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CURRENT SCIENTIFIC RESEARCH IN THE HUMANITIES AND SOCIAL SCIENCES CENTRAL ISSUES IN EDUCATIONAL RESEARCH

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Abstract

Philosophy of Science is a dense field that reflects on the nature and practice of Science, and is a formal way to represent scientific models. In this context, methodological complexities to research present an essential challenge to humanities practitioners wishing to engage in educational research. The humanities and social sciences, including in the field of education, continues to be transformed into the search for that ideal of quality and professional effectiveness that is aspired. Throughout its history, educational research has been able to accurately describe the phenomena of education. However, it has not achieved scientific goals that other academic disciplines have achieved, such as predicting, controlling or anticipating results. These positions have been the subject of debate in the philosophy of science, and have generated interesting, intense and controversial discussions in the search for scientific effectiveness. In this article we analyse six issues that educational research needs to solve in its search for scientific effectiveness and propose strategies to deal with them: (a) the need for a research model congruent to educational phenomena, (b) the need to strengthen non-experimental research designs to study causal relations, (c) the need for a pragmatic validity model in educational research, (d) the need for a generalization model in educational research, (e) the challenges of research-evaluate learning as an institutional product in an era of accountability, (f) the need for a model for educational research in a technological era.

Keywords: Philosophy of Science, educational research, scientific effectiveness, research methods, data reliability

1. Introduction

The challenges facing Philosophy of Science are vast, particularly in the current context of Humanities, Social sciences and education. At the beginning of the 21st century, the field of education continues to be transformed into the search for that ideal of quality and professional effectiveness that is aspired. Education is strengthened as an instrument of economic and social development to impact quality of life, in those countries that recognize it. The foundation of

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this search and of this transformation is the conviction that effective educational research is translated into a better education, a better profession and a better society. Since its inception, research in education has been a scientific challenge due to its complexity, amplitude and dynamism. Throughout its history, educational research has been able to accurately describe the phenomena of education. However, it has not achieved scientific goals that other academic disciplines have achieved, such as predicting, controlling or anticipating results. This has generated interesting, intense and controversial discussions in the search for that scientific effectiveness [1-6]. This earned the reputation during the 20th century of being an elusive science [7], complex and difficult to investigate [8]. In this paper we discuss six issues about educational research in a global era that emanate from the complexity of education. The issues are opposed visions between their members about how the practice of the profession should be. Issues emerge in times of change, when the profession must abandon its accepted practices, and adopt new ones to better respond to the society it serves. Unresolved issues produce stagnation and resolved issues allow the profession to develop. The objective of this paper is to review some issues of scientific effectiveness in educational research in a global era and present possible strategies to advance the subject in the practice of the profession. The work is organized into two sections: a) issues in educational research of the 21st century and, b) new frontiers in the search for scientific effectiveness.

2. Issues in educational research of the 21st century

2.1. The need for a research model congruent to educational phenomena

At the beginning of the 21st century it is understood that education is complex to investigate because it manifests characteristics such as the following: multidimensional, dynamic and non-static phenomena, multiplicity of relationships and variables that interact simultaneously, and causally and not always linear, occur in institutional contexts that affect the manifestation of educational phenomena, and in educational systems with complex and multilevel administrative structures that complicate the research work [3, 4, 9] Given the complexity of education, it is argued that educational research needs to identify a research model that helps it organize and define itself as a unique field of scientific research with its own identity. The issue is not about whether the research methods that we adopted from the Natural Sciences, Social Sciences and Humanities to perform research in education should be quantitative, qualitative or mixed, as discussed during the 20th century [2-5, 9, 10]. Educational research needs a theory that allows it to generate scientific knowledge about educational practices and their policies. The role of theory in education is to understand and explain to anticipate, control and predict. The application of all theory to an empirical instance implies the reflection of the event and the context that is studied to understand, help to construct and explain the research object and generate or build knowledge. The role of theory in

research is necessary in the emerging era of globalized educational policies where it is intended through standardized tests to digitize students. The use of theories to approach educational phenomena is imperative because they have to study in the context of the disciplines that seek to work with them. In the case of education, this means that a phenomenon cannot be described in isolation from other educational factors that surround it and that affect it in one way or another. The theories should help to understand inside and outside of an educational phenomenon and to link it with its past, present and future. Theories should help describe, explain or emancipate. Studying education involves managing the complicated, confusing, impure and uncertain of the phenomena that manifest in this profession. This may imply rejecting the current culture of the philosophies and methodologies that dominate the field. In an age of 'accountability', numbers and measurements seem to be the only means of generating data regardless of how the standardization of tests and curricula threatens the individuality of students [11]. You cannot study education only by looking at students. It is necessary to study students in relation to other students and the other components of education and society [12]. Educational research needs a more complex view of education, avoiding simplification, and better understanding the processes and contexts of education. At the beginning of the 21st century, several authors point to the theory of complexity, the philosophy of critical realism and relational philosophy as the possible platforms for organizing educational research and addressing the complexity of education [4, p. 15; 5; 9; 10; 13].

2.2. The need to strengthen non-experimental research designs

Non-experimental research design dominates educational research. However, it is experimental design that receives the most funding from federal funds in this era of accountability and evidence. To the extent that evidence plays a primary role in research with federal funds in the United States of America, and in turn in the formulation of educational policies, it is imperative to understand the role and effect of research design for generating data [14]. The possibility of an evidence-based practice captures the imagination of many politicians. The tendency to fund experimental research with federal funds in the United States of America, to generate evidence to guide the practice of education, began in the mid-1990s with the No Child Left Behind Act (NCLB). As a result, researchers and politicians ask complex and difficult questions of research designs. For example, what is the essence of knowledge that embraces this design? This question is different from the past questions of whether it is possible to believe in the findings of this study. The issue with the research design at the beginning of the 21st century is the in-depth reflection on the research practices, the methods used and the theories that are generated. This is the heart of the data validity. The political world wants studies that test theories and that confront educational reality to improve it. The experimental model with probability samples is considered in the political world as the research design

that allows achieving this ideal. This does not mean that other non-experimental research designs can contribute to that ideal of testing and validating knowledge to improve education [15].

According to Shavelson et al. [16], experimental design is a creative exercise that accompanies research management and that tests conjecture about evidence-based practice. The principles of this scientific research can be applied to the design of a non-experimental study as a process of generating knowledge, either to validate or to generate hypotheses. The challenge is that many non-experimental studies are designed to create innovative educational scenarios. A large amount of contemporary research is based on research and theories prior to educational scenarios. With these research and theories, we seek to trace the evolution of learning, as it occurs in the complexity and disorder of the classroom or schools. For these purposes, the predominance of the use of measurement tests is demonstrated, with the intention of generating theories about teaching and learning that contribute to developing tools to survive the practice of the profession. These researchers do not even reach a consensus in the terminology of their studies to establish their work. These researchers firmly believe that the proper study of the design can contribute to generate a culture of knowledge and evidence of scientific research [16]. Educational research is complex because it involves the immersion in multivariable scenarios aimed at producing or changing learning. Also, it involves institutional activities with teachers and students, and involves research designs to collect, understand and document these dynamics. The documentation may involve the use of video or audio recordings, of textual materials such as documents, interviews or questionnaires. These documents serve as the basis for the retrospective analysis of what has been studied. The other challenge in this process is to navigate in a systematic way by an extensive and longitudinal amount of data to reach and communicate rigorously what happened in the study and be able to make assertions with the information so that it can be replicated in practice. A large number of non-experimental educational research designs use the narration of situations that were studied to understand them in the institutional context and to communicate and justify the findings. On many occasions, the narratives are assumed as the truth even without the certainty of its truthfulness. This is why the design of the study must operate from a conceptual or theoretical framework that links the questions of the research with the methods, as the study is developed. In this way the correspondence from the design can focus on the discovery and the methods in the validation of the data.

The discussion of the phenomenon in the context of the theories used should facilitate its generalization among students, groups or classrooms [16]. This is possible if the following actions are considered: (1) *The design of non-experimental studies should conform with guidelines that allow generating valid and confirmable data***.** The research design should provide an understanding of the entire research process. The research process must respond to the following principles: "(a) pose significant questions that can be investigated empirically, (b) link research to relevant theory, (c) use methods that permit direct

investigation of the questions, (d) provide a coherent and explicit chain of reasoning, (e) attempt to yield findings that replicate and generalize across studies, and (f) disclose research data and methods to enable and encourage: this does not mean that all studies have to comply with all of these principles" [16]. (2) *The design should emanate from the research question***.** The objective of the research is to answer the questions and not to practice a particular research method [16, 17]. The three questions that should guide the educational research process are the following: (a) what happens in this situation? - Answering this question entails generating qualitative or quantitative descriptions. Ethnography, phenomenology, case studies, interviews and study of statistical samples can be used; (b) did an effect or impact occur? - This question requires studying a causal relationship that can be investigated with experimental or quasi-experimental designs. The generalization of findings can be tested and; (c) why or how did it happen? This question demands to understand causal agents and mechanisms in function. For this question, a study can be replicated to determine the generalization of findings and to understand better mechanisms and processes. (3) *The diversity of education questions demand a variety of research designs***.** To improve education, correlational and descriptive studies are also needed to identify variables and formulate theories that can be confirmed with the experiments [18, 19]. Longitudinal studies are needed where educational phenomena can be appreciated from a scientific, but more human perspective, than the traditional positivist view of reduction, causal explanation and prediction. The purpose of this recommendation is the need to understand and document phenomena, such as student learning, taking into consideration their wishes, beliefs, goals and the process of reasoning of students over a period of time. The best way to document this is through the narrated accounts. This allows capturing the sociocultural elements that form the behaviour of the students. This does not guarantee the certainty of the data that comes from the students or from the observations of the researchers [16].

2.3. The need for a pragmatic validity model in educational research

A scientific description is reached when the explanation of a phenomenon occurs and its manifestation is linked to facts. The scientific description takes the form of theory. The theory explains the phenomenon based on premises, principles, laws, hypotheses and evidence that lead to its acceptance or rejection [20, 21] According to Çakir [22] the notion of knowledge in education has been debated since 1980. As a consequence, the notion of the validity of knowledge also changed by debates in the philosophy of science, criticism of objectivity and epistemological debates related to knowledge. The methods to establish the validity of knowledge begin to vary according to the different paradigms of science that compete with each other. Each paradigm demands a different way of establishing the validity of knowledge. In the scientific culture of the 21st century, *objectivity* is defined as a method of acquiring knowledge based on reason and logic and in light of facts of reality. Modern social science seeks to

produce objective theories that can be challenged only in the light of data and evidence. The criterion for selecting one theory over another is the presence of data and evidence.

The theory of an objective knowledge emanates from the positivist philosophy, between 1920 and 1930. Between 1950 and 1960, it began to question the belief that research did not generate facts or that it was a mirror of external reality because all scientific observation is linked to culture and language. From this perspective, knowledge is a consent and communication act between individuals who decide to interact on the message. In this way, the foundation of objectivity is questioned by the position of knowledge relativism. *Relativism* questions the possibility of generating objective data if the researcher's observations are 'contaminated' or 'predetermined' by the theories he uses, his paradigm of the world or by his past experiences. From this perspective, any observation is questionable because of the possibility of being contaminated by the theory used by the researcher, the context from which it emanates and the language used to describe or explain it. Therefore, knowledge is influenced by culture and that makes it clear that there is no objective knowledge. With the historical study of science and the emergence of the sociology of knowledge, the theory of the relativity of knowledge has been strengthened. So, what does a valid scientific explanation mean?

The term validity tends to be used in educational research as trust in the inference that is generated from the data. Validity answers an essential question in research: Why should I trust the data of a study? [23] The concept of validity is used in education in many ways. Three theories on the validity of knowledge dominate [22]: (1) *Validity of correspondence* or when an explanation agrees with the phenomenon that is explained. This is the concept of validity that emerges with the positivist philosophy of reality and that dominates in educational research textbooks. From this perspective, the phenomena of education are explained as something objective and that exist independently of the human being. Regardless of the research approach to the phenomenon being studied, the researcher has to guarantee that correspondence between the data collected and the phenomenon studied to declare the validity of the data and propose reliable inferences - the correspondence validity in a product that is worked on and reached in the research process. (2) *Validity of coherence or logic***.** It is the validity that emerges in the light of asserting that something is true because it is deduced from other facts or observations that are understood to be valid. This type of validity is visible under the reliability concept when validated using statistical measuring instruments. (3) *Pragmatic validity***.** It is the validation of an observation in the light of a consequence. The consequences can be verified. Pragmatic validity is established in the relationship between an action and its consequence. If the action brings the expected result, a pragmatic validity is established. The concept of pragmatic validity in the field of educational research emerged in the mid-20th century, and it is gaining strength at the beginning of the 21st century in the face of the dynamism of educational phenomena. Pragmatic validity is observed more in the studies of mixed

methods where the research question becomes the motor of the investigative proceeding, and the richness of the data to answer the research questions becomes the core of the study. Pragmatic validity is also observed among qualitative researchers to handle the methodological plurality that is necessary when addressing the complexity of education [24, 25].

The concept of pragmatic validity in educational research emerges due to the weakness of statistics to explain the validity of a theory - concepts such as 'explanatory power' or 'control power' or 'error estimation' because they do not guarantee the validity or prediction potential of a theory. These concepts also do not establish the validity of the theory or its superiority over alternative theories. The concept of 'statistical power' failed to overcome concepts such as 'a logical explanation' or 'a simple and coherent explanation of a phenomenon'. In qualitative research emerges the work of Glasser and Strauss [26] on the development of field theories which becomes an alternative way of constructing and validating theories in the light of data and facts. The debate about the nature of knowledge between 1980 and the present brings into question the dominant concepts and the existing views on the validity of knowledge.

Since the essay by Cronbach & Meeh [27] on the problems of construct validity in the construction of measuring instruments in Psychology, the issue of validity has been more of a problem than a solution in the field of education. Validity is an epistemological 'issue' that methodologically is difficult to address. The quality and validity of the study is built in all the phases of a research and in considerations such as the decisions made by the researcher, in his interactions with the people he studies, and in the considerations that he inserts in the analysis, interpretation and presentation of data. There are no pure data, raw or without the contamination of thought or human actions. Neither the participants of a study nor the researchers are neutral because, whether they are aware or not when answering or asking questions or field observations, they bring to the research their cultural, historical and theoretical positions on the subject. With the data, the researchers make interpretations, and formulate assumptions and theories of the phenomena they study. These statements describe, interpret, reconstruct, criticize, predict or explain behaviours and educational phenomena. These statements connect the researchers' interpretation of the data and the phenomenon that was studied. It is for this reason that the validity of the study is constructed. It is for this reason that research reports pay close attention to the detailed description of the design and research methodology, and to the clear articulation of the relationship between the data and the assumptions made, as well as to the discussion of the strengths and the limitations of the study [28]. With the discussion of the complexity of education and its dynamic and evolutionary phenomena, the concept of correspondence validity forces educational researchers to seek that pragmatic validity in their studies. The conventional practices of educational research 'portray' the static aspects of the phenomena of education, but they do not validate them, and they need to be validated, as these educational phenomena manifest. For example, a teaching technique will never produce the same results or be stable because

educators can vary in their mood or because the personality of their various groups can be very different. Educational researchers need to track the effectiveness of the technique through its use in different groups and educational settings and on various occasions to determine its validity. This implies that all educational research must pursue two major objectives when studying a phenomenon: (a) the identification of knowledge about the phenomenon being studied, and (b) the validation of the knowledge it generates. The first objective is the description of the phenomenon and the second is its pragmatic validation.

2.4. The need for a generalization model in educational research

There is no universal definition of what generalization means. The dominant view of generalization seems to be to extend the data of a study to other people, situations, events or contexts [29, 30]. Generalization implies how much the data or the conclusion of a study is adapted to another particular situation. Generalization is considered the ultimate ideal of science because it implies the power to generate explanations and universal applications about the phenomena being studied [29]. Generalization is an interest pursued by institutions that sponsor educational research for the amount of funds that are invested in improving education. If research cannot be generalized between schools and individuals, it loses its scope and interest. If the findings of a study are not oriented to change the practice, only to describe the phenomenon under study, it is not necessary to generalize. If the study seeks to change the practice of the educator, then it is an effort to generalize [31]. Generalization is expressed in assertions of *X* event leads to a *Y* consequence and is observed in the research report on prescriptive assertions of how education should be. For example, if the student who reads daily increases his academic performance. Prescriptive assertions imply a causal relationship [29]. The requirement to formulate prescriptive assertions is the presence of evidence that supports the causal relationship. In educational research, four types of generalization are identified: (a) When a concept or idea moves from something particular to something general or common (e.g., classroom, school, pupil). (b) The inference that is made about the future based on the past. This generalization is associated with the works of David Hume. (c) Statistical or probability generalization where one moves from something specific to the general. This form of generalization is observed in large-scale investigations. (d) Move from a sample to the population. This is a form of statistical generalization. The most common generalization in education is statistical generalization [32]. Statistical generalization means identifying characteristics in the population, to study these in a sample and then generalize.

Several authors postulate that it is not possible to generalize in education and others establish that this is possible [29]. Generalization in education is problematic and an issue that some indicate should be addressed and others that it can be ignored [32]. Given the controversies of generalization in educational research, the question of why it continues as a topic of discussion and debate

emerges. The answer may lie in the following: (a) The absence of training in philosophy that occurs in training programs for educational researchers and that prevents them from recognizing the inaccessibility that results. (b) The clear presence of partisan politics and funds that have taken control over contemporary scientific research, and (c) the need for funds that educational researchers have and this surpasses their methodologies. The challenge is that no one explains the problems involved in continuing the search for generalization. For example, the problems of time, effort and connection with educational policies [32]. The problems of generalization can be organized into three categories: (a) *The conceptual problems of generalization***.** They emerge from the logical thinking model used to move from an observation to a generalization: the inductive model, the deductive model and the abductive model. All these modes of thinking to generalize have been criticized for being imperfect [32]. None of these models guarantees the certainty of a prediction or generalization. The scientific laws are based on past events and this does not guarantee their certainty when applied to the future. (b) *The methodological problems of generalization***.** Existing research designs are ways of generating knowledge. All research designs have limitations because they represent a limited way of generating knowledge [33]. Therefore, problems of generalization arise because the phenomena of education manifest a number of variables that interact simultaneously and because of the little information that exists of these variables. This makes statistical or probability generalization impossible. For example, if *X* teacher imparts the same module to two groups and the second group reacts differently to the module, it is assumed that it is because there are many variables that have not been identified, defined and measured in the comparison of the groups or because they have not been controlled [29]. (c) *The language problems of generalization***.** Generalization is communicated in the form of prescriptive and causal assertions. There is no consensus on what a prescriptive assertion means. For example, if you do *X* you produce *Y* or if A causes B. These statements should not be confused with causality. The prescriptive assertions are used to influence the behaviour of people. They come in the form of recommendations, advice or prescriptions of how things should be or should be done. Two themes emerge then, if possible the existence of causal relationships in education and what evidence is needed to establish the value of a generalization [32].

One way to deal with the issue of generalization is to address the issue in stages, with multiple methodologies and researchers, to meet the needs of formulating valid prescriptive assertions: (a) to compare groups appropriately, (b) demonstrate the consistency of the data through the replication of studies, (c) establish the relationship between interventions and results, and (d) eliminate alternative explanations [33]. To generalize, educational research must move to a three-phase model: (a) basic research, (b) development of the intervention to practice, and (c) validation of the intervention in practice. Each of these phases involves different activities and skills [34]. For example, in medicine, interventions are developed and validated in four-phase projects. Phase I tests

the treatment to determine the maximum dose tolerance, side effects, and safety considerations. Phase II collects data in a preliminary way about the efficacy and safety of the treatment. In Phase III, the previously developed and validated treatment is tested with a larger experimental group and compared with a control group under controlled conditions to determine its effectiveness. In Phase IV the intervention is monitored to identify secondary and unwanted effects before being presented to the public and marketed [30]. Finally, it is common in educational research to conclude the research report with recommendations to improve the practice. This practice should be discontinued because it is rarely possible to generalize with the findings of a single study and this includes large-scale studies. Research should be separated from the exercise of prescribing recommendations for practice (policies) [34].

2.5. The challenges of research-evaluate learning in an era of accountability

At the beginning of the 21st century, accountability for learning is a requirement that many governments around the world demand from their education systems in the interest of improving society and their quality of life [25, 35]. In the field of North American education, the concept of accountability is used in relation to the exercise that each educational institution must incur in generating data on the learning of its students and using these to improve the quality of education [25]. With accountability emerges a clearer understanding of the complexity of education and the challenges of promoting and determining learning as an institutional product [25]. In this context, educational research-evaluation has positioned itself as an instrument for rendering accounts and for determining the effectiveness of programs and educational institutions in promoting student learning [35]. Research-evaluation is defined as the use of research for the purposes of evaluating programs, policies, procedures and educational institutions [35, 36]. Research-evaluation has been a common theme in the field of educational research since the mid-20th century. At the beginning of the 21st century, there are more researchers who bring their research strategies to the evaluation of educational programs and institutions [35].

The objective of accountability is to evidence with data the effectiveness of educational institutions in promoting the learning of their students and their academic quality. This information is used to inform interested audiences in the educational institution, such as accrediting agencies, administrators, students, donors or companies that recruit graduates. The accountability exercise should provide data that can be used to determine the effectiveness of the academic programs, student services, or educational practices of the educational institution. An important political exercise in accountability is to demonstrate the academic success of students in relation to their fiscal cost and the public money they receive for its operation [25].

The movement of accountability began to take shape in the 1980s with the neo-liberal philosophies that entered public administration in many countries of the world. In the United States of North America, these philosophies reach

public education in the face of increasing concern with academic quality, the high costs of education and the importance of a well-educated workforce to enter a global and technological economy. The mechanisms for accountability in the field of education are implemented through *quality standards, accreditation standards and professional practice based on research and scientific evidence* [25]. Accountability brought to the discussion the complex, and at times difficult to differentiate, interrelationship between measurement, appraisal, evaluation and research of learning when talking about decision making and the evidence to be used for these purposes. Although many people in the field of education use these concepts as synonyms, there are others that do not because they claim that there are theoretical and practical differences between these concepts. The result of this discussion is the recognition that there is more than one mechanism to collect data on learning and that everyone contributes to decision making when improving education. Here emerges the recognition that the disciplines of measurement, assessment and evaluation have been distant from each other, and that there is a need to build bridges that connect this diversity of mechanisms to collect data on learning and thus improve the process of accountability [37].

Accountability for learning brings the attention into the complexity of educational institutions and the challenges faced by educational researchers-evaluators. For example, learning in an educational institution can be approached from different perspectives, such as learning that occurs in a classroom, learning that occurs in an academic program, or learning that occurs in student support services. For purposes of accountability, the call of the political world to administrators and educational researchers-evaluators is to determine learning as an institutional product [4, p. 14; 25]. Accountability for learning as an institutional product raises the following questions for educational investigators-evaluators: (a) what data is needed to understand learning, (b) what instruments should be used to collect data on learning, (c) who collects the data, (d) what procedures are used to collect the data, (e) how the data is interpreted, (f) who uses the data, (g) how the data is used, and (h) how the data is reported [19]. This in turn has propelled the interest in institutional research [35].

In North American education, there are three premises on "learning as an institutional product" that help educational investigators-evaluators to understand logic and procedures for purposes of institutional improvement and accountability [19]: (a) Learning is an institutional responsibility. Institutions must declare in their mission how they educate their students, (b) Learning is a shared responsibility among professors, students and administrators, and (c) Learning is an institutional intention. They need to have a mechanism of accountability and improvement of educational quality. The accountability movement brings to the discussion the social and psychological aspects of institutional learning. The social processes of learning are the activities that the institution adopts to socialize the student with the contents, values and skills that it aspires to develop. This implies the analysis of the structure used by the educational institution to provoke the students' learning and to develop them. The aspects that define the *learning structure* of an educational institution are

the curriculum, the academic and institutional policies that it uses, the support services it provides to the student and the educational philosophy that it adopts [25]. The psychological aspects of learning involve understanding how the student perceives and experiences the social processes of learning.

Three models dominate and translate the notions of learning into actions and into institutional data collection programs for accountability [25]: standardized testing programs, apprenticeship appraisal programs, and institutional research programs. Three approaches dominate the moment of explaining learning as an institutional product: explaining learning in terms of the value that the institution adds to the student (talent theory), explaining learning in terms of absolute performance (the number of successes or failures in a professional revalidation), or explain learning in terms of the cognitive development of the student (with what academic average they entered and graduated). The following four controversies highlight the complexity and challenges faced by educational researchers-evaluators in the task of measuring, evaluating and researching learning as an institutional product: (a) The relevance of current models of evaluation and evaluation of learning to the culture of educational institutions, (b) the absence of a common language about learning to be able to measure it and link evaluation data to accountability, (c) the issue of who makes the decisions to improve learning with the data of the evaluation, and (d) how the final report of learning appraisal should be for accountability.

2.6. Educational research in a technological era

The emergence of ICTs has generated a set of recent phenomena in education that need to be studied through innovative research models that respond to the challenge of analysing issues over which there are no precedents. Starting from the fact that they have been the result of the social transformations of the digital world, whose impact on education is undoubted, new teaching-learning typologies are related (*e*-learning, *b*-learning, *m*-learning, *u*-learning, *t* -learning, etc.) and new phenomena and concepts (digital backpack, podcasts, blogs, wikis, MOOC courses, digital divide, etc.) for which research and evaluation processes are required that combine practice with educational theory, in the search of its maximum effectiveness in the formative contexts of application. A change of paradigm in the investigation of these new educational phenomena must be carried out quickly so that, beyond its essentially didactic and instructive study, it contributes to offer answers to the knowledge of the digital postmodernism in which we find ourselves and its relation with education, as the main means for social improvement [38-40].

On the other hand, there is the new phenomenon of digitalization and its impact on educational research inclines research towards quantification. Is quantification the universal language of research in an economic knowledge? There is a need today for new models of educational research that respond to the complexity of the educational fact in today's society. The digitalization of information could seem an excellent way to use innovative methodologies and

more effective management of existing ones. Undoubtedly, quantification in educational research offers advantages and disadvantages, which must be studied and analysed. It is true that in too many cases, and far from being at the service of today's educational needs, it has been integrated into the dynamics of the publish or perish, centred basically within university contexts and far from the real educational practice from which the new paradigms of education [41-43]. Solutions must be offered to this present situation.

3. Conclusions - new frontiers in the search for scientific effectiveness

In this paper we argue that educational research needs a research model sensitive to the dynamic and multidimensional phenomena of education. Educational research needs a theory that organizes it and allows it to generate valid and generalizable data on education. At the beginning of the 21st century, the need to look at educational research as an international movement that shares common interests and related to the educational systems of the world is evident. Some examples of these related interests are student learning as an institutional product, identifying scientifically based teaching methods, developing educational policies based on research to eradicate partisan politics, the effect of education on the development of society, and the best methods to investigate education. These point out to the need for a north in educational research as an essential step in the search for scientific effectiveness. This north of scientific research in education has not been possible because educational research has been discussed dominantly in the context of the educational culture of the various countries around the world. A common north of educational research would direct various educational research efforts in the same direction. This would help to overcome the philosophical and methodological obstacles of the past and to respond to the transformations that education and educational research is experiencing in many countries in a global and technological era. This seems to us necessary in this historical moment where research-evaluation of learning as an institutional product emerges as an issue of scientific effectiveness in an era of accountability. Maybe in this way we can achieve a vision and a common model, or at least more uniform, on how to research education, what criteria we need to establish the validity and generalization of data, how to use technology in educational research and how train future generations of educational researchers. At this point, international educational research journals provide this platform to examine education and educational research as an international movement that connects educators and educational researchers from many countries in the search for that ideal of quality and scientific effectiveness, which does not it is limited to the education of the educational systems of our countries. Of course, this can be understood as another issue of scientific effectiveness.

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