Multidimensionality of Digital Research in Educational Science

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ABSTRACT

The aim of this article is to review the concept of e-research and provide insight into the multidimensionality of technology-based research in educational science. First, existing theories that reflect different aspects of digital transformation in academic work were reviewed. Secondly, additional elements were proposed for writing the research methodology when conducting technology-based research in the educational sciences. Finally, a criteria tool was created to illustrate the idea of how some additional technological aspects could be included in technology-based research and/or e-research methodology. To illustrate the reviewed concepts in the context of educational sciences, each section is supplemented with examples of empirical studies, particularly paying attention to research methodology (i.e., research instruments, research procedure, data collection, etc.). In addition, the article touches upon aspects of researchers' digital literacy.

KEYWORDS

Digital Transformation, E-Research, E-Research Design, E-Researcher's Identity, Research Skills, Researcher's Digital Literacy, Methodology, Technology-Driven Research, Technology-Enhanced Research

INTRODUCTION

Technology-based research in such branches of science as physics, biological science, and computer science has become a typical routine. However, technologies have given impetus to the application of technological solutions in other areas of science as well (Fry & Schroeder, 2009), such as offering new opportunities for researchers in the social sciences and humanities (Rogers, 2013; Markauskaite & Reimann, 2014).

It has been observed that the amount of research conducted using the internet is increasing daily (Kilinç & Fırat, 2017). The large amount of data in the digital environment provides endless opportunities for researchers, educators, and students to raise new questions in new ways (Anderson & Kanuka, 2003; Jankowski, 2009). The variety of computer software and online tools available facilitate and speed up many stages of the research process, such as communication with respondents,

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data collection, data analysis, publication of results, and so forth (Genoni et al., 2009; Jankowski, 2009; O'Donnell & O'Donnell, 2019).

When it comes to technology in education science, it most often means research on technology-enhanced learning, such as interactive learning materials, gamification, and the use of advanced technologies (e.g., VR, AR) and their impact on self-directed learning, student motivation, learning achievements, and so forth. However, with the development of technology-enhanced learning, technology-enhanced research in the context of educational science has also received much attention (Hwang & Tsai, 2011). The aspect of e-research, and technology-based research in general, in the context of educational research methodology is the main research object of this article, which highlights the experience of educational scholars in implementing technological solutions to achieve their research goals. Therefore, this paper aims to review the concept of e-research and provide insight into how different technology-based methods are implemented in education science. To achieve this goal, the study mainly addresses the following research questions:

- RQ 1. What kind of educational research can be classified as e-research?
- RQ 2. What is the variety of technology-based research designs in educational studies?
- RQ 3. How can one achieve a more comprehensive description of technology-based research methodology?

To answer the research questions, the theories of Anderson and Kanuka (2003), Kozinets (2010), Shepherd and Watters (2002), Hughes (2000), and in *Developing New Products and Services* (2012) are reviewed, and their concepts rethought in the context of educational science. As a result of the analysis of theoretical sources, additional aspects are identified, as well as several useful definitions proposed to describe the technology-based research methodology. In order to demonstrate the findings in a more illustrative way, a criteria tool has been created that provides insight into concrete examples of how education researchers are using the internet and other technology solutions to improve their research methodology in educational science.

The Significance of the Study

Anderson and Kanuka's (2003) quote about 21st-century scholars stating, "It is too easy . . . to become seduced by the technology itself" (p. 31) is still as relevant today as it was two decades ago. Without a doubt, technologies suggest more practical solutions to existing approaches, such as providing the ability to collect data from "any part of the world, twenty-four hours a day and seven days a week" (Kilinç & Fırat, 2017, p. 1465). However, the new possibilities of digital media also require new additional conditions and raise new questions about how to succeed in effective, high-quality, and safe research. For example, questions about data quality and reliability, as well as additional ethical risks, become particularly relevant (Kilinç & Fırat, 2017). Moreover, such an "easy way to go" solution, in some cases, can lead to ineffective use of information and communication technology (ICT) in science by producing results that have little relevance or significance (Anderson & Kanuka, 2003). For example, widely used online surveys can give better results by providing a much larger sample for analysis and the opportunity for respondents to express their opinions more openly than via in-person communication. On the other hand, there is a risk of receiving invalid or misleading responses or responses without the possibility of the subject to clarify and explain the answers, which may result in the data being invalid (Kilinç & Fırat, 2017). In addition, reflecting the personal observations of the tendencies of academic work in recent years, it seems important to highlight the following aspect. Currently, anonymous online surveys that are distributed remotely, for example, through social media, have become very popular in educational science, as well as in social sciences in general. Such technological solution provides an opportunity to obtain more data in a faster time period. However, in this case, it would be the responsibility of the researcher to mention it in the methodology section, since face-to-face and remote surveys have different levels of reliability. If the

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