

Introduction

The digital challenge in emerging mixed methods social research

El reto de la digitalización en las nuevas metodologías mixtas emergentes en investigación social

Guest-edited special issue:

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The ways in which we conduct social science research have evolved considerably in the last quarter of the 20th century and the initial decades of the 21st. The controversy between classical positivist and constructivist research perspectives has given way to multiple, diverse philosophical paradigms, which have led to the birth of new, more integrative forms of social science research. Mertens (2010), for example, proposes the existence of four main paradigms. Post-positivism has the ultimate goal of establishing general laws that describe universal relationships among a set of observable variables, and thereby contributing to theory development. Constructivism emphasizes the contextual meanings and meaningfulness that research participants construct about the social phenomenon being studied. Transformation advances a politically critical perspective of the existing distribution of power and wealth, and advocates actions that can advance social justice. Finally, in the pragmatic perspective, what is especially relevant is the contextual character of the phenomenon being studied rather than the methods and techniques for doing so. Other scholars have advanced forms of feminism, social critique, action research, and post-qualitative paradigms for social inquiry.

From this rich abundance of paradigms, in the last quarter of the last century emerged a different methodological standpoint that called for the use of more than one methodology and methods in the same study. This standpoint is called a mixed methods approach to social inquiry (Greene, et al. 1989). Within this emerging methodological framework, four primary purposes for mixing were originally derived from reviews of early mixed methods empirical studies. These purposes are:

- Convergence or Triangulation: Different methods are used to study the same phenomena. Similar results from the different methods afford a stronger argument for the validity of inferences.
- Complementarity: Diverse methods are used to study different facets or dimensions of a complex phenomenon, enabling an enriched, deeper, and broader understanding of the phenomenon at hand.
- Development: The results of a method stemming from one tradition are used to develop another method from a different tradition, where development is broadly construed to include sampling and implementation, along with instrument construction.
- Initiation: The mixed methods purpose of initiation legitimizes a space where the results from the different methods are actually dissonant or divergent. Figuring how and why this dissonance appeared can enable the discovery of paradoxes and contradictions, new perspectives on conceptual frameworks, and deeper understandings of the phenomena being studied.

Overall, a mixed methods approach to social inquiry is positioned to enrich the processes and products of research in Education and most other fields within the Social Sciences. In this sense, the improvement of the observer's viewpoint includes the use of mixed methods, featuring direct observations, participants, systematics; open and closed

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questionnaires, interviews, recordings – audio and video; and more.

Moreover, the integrated use of technology in the classroom has exponentially increased the capacity and possibilities of mixed methods research. Aspects such as the ubiquity of digital technology that, unconsciously on our part, collects information about our tastes, trends, purchases, movements/travel, and more, are facilitating action-oriented research processes more than ever. The emergence of new information sources and remote data collection have led to the possibility of developing new systems for systematic data collection in social processes mediated by digital technology. These technologies are also enabling the identification of interactions



among people, the processes of data recognition and interpretation, the generation of digital content - in the form of opinion or knowledge contribution - the display of the personal towards the public (private life/social life), and the dynamics of consumption, including the dynamics of movement and the displacement of people.

Specifically in the school setting, there are key dynamics of data collection related to the search processes a teacher performs in the design of his or her class, or the data sources that she/he uses for the formative assessment of student learning, facilitating new and organic ways to analyze what happens in a classroom.

In terms of research in educational environments, the use of mixed methods supported by technology helps to improve the observer's view. These improvements include access to multiple sources of data in various formats that allow them to better triangulate results; to complement visions of different actors and perspectives; to deepen and further develop more complex processes of analysis where one method can help another toward establishing more profound conclusions; to adapt their research to the complexity of human processes; and finally, to carry out analyses throughout processes of social life, which can complement and facilitate the analysis and understanding of linked and inter-dependent problems.

According to Hai-Jew (2015), the intrinsic complexity involved in understanding social and human problems, to which the classical experimental perspective can hardly provide an answer, has led to the development and spread of the use of mixed methods. These, in turn, have been enhanced by the use of technology, providing us with new ways of collecting information and data, as well as analyzing them.

Traditionally, some digital resources have been used for qualitative data analysis, such as NVivo, Atlas.ti, and MAXQDA. The assistance of this type of technology has made it possible not only to carry out a more in-depth and systematic analysis of qualitative data, but also to quantify the qualitative, thus making it possible to build bridges between different data sets and thereby also between previously conflicting paradigms. In current mixed method studies, it is common for researchers to develop multi-platform analysis processes, connecting NVivo or Atlas.ti with statistical analysis programs such as SPSS, ZAnalyze, or STATA. However, today's mixed methods studies not only leverage technology in the data analysis phase but also in the research design and data collection phases. On the one hand, web-tools such as Hopscotch (Jorrín-Abellán, 2019) assist researchers in the complex process of designing mixed methods studies offering, for example, the possibility of generating visual representations of the key elements

of a mixed design according to its typology. On the other hand, Web 2.0 tools enable researchers to carry out online discussion groups and interviews through the use of video conferencing systems, as well as the compilation and analysis of massive data sets (Big Data). Similarly, other approaches such as Social Network Analysis, which allows the collection and analysis of technology-mediated social interactions, or Science Mapping, which has revolutionized the process of generating literature reviews, have contributed enormously to the proliferation of mixed methods in the social sciences.

Mixed methods data analysis ideas and examples are in ample supply and offer considerable variety and creativity (Bazeley, 2013). Mixed methods data analysis is strengthened by careful and well-planned processes that help us to collect or select data, analyze the data, and build conclusions. Greene (2007) and Onwuegbuzie & Combs (2015) formulate different models with unique steps that describe and prescribe mixed methods data analysis processes. As an integrating compendium of the two previous models, we can establish the following four steps in data analysis in mixed-method studies: a) Establish systems of data cleaning and selection for the quantitative and the qualitative data, each one tailored to the particular quantitative or qualitative method used; b) Reduction and disposition of data; c) Data consolidation, and; d) Data integration.

These types of procedures have been the basis of the articles associated with this special issue which we now present.

The first article by Ramírez-Montoya and Lugo-Ocando offers a systematic literature review that analyzes 311 works published in Web of Science and Scopus databases, in which the use of mixed methods and digital technologies in the educational field are integrated. The analysis provided in this work allows a better understanding of the increase in publications related to educational innovation and the use of mixed methods, as well as the countless methodological possibilities for the study of educational innovations.

The aim of this article is to analyze the characteristics of these studies and the trends of new contributions to education. The authors achieve the identification of educational innovations that share features, and types of research designs that are very representative of such research on innovation. Furthermore, the use of the two main databases (WoS and Scopus) provides an important value to the general framework of the field in this work. It also allows us to present a number of shared strategies between the different experiences analyzed, which collectively signal this new way of conducting research.

The second article in this special issue presents Denia's work on the creation of a methodological algorithm designed to analyze sets of tweets and evaluate the impact of discourses on scientific topics on the Twitter social network. The relevance of this work lies in the use of data mining techniques, natural language processing, and social network analysis, all typical of Big Data. Previous methods could easily be used in social sciences and education studies, since they greatly facilitate the integration of traditionally qualitative techniques, with others of a quantitative experimental nature. More specifically, this article explains how these macro analytic strategies can be used in a straightforward manner in social and educational research, and how their joint use can greatly facilitate the integration of traditional qualitative techniques with quantitative experimentation.

The third article, the contribution of Salinas and De Benito, analyzes the defining characteristics of personal learning itineraries in technology-enriched environments, with the aim of improving learning experiences in initial teacher training. The study proposes an exploratory sequential mixed methods design, strongly supported by design-based research (DBR). The main contribution of this work is the development of a prototype of interchangeable structure of didactic sequences, in pre-service training teachers that allows the configuration of personalized learning itineraries by the students themselves, as well as the exchange and co-design of itineraries between different teachers.

The second and third works described above are solid representative examples of research that was based on technology or technological environments and that utilized a clear and defensible mixed design.

In the fourth work, Bonami focuses on one of the new research challenges that engages both Artificial Intelligence (AI) and Big Data. The analyses of technological spaces that have currently become the working support for the school, even more so in times of crisis such as that caused by the COVID-19, indicate that these spaces are fundamentally important to achieve quality teaching and learning. The analysis of the steps that students take when learning in blended and online scenarios, and the ways in which digital platforms can assist them to better learn using AI, makes it easier for us to understand how we build educational processes today.

And finally, the fifth article by Dagnino et al., is an example of how a mixed design enables the sequencing of different dynamics in the analysis of the technological training of teachers from a Learning Design (LD) perspective. This research shows how the analysis of a specific problematic reality, the barriers that a teacher encounters to carry

out a learning design with technology, are studied and analyzed. This work studies, through a mixed method design, the sensations, opinions, preconceptions, malfunctions of technology, as well as the difficulties that educational administrations represent for the teachers to carry out actions of educational change and technological adaptation.

To conclude this introduction, it is important to note that the works that make up this special issue are comprised of high quality and thoughtful instances of educational research. These provide examples of studies that can prompt and support our own meaningful engagement with the complexity of social and educational research. In schools, this process of research is helping to generate new ways of understanding the creation of technological resources, as well as to propose dynamics within and outside the classroom that have changed methodologies, ways of proceeding in didactic development, and of course new forms of assessment. This has also promoted a new way of investigating school processes, as well as social ones. Mainly, because the use of automatic information usually leads to quantitative order analyses that help, complement or converge with qualitative research processes.

These new ways of investigating educational issues have a light and a dark side. The light is reflected by the use of profuse data collection methods that serves to develop a process of analysis and interpretation of dynamics closer to reality. In other words it represents what in a “quasi-unconscious” way is carried out by people who participate in social processes of work, interaction, communication, collaboration, coordination, shared or group work, interdependencies, and social processes in digital networks. On the other hand, the loss of anonymity in social actions, therefore also in educational ones, opens up the intimidating possibility of observing human and social action from the position of the “Great Orwellian Brother,” in a way where the unconscious action of persons can serve to identify vital processes, intentions and human interactions that can be interpreted in a more profound but intrusive way than was usual before digital and technological development.

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