

Editorial

Challenges of experimental research in education

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To modernize the national system of education, to enhance teachers' excellence or even to change the direction of professional teaching activity, it is important to upgrade pedagogical science and provide its practical orientation. In this regard, there is a necessity to look differently at the role and methods of experimental research in education.

Accordingly, modern educator must fulfill the requirements of modern society; he/she be creative and learned, be able to analyze the experience and see prospects that means to be a researcher.

The existing views on experimental research are developed under conditions of functioning of stable or standard programme in the unified state school. But currently, institutional diversity and a wide range of teaching methods can be considered the most significant features of educational system.

These features suggest that pedagogical staff at the institution can design and implement their own educational technologies. Consequently, we observe a sharp increase in number of teaching approaches and methods within the educational process that leads to the explosive growth of pedagogical phenomena.

In addition, some transformations face education as a scientific field. According to Ponce & Pagán-Maldonado (2017) education in the 21st century possess the following characteristics and practices:

- ✓ Learning becomes more standardized to achieve the appropriate level of productivity and competencies among students;
- ✓ The changes within the educational system are really profound. Thus, education is not just a formal learning any more. Curriculum is getting more and more connected with real life or professional activity. A teacher is no longer a mediator between the educational material and learners. And assessment of learning outcomes is not oriented towards one learned.
- ✓ Education gets lifelong to keep up with the changes of modern society.
- ✓ Pedagogics is a unique, self-sufficient, and functional subject that is moving away from psychology.
- ✓ The 21st century calls for research-based education.

Naturally, this requires reconsideration and extensive use of experimental research.

Experimental research usually means verification of the effectiveness of teaching innovations such as new pedagogy, improved approaches or methods, curriculum, teaching resources, assessment schemes (Taber, 2019). Without a doubt, experimental research methods are the most potent tools for showing links between pedagogical phenomena and making conclusion with subsequent action assigned to introduce improvements and innovative transformations (Noethen & Alcazar, 2020).

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The relevance of experimental research is due to the existing controversies between new requirements to the experiment quality, on the one hand, and insufficient attention to formulation of methodological and theoretical aspects of the research under the modern conditions of educational development, on the other hand.

Additionally, we see a lot of research are devoted to the problems of methodology of experimental research and the procedure of the experiment. However, not many works describe the experiment as independent analysis or challenges facing researchers and practitioners.

We very much appreciate the findings of Taber (2019), Ponce & Pagán-Maldonado (2017), and Schanzenbach (2012) that describe the experimental research algorithm in detail and its limitations but they do not reveal the opportunities for development of pedagogical creativity and design of innovative experimental research avoiding existing challenges.

Pedagogical and scientific experience testifies that scholars may face a number of difficulties while carrying out the experimental research. They can be divided into objective and subjective. Objective difficulties are connected with the content of the experiment as a research method. Subjective difficulties, in turn, concern the activity of researchers who are involved in the experiment.

Other challenges may concern:

- ✓ Presentation of data and their systematization;
- ✓ Usage of methods of mathematical data processing to interpret the experimental results;
- ✓ Outlining of guidelines for improvement of the educational process of the basis of experimental findings;
- ✓ Description of software applied for humanitarian research, pedagogics in particular (for example, analysis of statistical software package like STATISTICA or STADIA) that enables appropriate evaluation of the data;
- ✓ Adequate presentation of methods and techniques of experimental research procedure (stages, classification of criteria, algorithm used for information collection);
- ✓ Analysis of statistical criteria (dependent or independent samples, recommendations for criteria selection);
- ✓ Design of the relevant sequence of the experiment;
- ✓ Realization of objective circumstances of the experimental research including the existing of a problem, usage of new research methods or technologies, need for new knowledge and skills being involved in the scientific activity;
- ✓ Determination of appropriate object and subject of the research;
- ✓ Conducting of comprehensive literature review;
- ✓ Selection of methodology for the experimental research;
- ✓ Formation of a hypothesis and identification of its significance level;
- ✓ Actual data collection;

- ✓ Results interpretation;
- ✓ Accepting of zero or alternative hypothesis;
- ✓ Formulation of scientific conclusions, development of recommendations on their basis;
- ✓ Correct and accurate publication of information about the experimental research conducted.

The purpose of experimental research in education is to develop innovations that refers to the following steps: substantiation, creation, approbation, verification, and implementation. Every step demands a researcher acting systematically, technologically, considering knowledge-based principles.

Besides, it is necessary to remember that innovation efficiency is always related to the certain context. And not all pedagogical innovations are valuable for the educational process even if they are proved empirically, theoretically, logically, methodologically, and statistically. It may happen that some innovations do not contribute to personality development of learners and occasionally may lead to loss of important components. In experimental research the identification of not essential innovations and the efforts for their introduction are called experiment quality risk.

Obviously, in such case, a good investigator should reject the proposed scientific decision and demonstrate ethics of experimental research.

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