

Diagnóstico sobre uso de las tecnologías en la evaluación del aprendizaje en Matemática y Física

Diagnosis on the use of technologies in the evaluation of learning in Mathematics and Physics

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Resumen: Se aprecian falencias desde la propia literatura especializada con relación a la superación profesional de los maestros ambulantes dirigida al desarrollo de la motricidad articuladora en escolares con diagnóstico de disartria. Se propone como resultado de la investigación un modelo de superación para el desarrollo de la motricidad articuladora en escolares con diagnóstico de disartria. Los métodos y técnicas empleados fueron el análisis de documentos, la modelación, la observación, la entrevista, la encuesta, los talleres de opinión crítica y construcción colectiva, y el pre-experimento.

Palabras clave: Maestros ambulantes; Disartria; Motricidad articuladora; Educación especial.

Abstract: We can see shortcomings from the specialized literature in relation to the professional improvement of itinerant teachers, aimed at the development of articulatory motor skills in schoolchildren diagnosed with dysarthria. A model of improvement for the development of articulatory motor skills in schoolchildren diagnosed with dysarthria is proposed as a result of the research. The methods and techniques used were document analysis, modeling, observation, interview, survey, critical opinion and collective construction workshops, and pre-experiment.

Keywords: Walking teachers; Dysarthria; Articulation motor; Special education

Introduction

Information and Communication Technologies (ICT) are an excellent means of instruction and support for education, their attributes are combined to promote new forms of learning that demand teaching approaches different from those traditionally used in order to promote and achieve the training of competent professionals. In this process of formation, they play a fundamental role the basic sciences that contemplate between the disciplines of the basic cycle of the careers of Engineering the Mathematics and

the Physics since they contribute directly to the development of logical processes of thought, and of inherent abilities to the profession such as modeling and simulation.

Diverse and significant are the transformations that have taken place in the teaching-learning process of these disciplines frequently addressed to the objectives, the restructuring of contents, the means and methods of teaching, and the redesign of programs, Falcón (2003), Alejo (2006), Barreras (2007), Ortiz (2002), Rodríguez and Llovera (2012); and less often to the evaluation.

The evaluation is one of the didactic categories that requires more attention within any educational project, not taking it into account would be in contradiction with the conception that the student, as a subject of their training, should participate actively and consciously in their process evaluative.

Within the functions of the evaluation its role in the process of student training is highlighted given its instructive and educational nature. Pérez (2007); Salinas, De Benito, and Pérez (2013); Pérez, Triana, y Garza (2016); Tejada and Ruiz (2016); Flowers and the Arch (2011); González (2012); Brown and Pickford (2013); Margalef (2014); Hernández, Casado and Negre (2016) consider that the evaluation constitutes a learning activity that provides information at each moment of this process, and allows the necessary adjustments and adjustments to be made to reach the proposed objective in correspondence with the achievements and difficulties of which they learn. In essence, its purpose is to direct learning and condition it intelligently.

However, during the daily pedagogical practice it has been observed that the process of evaluation of the learning of the Mathematical and Physical disciplines is still carried out by means of traditional instruments and techniques; the evaluations that are applied are predominantly of a reproductive nature, aimed at evaluating the learning outcome and not the process; and there is a tendency to identify the evaluation with the qualification.

These deficiencies and others denote that this process contributes little to the training of a competent professional, hence the need to improve it. For this, an investigation was carried out that has as object of study the evaluation process of the learning in the area of the basic sciences, and that has as a field of action the formative evaluation.

In this sense, the diagnosis and its results play a fundamental role to guide the research that must solve the problems that still exist in the evaluation process of the learning of these disciplines; its analysis and interpretation constitute the essence of this work.

Development

The University of Computer Sciences (ICU) is a center of higher education whose faculty has been nourished by the graduates trained in it, young people who suffer from pedagogical training and sometimes enough knowledge about the discipline they teach.

To diagnose and verify the status of the problem, its size and possible causes, the following actions were carried out:

- Inquiry about the level of knowledge and preparation teachers have about the evaluation of learning, and how they evaluate their students.
- Determination of the level of training and skills of teachers in the use of ICT.
- Exploration of the students' criteria about the evaluation of their learning.
- Observation of methodological activities to determine if in the organization and planning of these at the collective level, the subject of formative evaluation is addressed.
- To know the importance that is given to the use of ICT in the teaching-learning process of the Basic Sciences in the ICU, in particular in the evaluation of learning.

For the collection of information, the following questionnaire-type surveys were applied.

- Diagnostic to students with the objective of defining and quantifying the information related to the difficulties present in the evaluation of learning. To do this, a sample of 30 first-year students from the Introductory Faculty of Computer Science (FICI) was selected from a population of 100.
- Diagnosis to professors with the objective of specifying and quantifying the information related to the level of knowledge about the object of study, difficulties present in the evaluation process, and the level of knowledge, mastery and use of the tools to evaluate learning. To do this, a sample of 20 teachers of Mathematics and Physics was selected from a population made up of all the Basic Sciences professors of the UCI.
- Survey of virtual teaching environment (EVE / A) to professors and students with the aim of investigating their knowledge about the didactic resources made available in the teaching-learning process of the basic sciences. From a population constituted by all the professors of Basic Sciences of the UCI, students of four groups of first year of the FICI, and the students of second year of the Faculty # 2, a sample formed by 25 professors of Mathematics was interviewed, 20 of the FICI and 5 of the Faculty # 2, as well as 30 students, of these 15 of the FICI and 10 of the Faculty 2.

Once these instruments were applied, they were tabulated to make a descriptive analysis of them. For the statistical processing of the data, the Microsoft Excel application was used.

The results obtained after applying the survey to the students once the information was processed allowed us to diagnose and arrive at the conclusion of the need to transform the evaluation process of learning with the incorporation of ICT to it.

	Indicator
SDI 1	Techniques that you consider have been used to evaluate your learning in science: interrogation, problem solving, observation, product request
SDI 2	Instruments that you consider have been used to evaluate your learning in science: written or oral exams, research papers, open book exams or other types of instruments
SDI 3	Satisfied with the procedures that their science teachers have used to evaluate their knowledge.
SDI 4	You consider you must examine yourself to approve or to learn.
SDI 5	Your opinion as a student at the time of being evaluated is taken into account
SDI 6	Your opinion as a student is taken into account when evaluating another student
SDI 7	Consider yourself capable of evaluating yourself
SDI 8	Consider yourself capable of evaluating another student
SDI 9	Know some of the tools offered by the virtual teaching-learning environment to be evaluated through them.
SDI10	Has ever been evaluated through the virtual learning environment
SDI11	In the written assessments you are allowed to make use of supplementary materials such as: calculator, computer or other
SDI12	After a written evaluation, the teacher analyzes the mistakes made with each student.
SDI13	Consider that you are evaluated when you receive a grade.
SDI 4	When evaluated, only the knowledge acquired is taken into account and how it is applied in solving problems.

Table 1: items by indicator of the diagnostic survey applied to students.

Source: self elaboration, adapted from Hernández, 2016

The items SDI 1 and SDI 2 related to the evaluation techniques that the student considers have been used to evaluate their learning indicate that all the respondents consider that the most used has been the resolution of problems through written exams, while only the fourth part considers that the interrogation technique has been used.

In relation to the evaluation instruments used, 100% of the students recognized the written exam, and 93.3% the investigative work. An apparent contradiction is identified because the research work is an

instrument of the technique of application of products, recognized only by 20% of the students as an evaluation technique.

The above is in correspondence with the results achieved after having processed the item IDE 3. The fact that only 13% of students are satisfied with the procedures that their science teachers have used to evaluate their learning transcends the point of that 83% consider that it should be examined and studied only to approve.

The SDI 5 and SDI 6 items related to the student's participation in their evaluation process, show that the forms of participatory evaluation are absent in our classrooms. No student states that their criteria are taken into account when evaluating or evaluating another student in their class. This means that practically no student considers himself capable of evaluating himself.

The results obtained when processing item SDI 7 show that only two students consider themselves capable of making value judgments about their own learning. However, when processing the data corresponding to item SDI 8, 57.5% of respondents consider themselves capable of evaluating another partner.

We consider it of utmost importance that students practice these forms of participatory evaluation, and for this the teacher must put in their hands the precise instruments to carry it out because it is not enough for the student to reflect on their learning, it must also materialize its result and be able to issue a judgment or value about the level of development achieved.

Although the students are reserved about evaluating themselves, most show their willingness and ability to evaluate another. In this sense we think that the lack of actions aimed at the development of forms of participatory evaluation is one of the factors that undermine the development of this form of evaluation that constitutes one of the elements that characterizes the formative evaluation which, with the integration from ICT to the evaluation of learning, is favored.

When inquiring about the knowledge that the students have about the EVE / A tools, it was found that 73% (figure 1) knows them, which is in contradiction with the fact that 77% (figure 2), declares not having been previously evaluated through the virtual environment, which evidences its little use.

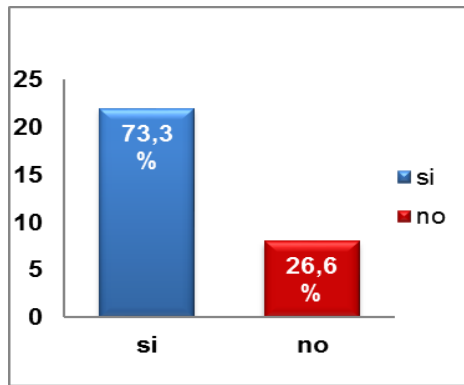


Figure 1: Graph corresponding to the percentage analysis of item 9.
Source: self elaboration

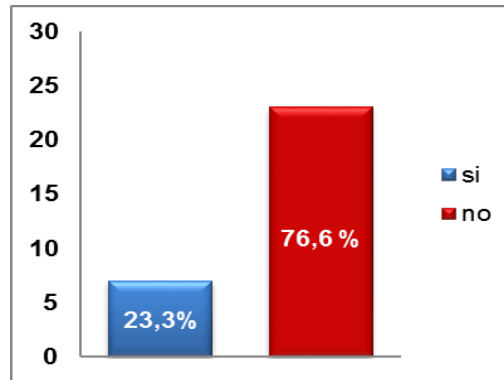


Figure 2: Graph corresponding to the percentage analysis item 10
Source: self elaboration

To all this, it is added that the students, in a general way, confirm that the evaluations respond to a learning rote, totally reproductive that is achieved with the repetition, in which the instrument that is most used is the pencil and paper exam and where, with the exception of the calculator, no other technological material is used. We consider the one of the reasons the non-design of activities taking advantage of the potential offered by EVE / A. Figure 2 shows that only 23% of students acknowledge having been evaluated through the virtual environment.

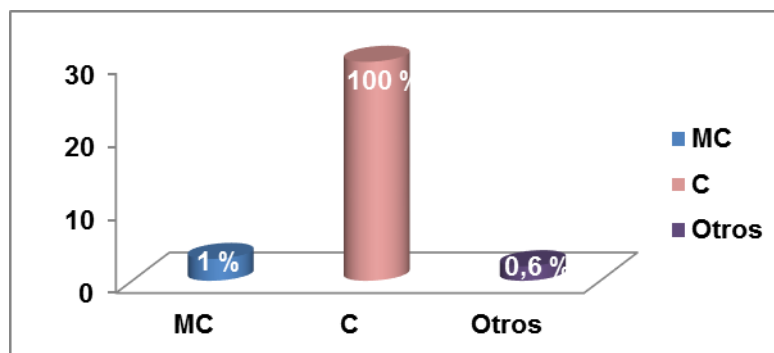


Figure 3: Graph corresponding to the quantitative and percentage analysis of item 11
Source: self elaboration

Similarly, the use of ancillary materials to perform the exams (forms, notes, books, computer media, and mathematical assistants in the evaluations, among others) is totally ignored, as shown in Figure 3.

The use of the various tools of the EVE / A is very important for the teacher to send the student his comment or information about the result of their learning, sometimes instantaneously, so not taking

advantage of it becomes a disadvantage. Finally, we must point out the fact that you should not evaluate to evaluate. The evaluation of learning should contribute to the formation of convictions, a sense of responsibility and study habits in the student; it cannot be an object of worry or fear for him, an error should be used to learn from it. Therefore, when a student is wrong should not be sentenced with a grade or note, that leads to school failure, it is advisable to analyze the error so that you understand and recognize what you need to achieve success, how much you still need to learn, and thus contributing to greater goals.

90% of the students in the sample believe that when an evaluation is made, their teachers do not analyze with them the mistakes made, with which the opportunity for feedback is wasted, and states that they perceive themselves to be evaluated when they receive a grade for them to evaluate is synonymous with qualification. The results show that the teacher in assessing student learning only takes into account the knowledge and skills that it acquired and developed without addressing the stages by which the student traveled to achieve it, so it can be classified as an analytical, centered in the knowledge, only to give solution to the evaluations that are applied.

The foregoing reveals the need for transformations in the evaluation process of basic science learning.

The results of the diagnosis applied to the teachers show that there are difficulties in the educational practice of the learning evaluation process in which the action of the teacher plays a fundamental role, which must have the minimum knowledge necessary to carry out this function. Given the characteristics of the Faculty of Physics and Mathematics in the ICU, it was decided to carry out a diagnosis whose results will allow to carry out actions with the aim of guaranteeing the preparation of the faculty to be able to begin the process of improving the evaluation of learning. 20 professors of both disciplines were surveyed, and the items corresponding to the instrument applied to them are reflected in table # 2.

Items	Indicator
ID1	My knowledge of didactics allows me to play the teaching-learning process with quality
ID2	The evaluation of learning constitutes a didactic category.
ID3	I have knowledge about various forms of evaluation of learning
ID4	I apply various forms of evaluation with my students
ID5	I have knowledge about how to implement various forms of learning assessment with the integration of ICT

ID6	I have knowledge about evaluation techniques and instruments
ID7	I apply diverse techniques and instruments to evaluate the learning of my students
ID8	consider that the techniques and instruments that I apply to evaluate the learning of my students are adequate
ID9	I have knowledge about tools that have the EVE / A to assess student learning
ID10	I am satisfied with the assessment techniques I use and the tools I use to assess student learning.
ID11	I use some of the tools that the EVE / A has to evaluate the learning of my students
ID12	The evaluations that I apply to my students are predominantly reproductive
ID13	By applying the evaluation system of the subject to assess the learning of my students, I place greater emphasis on the result achieved by these students than on what they did to achieve this result.
ID14	In assessing the performance of my students, I always give a mark.
ID15	I allow my students to participate in their evaluation process with the issuance of criteria about it
ID16	I take into account the opinion of students when assessing their learning
ID17	I have knowledge about actions aimed at the issuance of value judgments about student learning
ID18	I make known to my students actions aimed at the issuing of value judgments about their learning
ID19	I know of the advantages offered by ICT as a complement to a face-to-face course
ID20	I know that in the EVE / A of the UCI there are complementary courses in Physics and Mathematics
ID21	I use the EVE / A of my subject as a mediating element for guidance, monitoring and control of activities aimed at student learning
ID22	I have the perception that students study to pass
ID23	I have the perception that students study to learn
ID24	I am satisfied with the results achieved by my students
ID25	I know the resolutions and regulations in force in the teaching methodology for Higher Education regarding the evaluation of learning

Table 2 items corresponding to the survey applied to teachers
Source: self elaboration, adapted from Hernández, 2016

The results show that more than 50% of the members of the faculty consider that their knowledge in relation to the didactics of the basic sciences, despite the lack of experience, allows them to adequately perform the PEA of the subject taught to them time that they state that the evaluation of learning constitutes one of the categories of didactics.

It also highlights the fact that a large number of teachers, approximately 75%, recognizes the advantages that ICT offer as a complement to a face-to-face course in their subject, and states that they have knowledge about the tools that the EVE / A has for evaluate the learning of the students to whom, whenever they evaluate them, they give them a grade; The latter reveals an apparent contradiction between the knowledge that teachers have and how they apply them. One of the virtues of the faculty in general is that it recognizes the advantages offered by ICT as a complement to a face-to-face course in Physics or Mathematic

There are insufficiencies in the educational practice with regard to the evaluation of the teaching-learning process, about 80% of the professor's manifest:

- Have little knowledge about the object of study.
- Have little knowledge about various evaluation techniques and instruments.
- Little knowledge of actions aimed at forms of participatory evaluation.
- When evaluating student learning, greater emphasis is placed on the results achieved by the students and not on how they were achieved
- Not be satisfied with the results achieved by their students and with the fact that they perceive that they study only to pass.
- On the other hand, there is little use of the complementary course in support of the PEA of Mathematics, and of the tele-classes made available for learning and for self-preparation of the students. In the case of Physics, the limited use of virtual laboratories is also added.

The graph, shown below, reflects the score with respect to the total of the professors surveyed for each item.

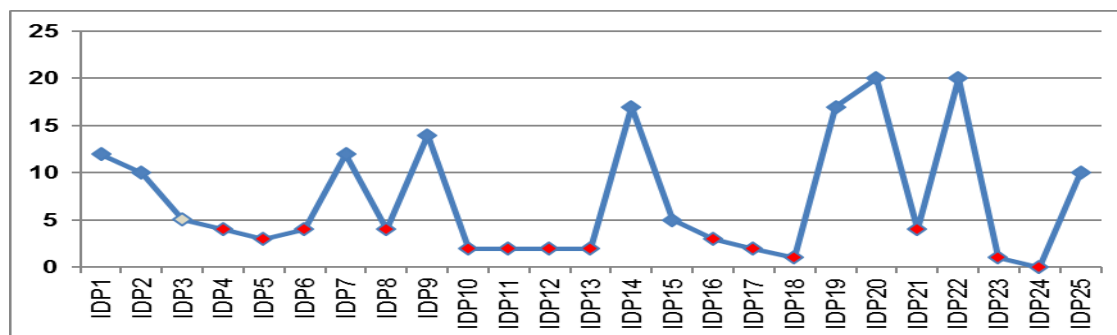


Figure 4: graphic corresponding to the distribution of frequencies by items of the diagnostic instrument applied to teachers

On the other hand, it is observed that the students, despite considering that the quality of the resources made available to their learning in the environment is adequate and sufficient, the tele-classes and the virtual laboratories are those they use the most because they consider that they are the most useful for preparing and passing the evaluations. The reason is that, being designed for the self-preparation of the exams, it makes them aware that using them can mean a guarantee of success.

The results obtained from the processing of the information collected during the diagnostic phase of the investigation corroborate the deficiencies in the process of evaluation of Mathematics and Physics in the ICU.

Conclusions

The results obtained show that the process of evaluation of Mathematics and Physics in the UCI has insufficiencies from the theoretical-conceptual point of view that transcend the educational practice, which bases the need for its reconstruction to transform the evaluation of learning of a censorship evaluation with a tendency to identify the same with the qualification, to an objective evaluation that may or may not be accompanied by a qualification; an evaluation with limited participation of the student to a participatory evaluation by the latter; an analytical evaluation, focused on the content, to an integrated evaluation that takes into account not only knowledge and skills, but also their attitudes, skills and performance; an evaluation with limited use of ICT to one with an advantage of these; an isolated evaluation to one with general feedback; an evaluation directed to the result and necessary to approve to achieve success a process evaluation that integrates the three types of evaluations that characterize it: diagnostic, summative and formative directed to how to achieve the proposed objective.

On the other hand, it is noted the importance of the diagnosis and its results to guide the research that will solve the deficiencies detected as well as the interrelation that must be established with the subjects that interact with the object of study. These results will be announced in methodological meetings, scientific events and meetings of researchers in order that teachers and students know about them, and reflect on the need of transforming the evaluation of learning of these subjects.

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