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Perception of the relevance of digital products for the support and monitoring of research projects in virtual students

Percepción sobre la pertinencia de productos digitales para el acompañamiento y seguimiento de proyectos de investigación en estudiantes virtuales

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ABSTRACT

In the digital era in which we are immersed, new subjectivities are being generated that demand transformation in the educational processes in which the teacher as an essential actor in the process, sees the need to transform their practices from the recognition of the contextual diversity where their students are immersed in such a way that seeks from their skills and abilities to generate alternatives that lead their students to the achievement of learning objectives in line with the formative purpose that frames their qualification. Within this process, research assumes that special chapter that requires professionals and specialists of all areas to generate and strengthen competences that allow them to give answers to those questions that emerge from a problem, a phenomenon or a need present in their context or in their discipline, based on scientific rigor. The objective of the research of which this article is a part is focused on the development of digital technological resources that allow the

researcher in training, especially the one who crosses his qualification process from the virtual mediation, to have a tool that directs, accompanies and enhances the methodological process of his research. This document presents the results of the diagnostic phase and the collection of requirements for the design and analysis of the system to structure and generate an alternative initial version of the software application that meets the need that is evident in the training process of researchers from the virtual mediation and thus achieve that transcendence in the different contexts of a territory from a framework of multicultural diversity. Through a study with a qualitative approach, data were obtained from different sources that from a triangulation allowed to identify the requirements to be taken into account and the phases of the construction of the digital product. This study was focused on higher education institutions that offer professional and postgraduate training programs in virtual mode. A total of 36 teachers belonging to the three cultural universities of Mexico and the Corporación universitaria Iberoamericana of Colombia were taken as participants.

Key words: Mediated research, digital product, Methodology, approach.

RESUMEN

En la era digital en la cual nos encontramos inmersos, se vienen generado nuevas subjetividades que exigen transformación en los procesos educativos en los cuales el sujeto docente como actor esencial dentro del

proceso, ve la necesidad de transformar sus prácticas a partir del reconocimiento de la diversidad contextual donde se encuentran inmersos sus estudiantes de tal forma que busca a partir de sus competencias y capacidades generar alternativas que conlleven a sus educandos al logro de objetivos de aprendizaje en línea al propósito formativo que enmarca su cualificación. Dentro de este proceso, la investigación asume ese capítulo especial que exige a profesionales y especialistas de todas las áreas en generar y fortalecer competencias que les permita a partir de la rigurosidad científica dar respuesta a aquellos interrogantes que emergen de una problemática, un fenómeno o una necesidad presente en su contexto o en su disciplina. El objetivo de la investigación de la cual forma parte este artículo se centra en el desarrollo de recursos tecnológicos digitales que permitan al investigador en formación especialmente al que cruza su proceso de cualificación desde la mediación virtual, tener una herramienta que le direccione, acompañe y realimente el proceso metodológico de su investigación. En este documento se presentan los resultados de la fase diagnostica y de acopio de requerimientos para que desde el diseño y análisis del sistema se estructure y genere una alternativa en versión inicial, del aplicativo de software que satisfaga la necesidad que se evidencia en el proceso formativo de investigadores desde la mediación virtual y de esta forma lograr esa trascendencia en los diferentes contextos de un territorio desde un marco de diversidad multicultural. Mediante un estudio con un enfoque cualitativo, se

obtuvieron datos de diferentes fuentes que desde una triangulación permitió identificar los requerimientos a tener presentes y las fases de la construcción del producto digital. Este estudio se centró en las instituciones educativas de educación superior que ofertan programas de formación profesional y posgradual en modalidad virtual, se tomaron como participantes un total de 36 docentes pertenecientes a las universidades tres culturas de México y la Corporación universitaria Iberoamericana de Colombia.

Palabras Clave: Investigación mediada, producto digital, Metodología, enfoque

Introduction

This article is the product of an innovation and research project developed in the contexts of the Republic of Colombia and Mexico. It emerges from what is stated in the goals of the Sustainable Development Goals (SDGs), which demand education for all in the framework of diversity, promoting inclusive, intercultural and multicultural education. Within this purpose, higher education institutions design their academic offerings in different modalities with the aim of expanding their area of influence not only in face-to-face classrooms but also in distance and virtual modalities, where to achieve this purpose they articulate emerging technologies with educational processes, thus reaching the heterogeneity of contexts of a territory with formative purposes within the different areas of knowledge. But within this articulation technology - education, there are different actors and elements such as the teacher, the learner, the curriculum, didactics and research where it is required to generate specific tools and skills in the digital environment to formulate, structure, exercise and transcend learning in each of the learners immersed in the contexts where the training purpose is reached, harmonizing the pedagogical and educational processes with the trends and impact of digital transformation applied to research in and from the context.

Materials and methods

The project is framed in innovation but is supported by research which is developed from a qualitative approach, within the socio-critical paradigm of action research type, where a current need is identified, which results in the transformation of an educational reality which arises from the interpretation of a phenomenon that promotes scientific interest to propose actions as an alternative solution that transcend for the benefit of the social transformation of communities, from the premise "education for all" as one of the goals proposed within the indicators of the Sustainable Development Goals. This is achieved from the recognition of diversity reflected in inclusive and intercultural education, directly and indirectly involving each of the actors of the educational process within the emerging technological proposals. The general objective of the project focuses precisely on identifying the digital competencies of teachers who develop their exercise in the current digital era and who project formative purposes, supported by technology as a mediation to transcend with their teaching to the different contexts of a territory from a framework of diversity due to disability, multiculturalism and interculturalism.

The population with which the project was developed was ad-hoc, made up of 36 teachers who voluntarily accepted to participate in the study. These teachers develop their work in different modules and seminars in higher education programs belonging to the faculties of education of the Iberoamerican University Corporation, as well as teachers of education of the Universidad Tres Culturas de México. As inclusion criteria, the educational level where they develop their teaching practice and the faculty to which they belong were established. The exclusion criteria were the institution where they are employed.

The digital product as a support resource, the teaching practice and the formative process of research were identified as categories of analysis for the study, which focused the interest of analysis and framed the research in such a way that allowed to identify on the one hand the relevance of formulating a digital product to support the formative process in research for the qualification of teachers in virtual modality programs, as well as those competences that a subject immersed in the digital era must have and strengthen to promote social transformation in a framework of diversity.

For the collection of information, instruments and techniques of qualitative research were used, such as a discussion group supported by different primary sources that have been developed from the practice associated with the formulation of new proposals to strengthen didactics in the virtual modality, Likewise, semi-structured interviews were conducted with teachers of the educational institutions taken as a

basis for the study in such a way that allowed on the one hand to affirm the data recorded in the documentary reports and on the other hand to argue from the same practice the requirements to be taken into account for the formulation of the digital product that supports the monitoring and methodological process of the research projects developed by the students who in virtual mode are developing their qualification process as teachers and who in turn have a level of competences of the digital era.

"... by means of the interview we obtain all that information that we do not obtain by observation, because through it we can penetrate into the inner world of the human being and human being and know his feelings, his state, his ideas, his beliefs and knowledge." (Cerda, H., 1991:259).

The data obtained from the application of the instruments were systematized and through the comparative matrix technique, findings were obtained, which from a critical and transforming analysis allowed interpreting the phenomenon as input for the formulation of a digital product that accompanies, directs and enhances the scientific rigor with which an end-of-course research project is developed.

Results

In order to obtain the necessary data to identify the requirements of a digital product that supports, accompanies and enhances research projects under development by postgraduate students in virtual mode. First of all, a documentary review of the trends associated with the digital competencies of the population to whom the postgraduate academic offer in virtual mode is addressed is carried out. The documents of the Colombian Innovation Observatory are taken as a primary source, as well as the reports of the Ministry of National Education, which in preliminary studies developed and promoted the identification and formulation of educational innovation indicators. These documents show that:

- Of the total population of teachers immersed in the different regions of the National territory. Teachers support their pedagogical processes with digital educational resources.

- Teachers in both secondary and higher education support academic management with basic office automation tools, of which they have elementary knowledge.

- A high percentage of higher education teachers in different modalities and areas of knowledge, create their own resources to support their process, from software or basic

digital applications, the document mentions that this indicator is above 50%. It should be noted that learning about the use of the resource arises on their own initiative.

- One of the indicators on access to the knowledge society through digital technologies shows that a percentage of more than 75% use information sources, repositories of digital educational content, from educational institutions and government agencies, which they access for consultation or formulation of activities.

Likewise, the same documents showed indicators of the actions developed by educational institutions in terms of articulating technology in academic, pedagogical and training processes to strengthen the academic offer with a holistic perspective that promotes education for all as suggested by the 2030 agenda in its goal number 4.

- From these documents we were able to identify that only about 40% of the educational institutions registered and duly authorized by the Ministries of National Education, have generated actions to provide alternative access to higher education through digital platforms.

- Similarly, the documents also show a similar number and percentage of higher education institutions that acquire and promote the use of virtual experimental laboratories.

- These same documents show that only 35% of higher education institutions have formulated, have active and promote the consultation of websites for the purpose of publishing content whose main feature is the authorship of members of the educational community.

- On the other hand, the same document mentions that only a percentage close to 20% use learning management systems (LMS) as a mediator in the teaching process.

This allows us to have an approach to the ways in which digital technology has been appropriated in the innovation of academic and pedagogical processes, as mediation or support, for teaching within and outside higher education institutions.

On the other hand, this documentary review also allowed identifying the educational trends within a framework of appropriation of digital technologies as support and

mediation in the process. These documents made it possible to identify and categorize the most commonly used resources, which are described below.

- Mixed Reality: or XR Reality, this category within digital technology includes Virtual Reality, Augmented Reality and 360-degree environments, as well as immersive technologies. Seeking the interaction of users with digitally created environments, projecting itself as an alternative to recreate non-existent realities in some contexts.

- Hyper-automation: Software and digital automation tools that support autonomous learning, based on artificial intelligence that favors processes such as analyzing, designing and managing learning methodologies that involve the use of digital technology.

- Privacy and digital ethics: Associated with hyper-automation, seeking privacy and digital ethics to ensure safe educational processes on the network, focused on the user and their way of using the Internet. This is the origin of terms such as netiquette or information literacy.

Also in this review, documents were found that are derived from studies on the main trends of digital transformation in education developed by ESIC Business and Marketing School of Spain, through its Institute of Digital Economy and Coolhunting Group, highlighting emerging trends such as:

- Immersive Education, where it identifies how virtual, augmented and mixed reality is leveraged as tools for training.

- Hybrid Education, emphasizing the articulation of online and offline education, evidenced in synchronous and asynchronous communication tools that are used to achieve educational purposes.

- The New Generation School where personalized training or self-learning is favored based on technological advances where Artificial Intelligence is highlighted, promoting accessibility, usability and availability for the personalization of training.

- Tech Learning, as software developments are known, designing tools for learning, based on training plans.

- World Wide Learning (WWL), focused on the recognition of diversity and the promotion of integration and visibility of this, from technological resources for inclusive learning that reaches the heterogeneity of contexts of a territory.

- Blockchain for Educational Administration, which promotes the transformation in administrative processes for the attention of internal and external users (students, applicants, teachers and administrative staff) favoring administrative, pedagogical and financial management, for example in the generation and validation of certifications, taking into account the privacy and security of data.

This is evidenced in the observable contexts and in the target population of this research, who within their qualification process in virtual modality, and as a complement to the formative purpose must develop research projects from a problem or a need that arises in their area of influence or to seek the explanation to a phenomenon that is evident in their context and who resort to various applications or digital resources in order to support their qualification process and respond to the academic activities that in virtual mediation are used as mechanisms for the achievement of learning objectives.

The documents consulted also make it possible to identify future trends for teachers and students where, according to the International University of Valencia (Spain), "the roles of tutor and student will begin to be diluted in e-learning. The role of teachers is already changing and will change even more in the future, going from group directors to coordinators or moderators of diverse communities, with an expert level in Web 2.0 tools and the technological environment of virtual training, and not so much in the content to be taught." (https://www.universidadviu.com/principales-tendencias-del-e-learning/, n.d.).

As mentioned above, in order to strengthen the inquiry within this study, a survey was developed, which allowed reaffirming and delimiting the need of the innovation proposal projected for the accompaniment and direction of research projects in students who develop their qualification process in virtual modality in a framework of recognition of diversity within the digital era. For this case, in addition to the data provided by the survey, the clarifications or justifications of some questions that allow to expand the opinion of the participants are taken into account.

In response to some questions that suggested identifying the need to generate innovation proposals for training support in research as fundamental competencies of the teacher or educational agent, answers were obtained aimed at: An application that provides a timely and immediate response to concerns that may arise within the

scientific rigor demanded by the development of the project, but that in turn allows the strengthening of research skills to understand the approaches, paradigms, types and designs of research work. It should be noted that these issues are associated with questions such as: Do you think that research training can be supported by digital resources that guide the methodology of a research project? Do you think that research training for virtual mediation students immersed in different contexts and the accompaniment by advisors in the development of research projects can be mediated with technological resources? What aspects should be taken into account? These questions focus the interest in the need to identify or propose digital products that support the accompaniment of the qualification processes in the academic offers in virtual modality that allows the individual from his context to have a support with the immediacy he requires, to respond to the activities that as learning mechanisms are raised in order to achieve the expected results within the training process. Especially in the area of research training where the student formulates and develops a project during the course of his career, it is essential to have the permanent advice of an expert who, through formative feedback, directs the methodology, type and design that structures the research under development and accompanies him to achieve each of the proposed objectives, and that some variables such as connectivity, technological heterogeneity in the different territories and the availability of the advisor's time limit such accompaniment.

Another relevant aspect is that it generates experiences that are not possible in the classroom; opening possibilities of adaptation and pedagogical and didactic adaptation; it is adaptable to the needs and rhythms of learning. With respect to aspects that show insecurity regarding the articulation of technology with training purposes, there is a lack of knowledge of technological tools or lack of references that demonstrate their viability; there is no distrust towards technical resources, but rather the absence of these. Likewise, those surveyed expressed that such technologies that can contribute to research qualification have not yet had an impact on face-to-face education and the opportunity for a good effect at a distance or virtually implies investment, as well as permanent training.

It was also asked whether technology guaranteed accessibility and adaptability within a training process, obtaining opinions where most of them see accessibility as well as adaptability as possible and correct for the achievement of training purposes in different contexts with that inclusive look. On the other hand, the minority that does not see access and adaptability as favorable focus on arguments such as: "not everyone has access to education through the use of technologies"; "a universal design of accessibility has not been strengthened"; "a higher rate of use of these tools by teachers

should be achieved"; "they can be shown as facilitating but not guaranteeing"; "more will should be shown to make such accessibility possible". Regarding adaptability, arguments such as: "there may be a flexibility that does not necessarily denote adaptation"; "the number of experiences offered by technology implies a permanent and rigorous updating that is not always carried out"; "technological flexibility should address the different exclusion scenarios that are not always addressed in detail".

Another of the aspects investigated focuses the interest on the usability and availability of technology for the benefit of social and educational inclusion, obtaining a scenario with a prospective of hope based on the character of intermediation, functionality, dynamism and multimedia integration presented by technology. With answers that focus the discourse on: "technology should make possible important changes to achieve equity in social aspects, but this implies, in turn, a wide challenge both for those who manage and use the resources, as well as for technological progress itself"; "technology should meet many needs, especially those of inclusion, but resources, programs and policies should be available to facilitate the use of technology itself".

For this diagnostic and requirements information gathering stage, a questionnaire was also applied in order to identify the level of acceptance and relevance of generating a software application for methodological support in the development of research projects. Acceptability responses were obtained regarding the statements that refer to the research project as an essential process for the qualification of an education professional in training, expressing the need to develop competencies in research methodological foundation, where it requires a personalized accompaniment by a thematic and methodological advisor who focused on the explanation of phenomena that occur in the context of the student orients the methodological route that allows him to identify the reality that will be the subject of research, select the approach, paradigm, type and design from which the project will be approached.

On the other hand, in the statements referring to the participation of a software as a mediator in the accompaniment, the interviewees see positively the support of a tool that in addition to showing the different methodological routes, provides permanent feedback on the research process that is being developed and that in turn allows the automation of the feedback process, However, the interviewed population does not feel a certain fear regarding the academic quality of the products achieved with the support of the software, but by being embedded and articulated with the LMS where the training process is developed and the permanent interaction with the advisor is guaranteed, this risk is minimized and tends to research projects framed in times, spaces and conditions of quality required at the level of training of the students.

Table 1: *Perception survey on digital product acceptability*

The development of a research project is an essential process for the qualification of an education professional in training.	80%
An education professional in the process of training in virtual mediation needs to develop competencies in research methodological foundations.	82.9%
For the qualification process in research, the education professional in training requires personalized accompaniment by a thematic and methodological advisor.	62.9%
For the research qualification process of the education professional in training, research should be focused on the explanation of phenomena that occur in their context.	65.7%
For the research qualification process of the education professional in training process, research should focus on the search for alternative solutions to problems that occur in their context.	68.6%
The education professional in training process, for the development of his research project requires to have a methodological route that allows him to identify the reality that will be the object of research, to select the approach, paradigm, type and design from which his project will be approached.	85.7%
For the development of a research project by a researcher in training, the permanent accompaniment of a thematic advisor is required.	77.1%
For the development of a research project by a researcher in training, requires the permanent support of a methodological advisor.	90%
A virtual student, for the development of his research project, requires face-to-face accompaniment by his advisor.	54.3%
A virtual student, for the development of his research project, requires accompaniment in virtual mediation by his advisor.	65.7
An education professional in the process of training, for the development of his research project, requires a methodological route to guide his process.	96.2%
The education professional in training process, for the development of his research project can rely on a software that in addition to showing the different methodological routes, gives him permanent feedback on the research process that he is developing.	85.7%
The accompaniment and research methodological guidance for the development of a research project by an education professional in training process, can be developed through a software that automates the process.	60%
With a software application for research methodological accompaniment and guidance, the education professional in training process reaches the necessary	66.8%

competences for the development of research projects with the quality standards required by the scientific community.	
A software application for the accompaniment and direction in the development of research projects should handle a technical language, which allows the researcher in training to appropriate concepts and enrich discourses around science and technology.	81%
A software application for the accompaniment and direction in the development of social and educational research projects should handle a universal language, which allows researchers in training from different areas of knowledge to have clarity in concepts around science and technology.	81%
A software application for support and guidance in the development of social and educational research projects optimizes the interaction between teacher and student so that feedback through synchronous or asynchronous communication is more productive.	77.1%
A software application for support and guidance in the development of research projects should focus its applicability on automatic and personalized feedback, based on previous modeling by a methodological expert.	65.8%
A software application for research methodological support and guidance requires the automatic integration of information from other applications.	77.2%
A software application of accompaniment and research methodological guidance requires the integration of information entered directly by the student.	65.7%
A software application for research methodological support and guidance necessarily requires to be articulated with an LMS (Academic Platform) for its functionality and use.	74.2%
A software application for methodological support and guidance must articulate its operation with the LMS (platform) to deliver feedback information to the student.	82.9%
A software application for methodological support and guidance should deliver feedback information to the student through various output mechanisms (physical printing, storage devices or data transfer).	85.8%
A software application for methodological support and guidance of research should be used by subjects with previous research knowledge.	65.5%
A software application for research methodological support and guidance should be adapted to the needs and interaction requirements of different users.	82.8%
A software application for methodological support and guidance of research should allow different roles within the process.	71.4%

A software application for the accompaniment and methodological direction of research projects requires prior training by the end user, regardless of the role he/she plays in the process.	80%
A software application for the accompaniment and methodological direction of research projects requires the methodologist to permanently update the information provided to the student within the training process.	74.3%
A software application for the accompaniment and methodological direction of research projects requires permanent feedback from the end user, regardless of his role, in order to be updated.	77.2%
Un aplicativo de software para el acompañamiento y dirección metodológica de proyectos de investigación debe entregar documentación adicional (Instrumentos diligenciados, instrumentos analizados, conclusiones) al estudiante para facilitar su proceso	71.4%

Conclusions

The data obtained in the research and after the triangulation of the information, it was possible to identify the need to generate digital products that support and mediate the development of research proposals to students who are in different contexts, each with its particularities within a territory. Likewise, it is necessary to strengthen competencies in both the teacher and the student to enhance the virtues of digital technology as a mediator in the different processes within a formative purpose. From those that promote and facilitate synchronous and asynchronous communication (ICT), those that enhance learning processes and knowledge management (TAC), and those that privilege empowerment and participation in the knowledge society (TEP), as well as those that strengthen academic management in the processes of evaluation and validation of transcendence (TEV). Likewise, competencies related to the use of emerging digital resources such as artificial intelligence and resources supported by machin learning present an immediate response that allow the learner to approach realities that within their context require the immediacy of the process and that is necessary for the training process in which they are immersed, and that are associated with the particular field of disciplinary expertise, and in turn allow them to recognize the social context with particular historical needs and dynamics. A competence that takes great relevance to generate and strengthen in teachers and tutors is the ability to motivate students and encourage their curiosity, in addition to having the ability to adapt their knowledge to content on demand, which implies self-management to assimilate knowledge and see things in a much more dynamic way, so as to generate awareness of the

importance of giving visibility and exchange the processes of teaching practice through digital technology resources and media. Making the teaching role as a facilitator of learning, with less control over where and how the content-independent process is carried out.

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