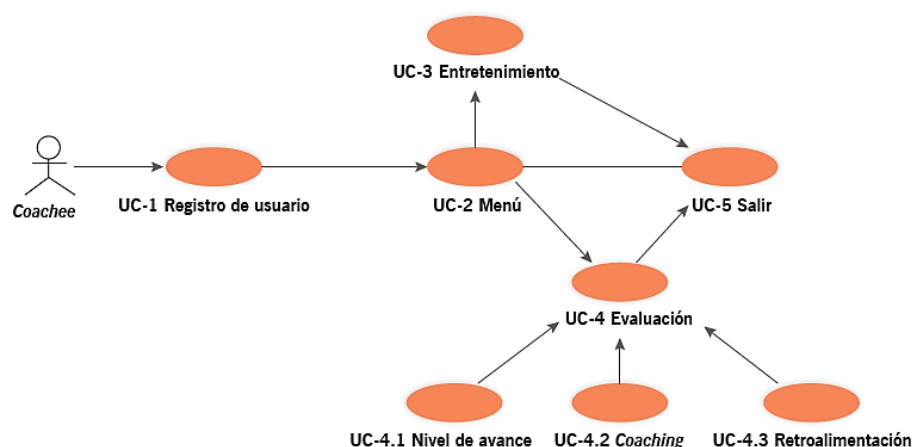


Figure 2. General use case diagram of the coaching system.

Table 1. Flow sequence of the coaching system

Case of use	Description	Result
UC-1 User registration (<i>coachee</i>)	A new user enters "New user registration" and captures general data to register	The system displays a pop-up screen with a welcome message (if the data was captured correctly) and assigns a password; the character of "Registered User" is taken
	The new user enters incorrect general data (with a different format), or leaves fields blank	The system displays a pop-up screen with a message indicating the steps to follow, and returns to data capture
	The "Registered User" incorrectly enters his password	The system displays a pop-up message indicating that the password is incorrect and allows it to be captured again
	The "Registered User" incorrectly enters his password	The system displays the main screen, where the menu options are presented
UC-2 Menu	The <i>coachee</i> decides between the options: "Entertainment", "Evaluation" and "Exit"	The system displays the screen of the option that has been chosen from the options menu
UC-3 Entertainment	The <i>coachee</i> selects the different options within the "Entertainment" menu to relax	The system shows you a screen with relaxing music, links to social networks, such as Facebook, Gmail,

		among others, as well as links to YouTube or an online radio station
	The <i>coachee</i> selects "Links of interest"	The system shows you a screen with some links of interest related to the subject of the tutorial <i>coaching</i>
	User selects "Exit"	The system completes the evaluation and saves the progress results
UC-4 Evaluation	This use case shows a menu with the options "Level of progress" and "Evaluate"	The system displays the option selected by the <i>coachee</i>
UC-4.1 Advancement level	The <i>coachee</i> selects "Advancement level"	The system displays a screen with the progress of the questionnaires that have already been carried out
UC-4.2 <i>Coaching</i>	The <i>coachee</i> selects "Evaluate"	The system displays a screen with the points to be reinforced, a graph of results according to the performance obtained in the module "Evaluate"

SYSTEM ARCHITECTURE

The architecture of any system is done in the design phase, its relevance lies on how its components are linked together, formed by a set of patterns and coherent abstractions that show a logic behavior. In this respect, the modules that give it form have some special and specific task. The interrelation among them is: interphases, data and functional processes, depicting an integrating vision (Cardacci, 2015). Because of the characteristics of the coaching system, an adaptation was done to the architecture, defined by intelligent tutorial systems.

ARCHITECTURE OF THE TUTORIAL COACHING SYSTEM

Intelligent tutorial systems, by nature, provide aid, advise and feedback to learners. The Carbonell model (1970) is formed by four modules: the student, the dominion, the tutor and the interface.

Dominion module: this contains the description of knowledge or teaching field, that is, the educational resources of the course. In our tutorial coaching system, it is included in the knowledge Base sub-module, which is responsible for presenting the topics and the materials in accordance with the student's performance detection. The role of the coaching sub-module is to show recommendations to obtain a better academic performance.

Student's module: this contains all the necessary and important information of the student. In the tutorial coaching system, it includes personal information of the students of the Bachelor in International Trade of the Netzahualcoyotl University Center of the Autonomous

University of the State of Mexico; furthermore, it stores the information of their academic path by means of answers to questionnaires, as well as of resources used during the period of use of the system, and of recommendations suggested by the system.

Tutor's module: this is the person in charge of monitoring, based on the academic performance of the coachee, what the most proper suggestions are regarding pedagogic resources. This information is provided by means of the decision tree algorithm application, linked to the dominion module of the tutorial coaching system, and is in charge of reinforcing the contents where a problem arose.

Interface module: this is responsible for enabling interaction with the user (coachee) and the tutorial coaching system, generally. This interaction shall more frequently appear with the dominion module, through the task or the activity which the student is doing, by means of a simulation of the dominion module (see figure 3).

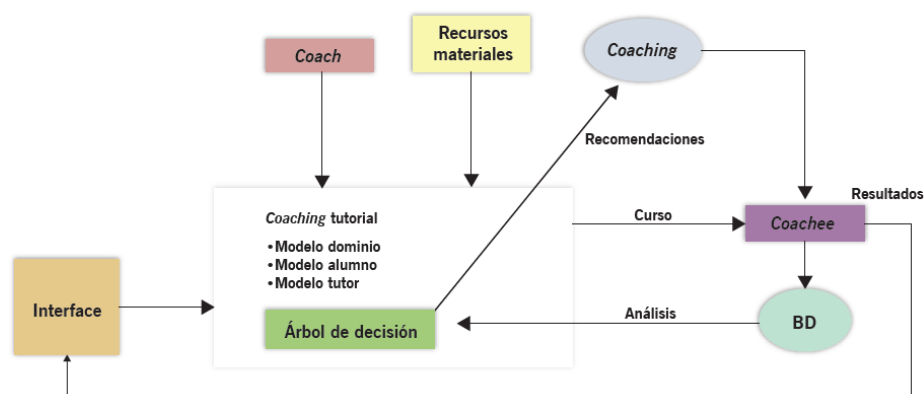


Figure 3. Architecture of the tutorial coaching system.

ASSESSING THE COACHING SYSTEM

As this is an educational software, different pedagogic aspects are to be considered. For this, the Zulma Cataldi (2000) template was used, which allows aspects linked to the learning objectives measured and to the type of communication of the software system.

To assess the learning test, using qualitative methodology was determined and criteria were considered for the application of the assessing instrument of Castrillon (2011), (see table 2), which consists of three activities: 1) selecting test users: from a population of 40 students, 20 were selected at random (experimental group), who used the coaching software continuously; 2) survey: by considering the Cataldi's template as reference, an instrument with 20 items was designed with questions regarding the presentation of the coaching system, which were given values from 1 to 5 in the Likert scale type (see table 3); subsequently, a partial weighted average was obtained for each question and, lastly, all the values of the items were added together, which generated a final score, which is the indicator for the quality of the software (see table 4); and 3) conducting a functionality test survey of the coaching system. To define the pedagogic quality of the software, the weighting is presented in table 4.

As a research method, a traverse design was used, which enables measuring students' perception of the coaching system functionality by means of the score obtained of the software's pedagogic quality points.

Table 2. Criteria for the application of the assessment instrument (Castrillon, 2011)

Learning tests	
Activities	Expected results
1) Selection of test users	Integration and characterization of the experimental groups
2) Construction of evaluation instrument (Cataldi template, 2000)	Characterization and definition of the test and the application environment
3) Test application	Measurement, analysis and interpretation of the results in the experimental and control groups

Source: Castrillón (2011).

Table 3. Value for each item

Score	Evaluation
1	Bad
2	Regular
3	Good
4	Very good
5	Excellent

Source: adapted from Cataldi (2000).

Table 4. Pedagogic quality level of the software

Score (%)	Pedagogical quality
0 - 20	Unacceptable
20 - 40	Regular
40 - 60	Good
60 - 80	Pretty good
80 - 100	Very suitable

Source: adapted from Cataldi (2000).

RESULTS

Figure 4 shows the chart with the results from the pedagogic development. Table 5 shows the 20 items adapted to the tutorial coaching system that were applied to the experimental group.

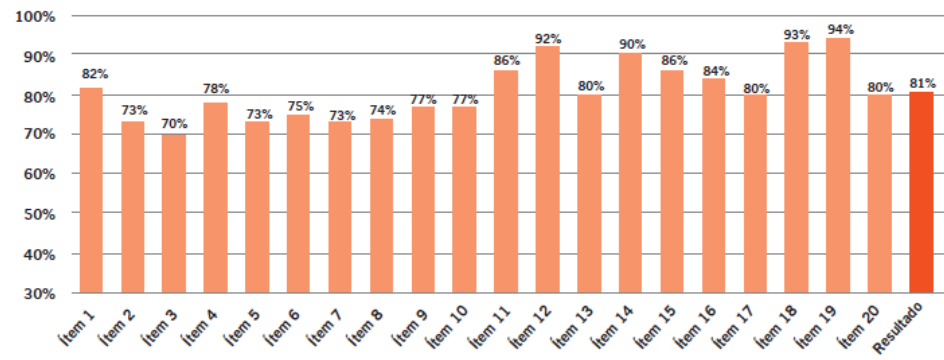


Figure 4. Chart with the results from the pedagogic assessment.

Table 5. Items adapted to the tutorial coaching system.

Indicator	Evaluators																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
1) Does it meet the proposed objectives?	4	5	4	5	4	3	4	4	5	4	4	5	3	4	4	3	4	5	4	4	4.1
2) Are the links related to the topics presented?	4	4	3	4	4	3	4	5	4	3	4	4	4	3	4	3	3	4	2	4	3.65
3) Do you consider the use of windows is appropriate??	3	4	3	4	4	3	4	5	3	4	4	4	5	3	3	2	3	4	3	2	3.5
4) Do you consider the use of buttons are appropriate?	4	4	4	3	3	5	5	4	4	3	3	4	5	4	4	3	5	4	4	3	3.9
5) Do you consider the use of colors is appropriate?	4	4	4	3	4	4	3	5	4	3	3	4	4	3	3	4	4	3	4	3	3.65
6) Do you consider the use of typefaces is appropriate?	4	3	4	5	4	3	4	4	3	4	4	5	3	3	4	4	3	4	3	4	3.75
7) Do you consider the system interactive?	5	4	3	4	4	5	3	4	3	4	3	4	3	3	4	3	4	3	4	3	3.65
8) Do you consider the interface to be user friendly?	4	5	3	4	4	3	4	3	4	3	4	3	4	5	4	4	3	3	4	3	3.7
9) Is it user-friendly?	5	4	4	4	3	4	5	4	4	3	4	3	4	3	4	5	3	4	3	4	3.85
10) Do you consider that the use of the icons is correct?	4	4	3	4	5	3	4	3	5	3	4	4	4	3	4	3	5	4	3	5	3.85
11) Do you consider the level of the questions presented adequate?	4	5	4	5	4	4	5	4	4	4	5	4	5	4	5	4	3	4	4	5	4.3
12) Do you consider the selection of the contents to be appropriate?	5	5	5	5	4	4	5	4	5	4	5	4	5	4	5	5	5	4	5	4	4.6
13) Do you consider the	4	3	5	3	4	5	4	5	4	3	4	5	3	4	4	3	4	5	4	4	4.0

overall screen design adequate?																					
14) Are the examples presented consistent with the problem to be solved?	5	4	5	4	5	4	4	5	4	5	4	5	4	4	5	5	4	4	5	5	4.5
15) Is the information presented adequate?	4	5	4	4	4	4	5	5	4	5	4	5	4	4	5	5	4	3	4	4	4.3
16) Does <i>coaching</i> facilitate feedback?	4	4	4	5	3	4	5	4	4	3	5	4	4	4	5	4	5	4	5	4	4.2
17) Has it aroused interest in you?	4	4	3	4	5	4	3	4	5	4	3	5	4	3	4	5	3	4	5	4	4.0
18) Is the language used suitable for the users?	5	4	5	4	5	5	4	5	4	5	5	4	5	5	5	4	5	5	4	5	4.65
19) Are the different learning rhythms respected?	5	5	5	4	5	4	5	4	5	5	5	5	4	5	5	4	5	5	5	4	4.7
20) Does it promote meaningful learning?	4	4	4	4	5	4	5	4	3	4	4	4	5	3	3	4	4	3	5	4	4.0
	General average																				4.04

DISCUSSION AND CONCLUSIONS

As discussed previously, a survey was conducted on 20 students selected from a total of 40 randomly. The questions considered several aspects and were categorized as follows: those related with the communication interface and those related with the contents presented. Likewise, they were weighted in a grading scale between 1 and 5 in accordance with the following values: 5) excellent, 4) very good, 3) good, 2) fair, 1) bad; and, subsequently, an average was obtained for each question.

The results were divided into two categories: scores below 4.0 (3.5-3.9) and scores equal to or greater than 4.0, which were obtained from the average assessment of each item. In the first range, nine items had scores below 4.0, these are for the communication interface and their value is between 70% and 78%, which places the software as “quite good”.

The remaining items had an average weight between 4.0-4.7. These questions were categorized in accordance with content of the topic. With these numbers, the software had a score between 90% and 94%, which places it as “well suited”. When joining the average of all the items, the final score is 4.04, which results in an average of 81%, which is considered to be “very good”.

As can be seen, students’ assessment towards the coaching system was generally considered to be “quite good” and “very good”; these results allow us to highlight the relevancy of this system by the contribution to the educational field. To the students, this was an innovating tool, of easy access, as they considered that this is part of the digital age. By contrast, this poses a challenge to the professors because of the need to update on the use of ICT.

The system is a potential tool, because it enables the coach to place a diversity of materials and that the student (or coachee) selects the most proper for his/her needs. Another advantage of the system is that it is very helpful as the different educational modalities are considered, which emerge in view of the needs of present time and provide an efficient accompaniment, especially in online modalities or blended learning. By the tools presented by the system, a student may obtain a thesis protocol to meet the criteria established for this document, which will enable graduation in time and manner, in accordance with the guidelines set forth by the Autonomous University of the State of Mexico for this modality.

Within future works, and with the purpose of improving the efficiency and efficacy of the system, a plan is in progress to design and apply an assessment instrument aimed to identify the opportunity areas that would contribute to the improvement of the system. This questionnaire will be applied to participating students on the use of the coaching system.

Badia, A.; Chumplitaz, L.; Vargas, J. y Suárez, G. (2016). La percepción de la utilidad de la tecnología conforma su uso para enseñar y aprender. *Revista Electrónica de Investigación Educativa*, 18(3), 95-105. <http://redie.uabc.mx/redie/article/view/810>

Baldinger, E. (2018). *Learning Together: Investigating Possibilities for Mathematics Teachers' Equity-Focused Learning through Coaching* (tesis doctoral). UC Berkeley.

Bayón, F.; Cubeiro, J. C.; Romo, M. y Sainz, J. A. (2006). *Coaching realmente*. Madrid: Pearson Prentice Hall.

Bécart, A. y Ramírez Garrido, J. D. (2016). Fundamentos del coaching educativo: caracterización, aplicaciones y beneficios desde los cuatro pilares del saber. *Plumilla Educativa*, 18(2), 344-362. <https://doi.org/10.30554/plumillaedu.18.1973.2016>

Belloch, C. (2017). *Diseño instruccional. Unidad de Tecnología Educativa (UTE)*. España: Universidad de Valencia. <http://biblioteca.udgvirtual.udg.mx/jspui/handle/123456789/1321>

Bou Pérez, J. F. (2013). *Coaching educativo*. Bogotá, CO: Ediciones de la U.

Carbonell, J. R. (1970). AI in CAI: An artificial intelligence approach to computer assisted instruction. *IEEE Transaction on Man Machine Systems*, 11, 190-202. <https://ieeexplore.ieee.org/abstract/document/4081977>

Cardacci, D. G. (2015). *Arquitectura de software académica para la comprensión del desarrollo de software en capas*. Serie Documentos de Trabajo, núm. 574. Buenos Aires: Universidad del Centro de Estudios Macroeconómicos de Argentina (UCEMA).

Castrillón, E. P. (2011). Propuesta de metodología de desarrollo de software para objetos virtuales de aprendizaje MESOVA. *Revista Virtual Universidad Católica del Norte*, 1(34), 113-137. Recuperado de: <https://revistavirtual.ucn.edu.co/index.php/revistaucn/article/view/332>.

Cataldi, Z. (2000). *Una metodología para el diseño, desarrollo y evaluación de software educativo* (tesis de maestría). Argentina: Universidad Nacional de La Plata.

Cejas León, R.; Navío Gámez, A. y Barroso Osuna, J. M. (2016). Las competencias del profesorado universitario desde el modelo TPACK (conocimiento tecnológico y pedagógico del contenido). *Píxel-Bit. Revista de Medios y Educación*, 49, 105-119. <https://www.redalyc.org/pdf/368/36846509008.pdf>

Christensen, R. & Knezek, G. (2001). Instruments for assessing the impact of technology in education. *Computers in the Schools*, 18(2-3), 5-25. https://www.tandfonline.com/doi/abs/10.1300/J025v18n02_02

- Coll, C.; Mauri, T. y Onrubia, J. (2008). Los entornos virtuales de aprendizaje basados en el análisis de casos y la resolución de problemas. *Psicología de la educación virtual*, 213-232. https://www.researchgate.net/publication/281119910_Los_entornos_virtuales_de_aprendizaje_basados_en_el_analisis_de_casos_y_la_resolucion_de_problemas
- Fernández Cruz, F. J. & Fernández Díaz, M. (2016). Los docentes de la generación Z y sus competencias digitales. *Comunicar*, 46, 97-105. <https://doi.org/10.3916/C46-2016-10>
- García Romero, F. G. (2018). Análisis de los modelos de diseño instruccional para aplicar a las asignaturas de la carrera de TSU en Tecnologías de la Información y Comunicación Área Sistemas Informáticos. *PAG. Revista Iberoamericana de Producción Académica y Gestión Educativa*, 5(10). <https://www.pag.org.mx/index.php/PAG/article/view/744>
- Giménez, J.; Fleta, Y. y Meya, A. (2016). Coaching nutricional para la pérdida de peso. *Nutrición Hospitalaria*, 33(1), 135-147. http://scielo.isciii.es/scielo.php?pid=S0212-16112016000100024&script=sci_arttext&tlng=en
- Jacobson, I.; Rumbaugh, J. & Booch, G. (2007). *El lenguaje unificado de modelado, manual de referencia*. Madrid: Editorial Pearson Educación.
- Jonassen, D. (1999). *Designing constructivist learning environments. Instructional Design Theories and Models*. Mahwah, NJ: Lawrence Elbaum.
- Joyce, B. & Showers, B. (1982). The Coaching of Teaching. *Educational Leadership*, 40(1), 4-10. <https://eric.ed.gov/?id=EJ269889>
- Kamphorst, B. A. (2017). E-coaching systems. *Personal and Ubiquitous Computing*, 21(4), 625-632. <https://doi.org/10.1007/s00779-017-1020-6>
- Kool, L.; Timmer, J. & Est, van, Q. C. (eds.) (2014). *Eerlijk advies: de opkomst van de e-coach*. Den Haag, Holland: Rathenau Instituut.
- Kularbphetpong, K.; Kedsiribut, P. & Roonrakwit, P. (2015). Developing an adaptive web-based intelligent tutoring system using mastery learning technique. *Procedia-Social and Behavioral Sciences*, 191, 686-691. <https://doi.org/10.1016/j.sbspro.2015.04.619>
- López Villafranca, P. y Gómez de Travesedo, R. (2016). Coaching académico para adquirir competencias profesionales. Estudio de caso en la Universidad de Málaga. *Opción*, 32(10), 95-110. <https://www.redalyc.org/pdf/310/31048901006.pdf>
- Martínez, L.; Hinojo, F. & Aznar Díaz, I. (2018). Aplicación de las tecnologías de la información y la comunicación en los procesos de enseñanza-aprendizaje por parte de los profesores de química. *Información Tecnológica*, 29(2), 41-52.

https://scielo.conicyt.cl/scielo.php?pid=S0718-07642018000200041&script=sci_arttext&tlng=n

- Moreira, M. A. (2017). Aprendizaje significativo como un referente para la organización de la enseñanza. *Archivos de Ciencias de la Educación*, 11(12). <http://dx.doi.org/10.24215/23468866e029>
- OEI y Fundación Telefónica. (2011). *Integración de TIC en la escuela. Indicadores cualitativos y metodología de investigación*. Madrid: OEI. <http://www.oei.es/historico/noticias/spip.php?article9607>
- Organización de Estados Iberoamericanos (OEI). (2013). *Miradas sobre la educación en Iberoamérica*. Madrid. <http://mapeal.cippec.org/wp-content/uploads/2014/06/OEI-InformeMiradas2013.pdf>
- Organización de Estados Iberoamericanos (OEI). (2017). *Programa de presupuesto 2017*. Madrid: Organización de Estados Iberoamericanos para la Educación, la Ciencia y la Cultura (OEI).
- Oinas-Kukkonen, H. (2010). *Behavior change support systems: A research model and agenda*. *International Conference on persuasive technology*. Berlín: Springer.
- Piñeiro, M.; Martínez, M. y Guillén, E. (2013). Planificación y organización de la docencia enseñar y aprender mediante coaching educativo. *Univest*, 1-7. <http://hdl.handle.net/10256/8364>
- Sandoval, C. y López, O. (2017). Educación, psicología y coaching: un entramado positivo. *Educatio Siglo XXI*, 35(1), 145-164. <http://dx.doi.org/10.6018/j/286261>
- Sans Zapata, M. (2012). ¿Qué es el coaching? Sus orígenes, definición, distintas metodologías y principios básicos de actuación de un coach. *Revista de investigación Ciencias*, 1-11. <http://ojs.3ciencias.com/index.php/3c-empresa/article/view/115>
- Silva, L. A. Á.; Gudiño-Gómez, L. S.; Macías-Montoya, M. M. y Lara, H. S. I. (2018). Coaching educativo: desarrollo de competencias en el educando de Nivel Superior. *INNOVA Research Journal*, 3(11), 169-182. <https://doi.org/10.33890/innova.v3.n11.2018.804>
- Tenelema Ramírez, J. I. & Moyolema Naula, F. S. (2016). *Análisis, diseño e implementación de un software educativo multimedia para la estimulación visual de personas con parálisis cerebral que reciben ayuda en el centro de rehabilitación despertar de los Ángeles de la ciudad de Riobamba* (tesis de grado). Riobamba, UNACH.
- Van de Heyde, V.; Stoltenkamp, J. & Siebrits, A. (2017). Designing a social work online self-coaching program: Integrated support and joint ownership. *Cogent Education*, 4(1). <https://www.tandfonline.com/doi/full/10.1080/2331186X.2017.1346547>

- Van Wissen, A. (2014). *Agent-based support for behavior change: Models and applications in health and safety domains* (tesis de grado). Países Bajos: University Amsterdam.
- Warner, T. (2012). E-coaching systems: Convenient, anytime, anywhere, and nonhuman. *Perform Improv*, 51(9), 22-28.
<https://doi.org/10.1002/pfi.21305>
- Whitmore, J. (2003). *Coaching: el método para mejorar el rendimiento de las personas*. Barcelona: Paidós.
- Wooldridge, M. & Jennings, N. R. (1995). *Intelligent agents. ECAI-94 Workshop on agent theories, architectures, and languages*. Berlín: Springer.



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