



Diagnosis of Digital Competencies for the Use of B-Learning Methodology in the Teaching and Learning Process

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Abstract. Education is undergoing processes of change, accentuated during the COVID-19 pandemic, highlighting the importance of developing competencies that ensure effective educational processes, such as digital competencies, which allow teachers to adapt to different learning environments. The objective of this research is to diagnose the digital competencies of secondary school teachers in a private educational institution in Ecuador. An observation rubric was used in classroom visits and a diagnostic instrument was applied, which is broken down into dimensions (5), subcompetencies (7), standards (17) and performance indicators (41). The research participants were 21 teachers: 12 women and 9 men. It is concluded that teachers have a level of mastery or development of digital competencies from medium to low level, which shows the need to design several training actions for teachers.

Keywords: B-learning · Digital competencies of teachers · Professional development · Secondary education

1 Introduction

Education is going through a transformation process generated by the COVID 19 pandemic, which demanded changing the face-to-face learning environment to a virtual one, which requires greater discipline and commitment by students and the proper use of technological means, above all, the development of digital competencies of all educational actors [1].

When talking about digital competencies, these refer to the knowledge, capacity and ability to handle information and communication technologies [2]. In addition, they require the development of practical skills for the use of computer tools that can be applied in different teaching processes and the ability to use electronic devices [3].

Parallel to this, mentions that digital competencies are defined as the ability to create and exchange digital content to communicate, share and collaborate in the development of knowledge with a view to achieving effective and creative development in life, work and social activities in general [4]. Based on this definition, when determining that digital competencies lead to processes of creation and exchange of content, the 21st century

teacher is placed in a role of change agent that allows him/her to co-design, together with his/her students, new learning scenarios (Escofet Roig, Novella Cámara, and Morín Fraile, 2021) [5].

For Rodriguez the use of ICT in the classroom has gone from being recommended to being essential, since as society advances, new skills are required and the education system must adapt to this reality, so that the student's output profile is in line with the demands of reality [6]. Likewise, Fernández and others show that having digital skills specifically in relation to the teaching profession is essential, since it is of great importance both for studies they wish to carry out and for better performance in job functions [7].

The digital training of teachers is currently an educational priority, because it impacts on the improvement of aspects such as: expanding the coverage and supply of educational services, strengthening the educational system in modalities such as face-to-face and virtual, access to online content and resources [8]. In addition, by developing activities through the appropriation of technology and digital literacy, students will develop critical thinking, analysis of real situations and problem solving [9].

Due to the pandemic of COVID-19, the teaching-learning scenarios, for the most part, used B-Learning (hybrid) environments that include both face-to-face classes and e-learning, this model is characterized by: (a) flexible, personal and warm training, (b) ease for group discussion of practical cases, (c) participation of subjects, (d) personal tutorials, (e) use of face-to-face time between teacher and students and (f) autonomy to organize study time for the student [10]. The student assumes a leading role, being responsible for their training and their skills are strengthened through the use of technology and digital resources [11].

B-learning environments represent a challenge for teachers because they need to think of new ways to guide the process, new activities, and evaluation processes that are in line with this new context [12]. An important point that should be emphasized is that there should be no confusion on the part of the teacher, in thinking that B-learning environments is a process in which it is enough to include technology; as mentioned by Contreras and others “the incorporation of the b-learning methodology should not be conceived only as adding technology to the class, but replacing some learning activities with others supported by technology” [13].

It is important to name some disadvantages analyzed by several authors, according to Gómez a negative factor is that for this environment to be successful everything will depend on the role of the teacher and the student, because if they do not adapt to the modality it is possible that the student no longer shows interest in learning, there may also be a problem regarding the use of technology since the existence of the same in the classroom may not be enough, and even a crucial problem is that the student does not have the skills of ICT management or does not have the possibilities [10].

Likewise, Ruiz determines that within this environment it is necessary to adopt new roles within the educational process, contrary to the traditionalists. Therefore, it is necessary to consider a previous test to understand the technological mastery of students and teachers. In addition to this, it is necessary to analyze the technological infrastructure, design and planning in a conscious and rigorous way so that B-Learning environments can be generated, otherwise it will not be possible [15].

In addition, another disadvantage that remains in relation to previous authors, is the mastery of the use of technology by teachers, since not all of them have this ability, due to several factors including age, according to Lopez and others, teachers over 40 years old, feel less competent and therefore less motivated for the implementation of technologies [16].

In view of the above, this research aims to diagnose the level of development of digital competencies of secondary school teachers in a private institution in Ecuador, through the analysis of a specific educational reality. From the results, it is intended to design a training program to develop digital competencies in B-Learning environments for teachers of this educational level, which can be applicable to other institutions and educational levels and will strengthen the professional development of teachers.

2 Materials and Methods

A descriptive research was applied, which according to Rojas is one that exhibits reality, through observation, recording, questioning and registration, i.e. it describes the phenomenon studied, to understand it through direct questions that allow understanding reality [17]. The method selected for the research is the interpretative method, the same one that involves a double process of interpretation, because on the one hand it implies the way in which subjects interpret reality and on the other hand the way in which scientists try to understand how subjects construct such realities [18], that is to say that it allows having two perceptions about the same context studied. Two instruments were applied, firstly, an observation rubric and then an instrument to diagnose the development of digital competencies in secondary education teachers.

The population was taken as the 21 people who make up the teaching staff of the educational unit under study, the teachers teach at the following sub-levels: initial, preparatory, elementary, middle, high school and high school. The population is represented by 12 women and 9 men, ranging from 20 to 50 years of age. The reason why it was decided that all of them should participate is that since the number of teachers is very small, it is necessary to select all of them so that the research process will be rigorous.

2.1 Participant Observation

Within the diagnostic process of the research, participant observation was fundamental, as it was considered a key part for the detection of the problem. According Bracamonte, participant observation allows knowing the reality of a social group, the actions, discourse and interaction; therefore, it is a technique that provides the opportunity to interpret the complex interactions that are generated within a context, placing the researcher as an active subject [19].

The observation was carried out through classroom visits in which the teaching-learning processes are evaluated, activities that are established in the educational institution under study in order to evaluate the teaching actions, for which a rubric developed by the Academic Board of the institution is used. According to Alsina and others, the observation rubric has the purpose of evaluating criteria on the execution of different

Table 1. Classroom visit evaluation rubric

Dimension	Indicators
Presentation	<ul style="list-style-type: none"> • Demonstrates personal cleanliness, wears clothing appropriate to teaching role.
Classroom management	<ul style="list-style-type: none"> • Maintains classroom discipline. • It allows all students to participate without interruption. • Use an appropriate volume, tone and speed of voice. • Respect the start and end time of a class period.
Didactics	<ul style="list-style-type: none"> • Evidence of the three moments of the class (anticipation, construction and consolidation). • Conceptualizes learning through strategies that allow the student to be the center of learning. • Performs activities transversalized by constructivist methodologies and that lead to meaningful learning. • It starts from previous learning. • Formulate questions that encourage the development of the student's critical thinking.
Use of technological and digital tools	<ul style="list-style-type: none"> • Uses web resources.
Materials	<ul style="list-style-type: none"> • Implement technological resources (projector, speakers, slides, etc.). • Fluent in TIC. • Uses materials (concrete or digital) according to the age of the students and the subject matter studied.

activities, tasks that are performed in classrooms; so it is a guide that shows the expectations of the previous activity [20]. The observation rubric contemplates 5 dimensions: (1) presentation, (2) classroom management, (3) didactics, (4) use of technological and digital tools, (5) materials, and each one has its corresponding indicators. The score under which it is evaluated in the observation rubric is on a scale of 1 to 5, with 1 being the lowest weighting and 5 the highest. The dimension destined to the use of technological and digital tools that occur within the development of the class is divided into three parameters: implements technological resources (projector, speakers, slides, etc.), uses web resources, handles ICTs fluently, for more details see Table 1.

2.2 Diagnostic Instrument for the Level of Digital Competence of Teachers

In addition to the observation rubric, an instrument was used to diagnose the level of digital competencies in the teaching staff, for which the proposal of Valdivieso [21] was considered, who designed an instrument consisting of 2 parts, the first related to socio-demographic information and the second that properly addresses the diagnosis of digital competence, for which it is broken down into dimensions (5), subcompetencies (7), standards (17) and performance indicators (41), with questions oriented to digital activities in the teaching practice according to Bloom's Taxonomy for the digital era,

measured under a dichotomy scale, in phase one (general aspects), and a valuation from 1 to 5 for phase two (digital competence diagnosis), in which the lowest number is equivalent to nothing/not at all, and the highest value to always/very much.

The author of this instrument carried out a validation under the technique of expert judgments that included a group of teachers of educational informatics at the secondary education level and experts in the subject of digital standards and competencies, who concluded that the instrument is valid for any research focused on the same subject, taking into account that the objectives proposed in the research in which the instrument was proposed are coincident and were aimed at developing a model for the evaluation of digital competence of secondary education teachers through the development and application of a diagnostic instrument that allowed knowing the user's profile.

Most of the items include sub-questions that allowed avoiding bias in the information that could be obtained, such is the case of standards 8, 9 and 10, related to pedagogical-didactic aspects, which include 6 questions with 33 response alternatives, through which information was sought on the use of ICT, as well as their implication in the design, management and achievement of learning results.

3 Data Analysis

The main results obtained after the application of the two proposed methodological phases are summarized below.

3.1 Results of Participant Observation

From what was observed during the classroom visits during the virtual classes, it was determined that teachers made little use of digital tools so that classes tend to be traditional, the teacher discusses the subject of study and the student listens, reading the student's text, dictation of assignments and homework to be copied in the student's notebook is added. In addition, it is observed that students on several occasions are disinterested, distracted, bored and/or performing other activities that are not related to the subject of study, even turning off their camera and microphone.

In addition, when the classes stopped being virtual and became B-learning, class management became much more complicated for the teacher, since they had to mix methodologies to solve the two environments: virtual and face-to-face. In B-learning, teachers require the implementation of all known and mastered strategies that respond to this environment and therefore this new environment means a great challenge for teachers.

It was concluded that most teachers have little knowledge in relation to the implementation of technological tools and the use of the network in the development of educational processes, so that classes do not motivate students to be active participants, but to be listeners, which does not develop their knowledge, skills and abilities, and therefore does not comply with providing a quality education or contextualized, not responding to the needs of a society that demands students with critical thinking, able to develop and make use of all the information found on the network and technology.

3.2 Results of the Application of the Instrument for Diagnosing the Level of Digital Competence of Teachers

We proceeded to the tabulation and analysis of all the data obtained according to the dimensions, sub-competences and indicators proposed in the instrument, tables were prepared summarizing the information obtained, for which each of the percentages of all the indicators were averaged.

Regarding the technical aspects, it is reflected that in terms of knowledge about hardware and software the results are positive, since almost 50% reached total mastery, although it is important to emphasize that since these are questions of general knowledge about this area, it would be optimal that all reach high mastery because each teacher should know the functions of technological devices with which he/she works, since 33.95% have medium mastery and 16.08% have low mastery, i.e. they are teachers who still do not understand the full operation of their devices even though they maintain constant use of them.

Regarding the dimension of aspects of improvement, in the sub-competence of searching, selecting and sharing information on the Internet, more than 50% have total mastery, i.e. they have the ability to surf the net and obtain the desired information according to their personal needs. But a warning sign is that 23.82% have a medium command and 24.71% have a low command, that is to say that there are teachers for whom this area represents a challenge, which within the development of educational processes is detrimental because it is the teacher who should understand how to acquire new information that enriches his knowledge and that of his students, but valid information.

Regarding the dimension of didactic pedagogical aspects, it can be observed that in the sub-competence of analyzing the viability of the curricular integration of ICT, the majority of the teaching population is divided into total mastery with 41.5% and medium mastery with 44%, while 14.5% is in low mastery. This leads us to infer that teachers have knowledge of how to relate or link ICT in the construction of knowledge, i.e., most of them have knowledge of when to implement technological tools in the classroom, and above all to understand which are the best ones according to the context in which they are.

On the other hand, in the sub-competency of designing learning activities and creating activities with ICT, 49.77% have total mastery, 27.69% have medium mastery and 22.53% have low mastery. Therefore, it is understood that teachers have the ability to create learning environments mainly based on the use of technology, and also have the ability to generate evaluation processes through the use of digital tools. That is to say that just as they include ICT in their class planning, they also implement it in the development of the class, and only for 22.53% of them it can represent a challenge.

Regarding the dimension Aspects of School Management, sub competency applying ICT to the institutional management process, 64.25% of teachers have a medium mastery, 33.25% have a low mastery and only 2.5% have a high mastery. This may be due to several factors, including the fact that teachers are not very involved or do not take ownership of promoting the center, i.e. within the institution there is no department or committee in charge of it, but teachers are not motivated to do so either. But in terms of looking for technological tools that encourage communication with legal representatives or family

members, they mainly use the WhatsApp social network, which is positive and negative, because they have not sought other ways such as the educational platform or email.

In the dimension Ethical, Social and Legal Aspects, the sub-competency demonstrating an ethical and critical commitment to ICTs is the one that shows the lowest percentage, since no teacher reached full mastery, and on the contrary, 81% have low mastery and 19% have medium mastery. Clearly, the teaching staff does not have solid knowledge to understand the importance of teaching students to protect themselves from false information, not to share personal information, or the misuse that can be made of ICTs, which may be a mistake that even the teachers themselves make.

4 Discussion of Results

Once the data collection is completed, it is necessary to analyze it in order to understand the level of teachers' digital competencies, and what are the factors or relationships found among the data obtained. Starting from the technical aspects of the teachers' competencies, since more than 50% of teachers have a medium to low command, i.e. they do not understand very well the functionality in terms of software and hardware, a relationship is obtained with the rubric of classroom visits since in the indicator "fluent in ICT" most of the teaching staff obtained scores between 2 and 3.

It is also corroborated with what was stated by the author López and others [16], since teachers between 38 and 45 years of age obtained a low mastery in most indicators, but an interesting fact is that teachers aged between 34 and 38 years do not reach total mastery, since they have a medium mastery, which implies that even in not so mature ages, it does not mean that they have a good command of ICT, does not mean that they have a total mastery in the development of digital competencies, although clearly an improvement is evidenced, a situation that has a growth in the opposite is the case of those who are between 21 to 34 years old who reach total mastery, this undoubtedly demonstrates a positive relationship between age and mastery of technical aspects.

On the other hand, in the pedagogical-didactic aspects competency, less than 50% of teachers have medium to low mastery, which has a direct impact on the construction of the teaching-learning process, since they do not have sufficient knowledge about ICT management and therefore are not prepared to develop didactic methodologies mediated by technology; Parallel to this, in relation to the construction of didactic material supported by ICT, the results reached a lower to low domain, which is also evident in the rubric, more than 50% obtained scores between medium and low, these results reflect the need mentioned by Morales [8] and Suárez and others [9] who express the urgent priority to train teachers at all levels in digital competencies.

For a teacher to keep up to date, training is necessary, which according to the data provided is one of the indicators ranging from medium to low, so that possibly, not being trained, the implementation of a B-Learning environment in the educational institution could cause some inconveniences motivating the teacher to maintain traditional classes, which corroborates Ruiz [15].

According to the definition of digital competencies issued by UNESCO [4], the results indicate that more than half of the teaching population has medium to low mastery in relation to indicators such as: facilitated students to build new ideas through immersion

in technological learning environments through simulations, questioned the use of certain technological applications in teaching, and promoted social interaction, communication and collaboration through social networks.

The above is contradictory with the teachers' answers to the indicators to elaborate the class plan or the pedagogical project with the use of ICT, since 76% have a high command, that is to say that within their school planning, they contemplate the use of technology, but possibly they have a wrong concept of what is ICT implementation in the classrooms, or they can plan it but leave it as part of the papers or documentation, since it is a requirement they must fulfill for the Ministry of Education, but it would simply be a piece of paperwork. As stated by Escofet Roig, Novella Cámara, & Morín Fraile [5], it is essential that teachers assume a new role as actors and managers of change.

Finally, in the absence of digital teaching skills, this new B-Learning environment could present resistance from teachers, so it is essential to develop teacher training programs that encourage teachers, as stated by Rodríguez [6] and Fernández [7], trained teachers are required to train the new generations who will respond to the new labor needs.

5 Conclusions

At the end of the research process, it is concluded that within the institution the level of digital competencies in most of the population is medium to low. Possibly it is necessary that teachers receive constant training on this subject, since they are not interested in an autonomous way in acquiring learning through training or obtaining fourth level studies, since only 2 of the population are studying or have a master's degree, and only 5 teachers participate in training processes.

Within the training that the institution can provide, it is necessary to start from the functionality of their technological devices so that they can take full advantage of each of their functions and can solve problems in case they are required. On the other hand, it is important to address the competence of demonstrating an ethical and critical commitment to ICT, since no teacher achieved total mastery, i.e. they are not aware of the importance of being critical of what we consume in networks and the use we give to each of their devices, so that the teacher is and forms citizens aware of the opportunities provided by ICT.

The fact that teachers do not have mastery of digital skills clearly affects the education of students, first in virtual environments classes become traditionalist, in B-Learning environments classes fail to consolidate knowledge, that is to say that within the institution you can only work under face-to-face mode, possibly they can not open up to new educational scenarios and get good results, which is a problem because in a changing society, and education must be coupled to it so that it can develop students who contribute to it.

After the data analysis, a data to be rescued is that within the indicator elaborated the class plan or the pedagogical project with the use of ICT, the teachers obtained total control, that is to say that they are aware that within their PUD and PCA they must include the implementation of ICT, but in the classroom visits, a large percentage of teachers did not obtain positive results in relation to this topic, that is to say that in terms

of pedagogy and didactics they still do not have a clear notion of how to transversalize and have an education based on the use of digital tools and the network.

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