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Research And Technological Innovation in The Development of Educators

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ABSTRACT
The process of change and recombination implies a transformation of the individual himself. It presupposes a change in attitude, understanding, and gradual transformation of educators. In addition to a deep theoretical background in the content they teach, they must demonstrate how these contents are applied to solve professional and personal problems: it is transmitting the past, building and anticipating the future. This article aims to demonstrate how, from a lifelong learning perspective, educational research and technological innovation provide essential avenues for producing knowledge and achieving desired changes. It becomes a process of action research and research in action, where technological innovation relies heavily on learning, participant training, learning by doing, and learning by interacting, among other avenues.
Where are we now? Where would we like to be in the future? Who are teachers and professors educating in the second decade of the 21st century? How are they, how do they think, how do they act, how do they perceive reality, and how do they express their feelings? What alternatives exist in the design of virtual learning environments, and how are information and communication technologies applied?
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I. INTRODUCTION

Currently, the dynamics of the rapid development and dissemination of knowledge, in which technological advances are used to solve individual and social problems for sustainable development, and the self-improvement of educators, allow us to consider and develop teaching and methodological projections, which should enable:

- The projection of a teaching and learning process based on change, transformation, constant movement, independent research, and the use of information and communication technologies.
- The development of a network of interpersonal relationships for collaboration and cooperation in group and team work, oriented toward the scientific solution of professional problems through the fulfillment of functions, closely related to the dynamics of the context in the relationship between human beings and technologies, where artificial intelligence plays an important role.

The current state of educator development is framed within a perspective where the essential thing is no longer the acquisition of vast amounts of knowledge but rather the ability to adapt to a constantly changing world, where the most important are the skills to search for information, analyze it, select the appropriate information, and apply it appropriately to each specific situation using the technologies available.

Therefore, all participants in continuing education must be aware of this reality if they want to carry out an optimal teaching and learning process that will help them meet the demands of reality. Therefore, the way we understand and practice teaching will no longer be the same, especially with the unstoppable integration of new technological tools that already permeate every aspect of our daily lives.

Currently, in the context of Higher Education in Cuba, distance learning (blended learning and virtual environments) is being implemented in the continuing education of educators, taking into account the scope and flexibility of this activity, particularly in postgraduate courses, diplomas, master's degrees, and/or specialties, as

well as doctoral training. Hence, the teaching and learning process requires skills and abilities to guide the student's learning process in a meaningful, creative, and innovative way, always open to every possibility of improvement and enhancement. It demands a permanent search, a search that only exists in the responsible act of the person carrying it out. More than a mere doing, it is a task, that is, when it is not dichotomized from reflection.

Therefore, the teaching and learning process in teacher training must be studied and researched from a projective perspective, which includes its design, implementation, and evaluation, and orients its results toward personal and social issues. This approach, starting from a diagnosed present and continuing education toward a desirable future, must recognize the multifaceted nature of interrelationships, as well as the heterogeneity of participants who face a dual learning challenge: that of mastering the content and that of the training modality itself.

Research and innovation in continuing education require professional systematization as a process that will increase teacher self-preparation. The purpose of this process is to promote self-management of knowledge and the creation of working conditions that allow for alternative solutions to professional problems and tasks. This enables personal and professional self-development through the fulfillment of their duties. This requires a critical interpretation and assessment of various experiences. The conception we hold is based on assessing the what, how, and why of the unity of theory and practice between research and technological innovation. We will begin with an analytical framework that enables a developmental teaching and learning process that truly transforms us and transforms us into better citizens every day. This is a strategically important action for the qualitative change in the work of educators, hence the objective of this article.

II. Materials And Methods

To achieve this objective, various qualitative research methods were applied, such as participant observation, bibliographical sources, interviews with educators and staff, and theoretical methods such as analysis-synthesis, modeling, and a systemic approach, among others. These methods allowed us to delve into the essence of the object of study: the development of educators through technological innovation.

DEVELOPMENT

Educator training has been heavily dependent on computer-based rationality linked to written text, but models closer to the integral sensibilities of images, multimedia, and audiovisual media will gradually prevail in contexts of horizontal human relations. This could, in the long term, change the ways in which people communicate regarding their training. There is a question that should guide the analysis and critical assessment of this issue: Who are and will be educated by 21st-century teachers? How are they, how do they think, how do they act, how do they perceive reality, and how do they express their feelings? Will distance education be possible if we do not understand the generation we are educating as citizens and professionals? Today, the level of visual or iconographic decoding is higher than in previous generations, which is why the rejection of more traditional modes of presentation is increasing. Technology and Innovation (T&I) are essential for achieving most integrated, flexible, rational, and indivisible goals and objectives, which also combine the three dimensions of sustainable development: economic, social, and environmental. These recognize that the expansion of Information and Communication Technologies (ICTs) and global interconnection offer great opportunities to accelerate human progress, overcome the digital divide, and develop knowledge societies. The same is true for scientific and technological innovation.

The concept of innovation refers to a new or improved product or process (or a combination of both) that differs significantly from previous products or processes and that has been made available to potential users (products) or put into use within the organization (process). Innovations are closely linked to science and technology, as they offer the knowledge and tools necessary to foster creativity and innovation in different areas.

Today, the interaction between science, technology, and innovation is essential for the progress and competitiveness of nations, as we live in a globalized and highly technological world. These three concepts form an indivisible triangle, which drives the advancement of society and contributes to the well-being of individuals.

Institutions that train educators face the challenge of providing training that prepares them for lifelong, problem-based learning that promotes creativity through curricula aligned with the national innovation system. Innovation relies heavily on learning, learning by doing, learning by interacting, among other avenues.

Consequently, being and wanting to be an educator implies critically and reflectively assessing pedagogical practice as the core of lifelong learning. This is the capacity that must be developed to discover the strengths, limitations, or ambivalences in the planning, execution, and control of one's pedagogical activity in different contexts, and to practice one's profession as a researcher of pedagogical theory and practice. This is recognized as the ability to identify and solve professional pedagogical problems using educational research

methods and the transformation of information into understanding of knowledge. Understanding is the ability to think and act flexibly based on what is known.

The rationale for practice as a permanent and constantly problematizing reality contributes to a new awareness among teachers, turning their work into a lever that fosters a new professional style: independent, reflective, and self-regulated. In short, it explores their everyday reality and fosters student teacher training, enabling them to become responsible protagonists of their own innovation and the transformations necessary to elevate the quality of the pedagogical process. It constitutes a superior process in the professional practice of ongoing self-improvement.

The application of this concept fosters in educators in continuing education the tenacity to achieve their goals, responsibility and self-demand, and the ability to mobilize and overcome difficulties.

1. Educator Training and Self-Transformation

Educator training and self-training lead us to reflect that, in order to think about the world, society, and ourselves, we must adopt the perspectives of others, of every other, with whom we coordinate our actions. There is no idea of a university without questioning and transformation.

Consequently, in the educator training process, participants must learn to contextualize their professional activity historically and socially, questioning the social significance of the content they transmit and the methods and forms they use within the context of current social relations. This means situating phenomena from the perspective of their historical and class development.

This constant contextualization of specific pedagogical situations fosters the development of skills that will allow students to engage in critical analysis to overcome the methodological challenges that arise in professional practice.

How can we achieve a training process that integrates these assumptions? Situational planning will be based on strategic planning, which is defined as:

A teaching resource that involves defining the actions of teachers and students based on the problematic situation or event to be overcome. It begins with the problem and intentionally promotes its scientific understanding and resolution, as they engage with the situation and recognize, promote, and address the needs and interests of the individuals involved in the specific situation.

Situational planning in teacher training based on participant observation involves the following phases:

- Conducting a situational assessment.
- Complementing and coordinating the teacher's expectations with those of the group in the specific reality of the professional problem to be solved.
- Prioritizing which aspects of concrete reality should be addressed, expressed in terms of the "choice of the professional problem."
- Choosing the professional problem.
- Formulating educational intentions.
- Problematization as a method requires revealing contradictions about the aspect of reality, which implies reaching its essence with certainty.
- Searching for new content, its connections, and relationships through research.
- Encouraging the reformulation of problems, which allows students to externalize their self-reflective, projective, and evaluative dimensions.

Situational planning is also open from a strategic perspective, as it begins with a problematic situation that becomes an object of knowledge, thus enabling the search for answers and alternatives to that problem. Situational planning itself is open to:

- The possibility of contextualizing the learners.
- The construction of knowledge.
- Real participation through feeling, doing, thinking, and creating.
- The development of free and polycausal thinking.
- Constant reflection on what is taught and how it is taught and learned.
- Scientific knowledge as content for decoding reality.
- Creativity as content for resolving everyday issues.

The planned activities should challenge all participants to:

- Reflect on their previous understanding and practice, including all the strengths, opportunities, and threats perceived in the context.
- The possibility that the "learned" content may not be sufficient or adequate to determine or resolve the problem that the context is demanding; to reformulate it, clarify it, or find other relationships.

- Develop models from a renewed perspective on reality, which respond directly and primarily to problems related to learning inside and outside of school as a single process and can serve as a "hard core" for new relationships and concepts.
- A profound transformation of their references, in order to function with them and develop progressively.
- Reconceptualize their conception of diagnosis and the dynamics of working with problems.
- Appreciate that the educational context is not only a starting point, nor the final result to be transformed, but rather a place where we rework conceptions that lead us to reformulate the new problems to be solved.

Hence, the professional problem can be considered as:

- The reflection in the professional's consciousness of a contradiction that stimulates the need to search for solutions.
- The recognition of a social need, which gives rise to the generation of new knowledge and solutions.
- The appropriation of the unity of socialization and the scientific-pedagogical culture.
- The creation of new knowledge collectively and individually.
- The development of critical thinking, through questioning opinions, a new perspective for understanding and explaining reality, as well as the critical reconstruction of the students' common knowledge.
- Learning through searching, action, and confrontation.
- The construction of meanings for everyday life.
- The interest and responsibility of participants in their learning, as well as the development of answers to the various questions that arise from the educational reality.
- Promoting a reflective and investigative attitude of professional self-improvement in the direction of the teaching-educational process.

The process should be conceived as a professional problem-solving project, centering reflection, research, and innovation in pedagogical theory and practice. The process combines theoretical and practical tasks in a system that prioritizes the logic of the profession.

The procedures for initiating reflection and monitoring learning actions should begin with reflection and questioning of the task (why is this activity necessary and how should it be done), assessment of the task-solving process (what thought and action processes did I follow to solve the task? What were the errors and achievements in the process? What should I do when planning my next activity to improve this process? How useful was the requested assistance?), assessment of the results, and reflection on their potential usefulness in professional life (what have I really learned?).

In this task-solving process, it is important to highlight how the student consciously and reflectively executes a series of essential actions in the teacher's professional practice, such as the following:

- Reflection and questioning of each of their actions
- The search for knowledge using different sources (school documentation, professional exchange, bibliography, among other aspects)
- Self-assessment and analysis of their capabilities and limitations to undertake the solution of a task.

Educator training requires participants to have skills related to the planning, control, and regulation of the independent learning process. Students must construct their own set of objectives and requirements within the framework of the guidelines offered, but from a completely individual approach.

In relation to the needs that arise, this will be the innovative response that must be given in the teaching-learning process, taking into account that these causes are not static and that in the advancement of society, each of them is in itself a dynamic system to which an innovative response must be given as the central core of the work of the teaching staff of an educational institution. Therefore, the development of learning strategies could contribute to improved performance in this learning modality, since in a distance learning environment, teachers face somewhat different conditions than in face-to-face training, with the challenge of providing more targeted and autonomous learning. Motivation and self-discipline also appear as important factors, since this modality involves less direct control over students (a role that requires students to incorporate their experience and knowledge).

Attention has been paid to and a series of actions have been planned aimed at enhancing learning through the development of three types of strategies—cognitive, metacognitive, and a—that participants can intentionally deploy for the teaching-learning process in which they are involved: the problematic situation they are trying to modify, which has all the richness of immediacy, where multiple intermittent and concurrent variables are present; the resistances they face in this situation to achieve change; the procedures used in the diagnostic and problem-defining phase of the research project, combined with their thought patterns, implicit theories, beliefs, and representational norms used by each of the participants.

How has the development and consolidation of research and technological innovations been evidenced as a tool that has contributed to educational development?

- Communities that take on challenges and constantly seek new ideas and ways to achieve greater development for educators, students, the institution itself, and the community. It is about recognizing the social-affective relationship.
- There is a desire to produce and change concepts, attitudes, and practices.
- Contradictions and confusion are considered part of the innovative process.
- Critical reflection processes are carried out to avoid falling into routine practices.
- There is openness to dialogue and contrast with other groups of educators.
- Critical reflection and systematization of the innovative process.
- Increased professionalism among educators, expressed in the relationships between being and wanting to be, transforming and undertaking innovation, and collaborating and cooperating.
- Among its members, there is a sense of "we," of being restless, curious, constantly questioning, of believing that the path is made by walking, and of gradually moving from a culture of complaining to one of undertaking transformation. Being consistent between what they think, say, and do.
- The development of innovations in educational institutions is not without problems, difficulties, and obstacles. Identifying them is vital to recognize that each institution is unique, and that solutions are also unique. However, their leaders should not only focus on their own context, but also on the regional and national context.

Why implement technological and other types of innovations in educational institutions?

Through our understanding of these many innovations, they help us understand ourselves and our circumstances, develop a way of acting that enables us to make decisions in life in general and in our professions specifically, understand where we come from and where we want to go, communicate, better understand what we already know, continue learning, and undertake transformation. They are a historical imperative, a hope for a better world, which leads to autonomy, which compels us to research, to have a point of view, and from there, to dialogue with others, making possible tomorrow what is impossible today.

Research and innovation processes constitute an ethical and aesthetic commitment that contributes to developing a consciousness-attitudinal approach capable of uniting the worlds of life, work, and the institution.

2. **Virtualization Trends in Professional Training**

The integration of Information and Communication Technologies (ICT) into the pedagogical model of professional training began in the 1970s, with the Open University (OU), Athabasca University (AU), and the National University of Distance Education (UNED) being the most prominent examples. Later, universities with a virtual-online model emerged, such as the Autonomous University of Barcelona (UAB) in the Balearic Islands, the Polytechnic University of Catalonia, the Agustino Neto University of Angola, the University of Havana, the ISPJAE (Spanish Institute of Technology and Communications), and the E.J. Varona and the University of Computer Sciences, as well as virtual universities such as the Open University of Catalonia (UOC), the Western Governors University (WGU), and the Cuban Science Network (CITMATEL).

The hybrid or mixed model corresponds to a bimodal education model consisting of the compatibility of in-person and virtual modes to flexibly adapt to the changing needs of the educational process. The in-person nature of traditional education and the virtual nature enabled by virtual education are neither incompatible nor mutually exclusive, but rather allow for different degrees of possible combination. Trends in virtualization in university education in Latin America and the Caribbean can be summarized as:

- Mass coverage
- Differentiation and regionalization of higher education institutions (HEIs)
- Curricular transformations
- New regulations and quality assurance
- Virtualization of teaching
- Continuing and postgraduate education
- Internationalization of higher education
- Commodification and diversification of funding sources
- Reforms of Higher Education Institutions (HEIs)

Among the current trends in virtual education, we can mention:

- Fragmentation of educational processes
- Resource balance
- Hybrid web-based modalities
- Global character/internationalization/alliances
- Mobility and ubiquity
- Complexity of assessments
- Dependence on the quality of technological options

• Changing roles of teachers and new pedagogical modalities
• Changes in the relationship: costs/coverage/quality.
• Expansion of virtual education as a new educational modality.
The pedagogical foundations can be summarized as:
• The role of the educator in the process of social transformation and the scientific foundation of pedagogy as an element of societal transformation.
• The link between the social environment and the pedagogical process and between its components.
• The notion of pedagogical-instrumental mediation is key to understanding the system of student-group-teacher-tutor relationships and the content-methodology-educational resources for virtualization.
This process of educational transformation entails, in the short and medium term:
• Redefining the work dynamic and redistributing the in- and out-of-class work (Flipped Classroom).
• Measuring, collecting, analyzing, and interpreting data with the aim of optimizing learning and its environment (Learning Analytics).
• 3D printing to develop creativity and innovation.
• Gamification to contribute to creativity, participation, critical thinking, decision-making, and establish an emotional experience.
• Activity tracking and measurement with real-time monitoring (Quantified Self).
• Combining formal and informal environments through virtual assistants.
• Teacher preparation
Implementing a virtualization model requires a strategy encompassing technological, social, and pedagogical dimensions so that the university community can embrace the conceptual dynamics and benefits of virtualization and its technology, as well as understand the potential of virtual educational resources for community building and online collaboration. This requires its various stakeholders to be trained in their new roles and to have the necessary physical, logical, and ICT service infrastructure, as well as contextualized educational resources.

3. Virtual environments for open, collaborative, contextualized, and interactive learning

Virtual teaching-learning environments (VLEs) are spaces for collaboration and exchange with restricted access, conceived and designed so that students, teachers, and groups who access them can develop and participate in processes of acquiring and establishing knowledge, skills, and values. They incorporate synchronous and asynchronous communication tools and integrate with virtual learning communities and social networks, leveraging the capabilities offered by the web. The main feature of this VLE is the creation of a space for interaction that accommodates all participants (managers, training support staff, teachers, and students) in the educational process within a virtual community. For Salinas (2007), a virtual teaching-learning environment is a space or community organized for the purpose of enabling user learning through certain components:
a) pedagogical aspects: this refers to learning activities, teaching situations, support materials, tutoring, teaching methodology, assessment, etc.;
b) appropriate technology, that is, the tools selected in connection with the pedagogical model; and
c) the organizational framework, which includes the organization of the space, the calendar, and community management, but also refers to the institutional framework and implementation strategies.
For Boneu (2007), there are four basic and essential characteristics that any e-learning platform should have: interactivity, flexibility, scalability, and standardization.
An educational resource system is essential for the effective virtualization of training processes. The following components characterize it:

- Learning objects
- Educational platforms or learning management systems
- Websites
- Content managers
- Databases and repositories
- Tools for:
- Communication
- Collaborative work
- Development and management of applications, educational resources in general, and learning objects in particular, collaborative and immersive 3D learning scenarios, mobile learning, for so-called emerging technologies, and others offered by WEB 2.0 and 3.0.

When selecting digital educational resources, their interactivity, flexibility, scalability, standardization, and cost-effectiveness must be taken into account. EVEAs generally include an institutional portal and a learning management system. The above calls for the improvement of the educators' self-preparation method to achieve a

permanent update of knowledge, the development of feelings and commitment to the activity they carry out and which poses new problems and demands that lead them to establish new goals and objectives that lead to a permanent process of searching, reflection and research, from technological innovation, where professional problems are identified, theorized and solved with a transformative approach.

III. CONCLUSIONS

In teacher training, innovation entails strengthening research that combines quality and relevance and, through this, the capacity to produce and circulate knowledge aligned with the needs and demands of society, productive sectors, and communities.

One of the major challenges in teacher training is to identify diverse sources of innovation, where contributions from significant research emerge, but also those from technical sources or those that emerge in the midst of a learning process, such as technical training or academic advancement.

Educators must understand that it is very difficult to stimulate change in others if we ourselves are not prepared to change. Openness to the exchange of experiences and good practices is one of the necessary conditions for the development of creativity.

The need for theoretical thinking (complex dialectics) as a central focus remains to be investigated, which is provided to some extent by the development of historical and critical thinking in teachers. Systems thinking alone is not enough. This would shift the approach to the necessary relationship between theory and practice, and between research and technological innovation in the educator training process.

The studies conducted serve as the basis for constructing a theoretical framework essential for a virtual training model. A strategy for virtualizing training, characterized by the use of an educational resource system and an EVE, is necessary for the incorporation of the virtual modality. The design of the EVE and the educational resources must correspond to the technological developments achieved.

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