

## Experimental Work Organization for Preparing Master's Degree Students for Research Activities

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### ABSTRACT

The paper describes the peculiarities of the experimental work organization to prepare master's degree students for research activities, and suggests a set of pedagogical conditions for this preparation under the conditions of the master program's educational process. To confirm the validity of the scientific theoretical assumptions, a plan is suggested with input and final diagnostics, intermediate tests, and several control and experimental groups. Master's degree students' preparedness for research activities was assessed by the following indicators: motivational-values attitude to the research, a set of research knowledge and skills and professionally significant personal qualities of the lecturer-researcher. Based on these indicators, three levels of master's degree students' preparedness for research activities were determined: reproductive, reproductive-creative and creative. The research determined that the master's degree students' reproductive level of preparedness for research activities is caused by insufficient attention, paid to this issue in the master's degree programs. The main solution to this problem is the implementation of the pedagogical conditions set to prepare master's degree students for research activities. The study showed the importance of the research results for the educational process of the master's degree course.

### KEYWORDS

Preparedness for research activities; master's degree student; experiment; pedagogical conditions; research activities

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## Introduction

Socioeconomic reformations, integration into the world higher education system, new values emergence and the education significance comprehension revealed a necessity of a new-type pedagogue, capable of implementing a research and science-based approach in the professional activity organization and being a

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competitive specialist (Kiel, 1987; Valeeva & Karimova, 2014). Therefore, the person's intellectual and moral development, based on his involvement in various independent activities in different fields of knowledge, may be considered the main developing education course (Grabes-Gissen, 1992; Chervova & Yaniuk, 2007).

Therefore, the preparedness for research at the master's course level becomes one of the most essential and systematically important components of professional training, since it is not only the goal, but also the means of efficient student personal development (Rabei, 1996).

The analysis of the chosen problem status in the theory and practice of higher education institutions determined the task for developing pedagogical conditions that will ensure the preparation of master's degree students during professional training (Danielewicz, 2014):

- the ability to search and independently learn new research methods, to change the scientific and scientific-practical profile, to change sociocultural conditions;
- the preparedness for active communication in the scientific, professional, and public fields of endeavor;
- the ability to use advanced modern theoretical and practical knowledge;
- the ability to use latest information technologies to independently acquire and efficiently use in practice new information, knowledge, and skills, including innovative fields, to expand their intellectual potential;
- the ability to easily demonstrate working skills in a research team, to generate new ideas, to maintain and develop their creative potential;
- the preparedness for conducting experiments and researches, objectively evaluating research results and implementing them.

The *pedagogical conditions* (Bransford, Brown & Cocking, 2000; Merzon et al., 2015) of efficient preparation for research activities (RA) are interpreted as a system of measures in the educational process organization for master's degree students' training that improves this process and allows achieving the desired result by more efficient means (Donovan & Pellegrino, 2003).

The authors proceed from the fact that a master's degree student's research work includes:

- research work throughout the semester;
- research practice;
- research seminar;
- preparation and publishing of research papers;
- preparation of a master's thesis.

Based on the scientific literature survey, the authors suggest the following pedagogical conditions:

- a) involvement of master's degree students in the informational-research environment at all stages of professional training;
- b) intensification of master's degree students' RA by using innovative educational technologies;

c) focusing master's degree students on self-education by actualizing self-knowledge, creating situations of success and entry into a reflexive position (Derman, 2008; Rudenko, 2015).

The objective of the research work is to form a master's degree student's ability to carry out professional activity in project management.

The master's training program has to prepare the graduates for the following types and tasks of professional research works:

- generalization and critical analysis of results, obtained by domestic and foreign scientists in a certain scientific knowledge field, relevant scientific problems discovery and formulation;

- substantiation of the relevance, theoretical and practical importance of the scientific research subject, plan and program drafting for the scientific research conduction;

- an independent research conduction in accordance with the drafted program;

- studied processes' theoretical models, phenomena and objects development;

- methods and means selection, empiric research instruments development, collection, processing, analysis, evaluation and interpretation of obtained research results;

- search for information on research projects and grants.

The confirmation of the suggested theoretical assumptions' scientific verity requires the special events organization for their practical use and verification (Maienschein, 1999). The most efficient solution to this problem is an experiment, since according to Y.K. Babanskiy (1989), the experiment allows artificially separating the studied phenomenon from the other, purposefully changing the pedagogical influence conditions on the subjects, and recreating individual studied pedagogical phenomena under approximately similar conditions.

Experimental work at universities demonstrates the efficiency of master's degree students' preparation for RAs under the specially designed pedagogical conditions' set (Middle States Commission on Higher Education, 2003).

In the author's opinion, the organizational support of such training involves changing the paradigms and methodological approaches to masters' degree students' professional training, allows students to learn the cooperation skills, develops tolerance and focus, organizes subject knowledge, allows developing an individual learning strategy, etc.

The professional pedagogic competence of a master's degree student is practically oriented, and acts as a systematic personal new formation that generates success motivation during the complex professional tasks solution. It is based on the integration of the motivational, cognitive and activity components, internal processes of self-education, self-organization, self-development, and personal growth (Stelma & Fay, 2014; Carril, Sanmamed & Sellés, 2013).

The experimental work organization model for preparing master's degree students for RAs includes: the objective – preparing master's degree students for RAs; the components of master's degree students' preparedness for RAs

(motivational-value, cognitive, operative-executive, creative) and their formation level criteria; means of preparing a future lecturer for professional activities, and the technology implementation stages during the master's degree students' preparation for RAs: adaptive-orientation (forming the research technologies ideas in the chosen specialty), cognitive-reflexive (forming prediction skills, drawing on personal researches), creative-productive (forming work systems organization skills with research means and technologies); the levels of a future pedagogue's preparedness for RAs: low, medium, high (Adam, 2012).

The "master's degree student's research activity" concept is interpreted as an active investigative attitude of a master's degree student to learn pedagogical phenomena, which consists of the motivational preparedness and intellectual abilities to master the pedagogical science as a theories' system in the education field; research technologies' mastering, independent research objectives' setting, new methods' invention and means of their achievement; various, including sudden, unpredicted research results obtainment and their subsequent use for learning purposes (Karsten et al., 2015).

The methodological structure substantiation of a master's degree student's RA was based on the fact, that:

a. the problems component includes the master's degree student's empirical facts discovery and contradictions in RAs;

b. the technological component consists of successive actions, aimed at implementing the activity system, the activity means and ways' selection, the activity system implementation;

c. the reflexive component implies self-evaluation and a master's degree student's evaluation of the implemented RA system, the possible need determination for its correction.

The purpose of this paper is to study the original academic course titled "Theoretical and Methodological Framework of Research Activity" effectiveness for master's degree students.

## Methods

The study was conducted using a theoretical and empirical methods' combination.

Theoretical methods: a) analysis of legal documents that regulate the master's degree courses' work with a view to substantiating the problem relevance and determining the legal possibilities for its solution; b) the historical-pedagogical analysis with a view to building the research problem historiography; c) the theoretical-methodological analysis allowed formulating the initial research positions; d) the conceptual-terminological analysis was used to describe the conceptual problem field; e) the systems' analysis laid the foundation for the problem comprehensive investigation.

Empirical methods: a) advanced pedagogical experience research and generalization in the training of masters' degree students; b) summative experiment to determine the initial level of master's degree students' preparedness for research; c) formative experiment for the developed model practical implementation and the conditions of its efficient functioning; d) observation, polling, testing.

The experiment took place in the educational process natural environment at the Kostanay State Pedagogical Institute master's course, and the A. Baitursynov Kostanay State University scientific and pedagogical master's course in 2012-2014. Its summative stage was aimed at the following objectives: to determine the experiment plan and to develop basic procedures for its implementation; to determine a representative selection of the experiment participants and the expert group members; to determine diagnostics methods that allow objectively assessing the master's degree students' preparedness level for RAs.

In order to conduct the experiment, the authors chose a plan with an input and final diagnostics, intermediate tests, and several experimental and control groups. This plan has sufficient validity and allows tracing the dynamics of changes by evaluated parameters.

The following indicators evaluated the level of master's degree students' preparedness to RA: motivational-values attitude to the research, a set of research knowledge and skills, and professionally significant personal lecturer-researcher qualities. Each indicator is described by its characterizing features. Based on the selected criteria and indicators, the authors determined three levels of master's degree students' preparedness for RA: reproductive, reproductive-creative, and creative.

Four groups were formed for the pedagogical experiment conduction: one control group (CG) and three experimental groups (EG-1, EG-2, EG-3). With each group the experiment took place for two years, and was conducted as follows: the control group was training using individual fragments of pedagogical conditions, without their purposeful use; in the experimental groups 1EG-1 2EG-1, 3EG-1 that were respectively involved in the experiment during the first and second year of its implementation, the first condition was implemented; in groups 1EG-2, 2EG-2, 3EG-2 – two conditions (the first and second one) were implemented; in groups 1EG-3 2EG-3, 3EG-3 – three conditions were implemented.

The work was carried out in three main areas, with each area accomplishing specific tasks.

*The first area* is associated with the formation of master's degree students' motivational-values attitude to RAs and incentives for active participation in research, as well as for the professionally significant personal qualities formation of a lecturer-researcher that are necessary for efficient independent RAs. Mastering research knowledge and skills takes place at the general methodological level, during the fundamental disciplines learning.

These problems solution in the experimental groups was carried out during the study of a special "Theoretical and methodological basics of RAs" course, fundamental disciplines, in the "School of Young students-scientists" work, and the drafting of self-education programs.

The leading role in this area of model implementation was played by the special "Theoretical and methodological basics of research" course that is aimed at both the satisfying student's educational needs, and improving the student's research culture, i.e. his research competence, forming a research position.

The special course consists of three modules: RAs' philosophical and methodological basics, RAs' technological aspect, professional and research

culture and ethics of a researcher. The course goal is to form master's degree students' general scientific-research knowledge and skills.

Classes were conducted in conversational-search mode, with the following methods application: micro-research, students' cooperation in micro-groups, and the project method. The used techniques included problem-motivational situations and action by analogy.

The compilation of self-education programs played an important role in the formation of the motivational-values attitude to researches. Such programs include the student individual work plan, and each student's portfolio compilation.

The individual plan drafting enables the student to choose individual educational courses, to clearly understand the content of the master's training, the consistency and volume of studied disciplines, their role and place in the training, their connection with his forthcoming researches (Millar, 2006). It should be noted that the preparation of an individual plan is an important psychological moment for a student. Being designed in accordance with individual peculiarities, it adds personal meaning and motivation to the student's process of learning.

The portfolio was applied as an opportunity for master's degree students to reflect on their own changes, to establish a connection between prior and new knowledge.

At the same time, works were also carried out at the school of young students-scientists. The purpose of the school of young students-scientists is to form significant personal qualities of the lecturer-researcher, aimed at self-education. During their training at the school of young students-scientists, master's degree students gain positive experience of researches, form professionally significant qualities of a lecturer-researcher.

Thus, the above organization laid the foundation for the master's degree students' formation of a motivational-values attitude to RAs, raising interest and positive attitude thereto, and aspiration to test their abilities.

*The second area* is associated with the formation of research knowledge and skills at the level of a specific scientific and pedagogical research. Studying the "Organization and planning of a pedagogical research" discipline is integral in this area.

With a view to expanding research knowledge specifically at the pedagogical level, the course was filled with new content that required master's degree students to apply the entire set of research knowledge, skills, to demonstrate a higher level of independence and creativity while studying this discipline. The content included:

- 1) The lecturer's development of set of research assignments – learning programs that reflect the main content of the learning process. This forms the students' thinking, and inspires learning.

- 2) The organization of classes by using innovative educational technologies.

The main goal of the lecturer was not to convey information, but to acquaint students with the objective contradictions of scientific knowledge and ways to eliminate them. In this case, the authors used specific questions to the audience, which created conditions for the emergence of alternatives. In order to ensure

the active participation of students in the lecture, the questions to the audience at the beginning of the lecture and further into it were aimed not at assessing knowledge, but rather at determining the students' opinions and their level of awareness regarding the considered problem, and the level of their preparedness for comprehending new material.

The research revealed the need for a systematic professional orientation and consulting of master's degree students, which would enable them to choose a line of research and the subject for the master's thesis:

- the master's degree students' training of scientific work skills, including the preparation and conduction of researches, writing research papers;
- training skills of working with information resources of scientific foundations, government authorities, and management of this or that organization that act as commissioning clients for research works;
- discussion of projects, scientific and research works of master's degree students;
- discussion of research papers, monographs, research results, regulatory documents within the scope of the master's thesis;
- development of master's degree students' skills of public speaking, scientific discussion, and presentation of research results.

At that, by analyzing their answers to questions, students independently come to the conclusions and generalizations that the lecturer has to inform them of; they understand the depth and importance of the problem under discussion, which, in turn, raises their interest in the material and the level of its comprehension. Thus, one is able to both convey useful information to students, and assure them of the necessity to accept it as a guide to action.

Dialogue-based involvement of the lecturer in communication with students was based on the following principles:

- a) The lecturer contacted the students as an interlocutor, rather than a "legislator".
- b) The lecturer not only accepted the student's right to a personal judgment, but also was interested in it.
- c) The communication with students was organized in such a way as to guide them towards independent conclusions, to make them partners in the process of training, searching for and finding ways of resolving contradictions.

In the last part of the class, the authors used small tests for this material, with the help of information technologies. This was aimed at controlling, and determining the level of understanding of the most important core provisions of methodological importance for further independent work. After every lecture, special home tasks in form of tables were given. Their independent performance helped reinforce the learned material. This technique provides a schematization and systematization of the material, which contributes to a more exact comprehension of information, development of research, critical thinking, and focuses on self-education. One of the ways of material systematization is the table, suggested by Donna Ogle.

*The third area* is aimed at practicing research skills at the level of mastering the knowledge and skills of scientific and pedagogical research procedures and techniques. At this stage, independent RAs are intensified. This

happens during the conduction of analytic-project-evaluative activities, during the pedagogical and research practices, during the scientific and research work for writing a master's thesis, and during the organization of extracurricular RAs.

These tasks are accomplished by:

- 1) Drafting programs for the organization of research, scientific, and pedagogical practices;
- 2) Compiling a "Scientific and pedagogical aspects of designing a master's thesis" guidance manual;
- 3) Organizing extracurricular research work.

### **Data, Analysis, and Results**

Research results indicate the importance of:

- master's degree students' learning of the methodology, technology, and instruments of RAs;
- master's degree students' learning of relevant scientific problems within the scope of their selected learning program;
- the need for training master's degree students' skills of academic work, including preparation and conduction of researches, and presentation of their results;
- the development master's degree students' skills of scientific discussion.

The results of the summative experiment showed an insufficient level of preparedness for RAs of the subjects from the control and experimental groups: from 88% to 94% of master's degree students were at the reproductive level, from 5% to 15% – at reproductive-creative level. No master's degree students with the creative level of preparedness to RAs were recorded.

The summative stage of the experiment proved that the preparedness for RAs is not a natural new formation; its creation requires special actions.

The master's degree students' predominantly reproductive level of preparedness for RAs is caused by insufficient attention, paid to this issue in the master's degree programs. The main solution to this problem is the implementation of the set of pedagogical conditions for preparing master's degree students for RAs.

The objectives of the formative stage of the experiment included the introduction of pedagogical conditions, the examination of the adequacy of selected conditions, the determination and analysis of changes in the subjects' level of preparedness for RAs.

Apart from the initial test, two intermediate and one final test were conducted during the experiment. The data obtained from the experimental work revealed a positive trend in the level of preparedness of master' degree students for RAs during the use of the set of pedagogical conditions that was developed by the authors.

Thus, the results of the final test confirmed the presence of the most significant positive dynamics in the experimental group, in which all three conditions were introduced. The dominant level of preparedness for RA is the creative one (68.42%); 31.58% of students were at the reproductive-creative level; no students with the reproductive level of preparedness were recorded. In the control group, the changes were less significant, which confirms the need to



implement the entire set of pedagogical conditions. The chi-square test and Student's t-test confirmed the significant importance of discrepancies between the two sets of data.

**Table 1.** The results of the chi-square test and Student's t-test for the level of master's degree students' preparedness for RAs (third test)

Compared groups	Experimental data						
	Chi-square	Significance level	X sample average		Dispersion		Student's t-test
CG and EG-1	4.312	0.10	3.56	4.22	0.17	0.06	2.21*
CG and EG-2	7.413	0.03	3.56	5.34	0.17	0.04	2.24*
CG and EG-3	13.673	0.01	3.56	5.97	0.17	0.03	2.051*
EG-1 and EG-2	1.491	0.45	4.22	5.34	0.06	0.04	2.26*
EG-1 and EG-3	3.359	0.15	4.22	5.97	0.06	0.03	2.31*
EG-2 and EG-3	1.164	0.54	5.34	5.97	0.04	0.03	2.14*

Table 1 shows that the chi-square values during the comparison of the control and experimental groups is very low (CG and EG-3) – 0.001 or low (CG and EG-2) – 0.03, consequently, the experimental data refute the null hypothesis; therefore, the alternative one is accepted. The results of comparing EG-1 and EG-3 show that the alternative hypothesis can be accepted at the significance level of 0.15. The ranking of master's degree students by their level of preparedness for RAs in these groups is different. Therefore, one can conclude that the use of the entire set of determined conditions yields better results than the use of one or two of said conditions.

As the table shows, there was a significant increase in the average values at all tests in EG-1, EG-2, EG-3, but the greatest increase was observed in EG-3 (from 3.59 to 5.97). Changes in CG were insignificant. Dispersion value in CG during third test increased, compared to initial test. The increase in the dispersion in CG indicates that there is a large spread of data. EG-1 and EG-2 showed an increase in the average values and reduction of dispersion, which indicates a high level of preparedness for research. However, the greatest change occurred in EG-3, where the structural-functional model was implemented with all three specially created conditions. In addition to the positive increase in the average values, there was a significant reduction of dispersion values, i.e. the increase concerned both the average score of the group, and the number of masters' degree students with a high level of preparedness for research. These findings are confirmed by the Student's t-test. Apart from these criteria, the authors calculated the coefficient of correlation between the indicators of preparedness for RAs at the initial and third tests with a view to identifying the interrelation and mutual influence of the indicators.

The results of the correlation coefficient in the experimental groups significantly increased, when compared to the summative stage, which indicates the positive mutual influence of preparedness indicators, i.e. as one indicator grows, the level of other indicators increases, too. Consequently, the formation of the motivational-values attitude to RAs positively affects the formation of the set of research knowledge and skills. As the motivational-values attitude to RAs increases, so does the level of formation of the set of research knowledge and skills. By analogy with the increase in the level of research knowledge and skills, the level of development of lecturer-researcher's personal qualities increases, too.

The selected research methods showed that the set of pedagogical conditions (involvement of master's degree students in the informational-research environment at all stages of professional training; intensification of master's degree students' RA by using innovative educational technologies; focusing master's degree students on self-education by actualizing self-knowledge, creating situations of success and entry into a reflexive position) is necessary and sufficient for the efficient preparation of master's degree students for RAs.

Therefore, the results of the formative experiment showed an increase in the level of master's degree students' preparedness for RAs in all groups. The discrepancy in the preparedness for RAs of students from the control group and the experimental group proves that the introduced pedagogical conditions, both individually and in complex, stimulate the formation of a research-level preparedness for RAs. The most significant changes occurred in the experimental group, where the entire set of pedagogical conditions was introduced. With a partial introduction of said conditions, the results were notably worse.

The processing of experimental chi-square data showed that the discrepancies in the efficiency of preparation for RAs are significant at the 0.05-0.10 significance level. The processing of experimental data by Student's t-test showed that the ranking of master's degree students by their level of preparedness for RAs is determined not by random factors, but by the implementation of the entire set of distinguished conditions, rather than their partial use. The results of the Pearson correlation analysis evidence a positive mutual influence of the indicators of preparedness for RAs, i.e. as one indicator grows, so do other indicators.

Thus, the correlation coefficient confirms the efficiency of the developed pedagogical conditions for preparing master's degree students for RAs.

## Discussion

The main objective of the experimental work was to test the suggested set of pedagogical conditions. The results of the summative stage of the experiment showed that the level of the master's degree course's preparation for RA was insufficient; therefore, it was necessary to introduce pedagogical conditions that ensured the efficient preparation of master's degree students' for independent research.

The goal and result of the master's degree students' preparation for RA is the said preparedness, which is an integrative, dynamically developing personal quality of a student that is characterized by the unity of motivational-targeted, content-operational, and evaluative-results component. The efficiency of the suggested pedagogical conditions can be evaluated, based on level of preparedness for RA.

The criteria for measuring the process of preparation for RAs under this experiment are motivational-values attitude to RAs, cognitive-operational and personal criteria. The indicators that determine the level of master's degree students' preparedness for RAs are the motivational-values attitude to RAs, the set of research knowledge and skills that are required to perform RAs, and professionally significant personal qualities of a lecturer-researcher.

Based on the criteria and features of master's degree students' preparedness for RA, three levels of preparedness were determined: algorithmic, interpretive, and research.

Experimental work for the implementation of efficient pedagogical conditions of preparing master's degree students for RAs was conducted in three areas, with each area accomplishing specific tasks. The first area was associated with the formation of students' motivational-values attitude to RAs, incentives for active participation in the research, and professionally significant personal qualities of the lecturer-researcher that are required for the conduction of an efficient independent research. Mastering of research knowledge and skills takes place at the general methodological level, during the learning of fundamental disciplines. The second area is associated to the formation of research knowledge and skills at the level of a specific scientific and pedagogical research. The third area is aimed at practicing research skills at the level of mastering the knowledge and skills of scientific and pedagogical research procedures and techniques.

The set of pedagogical conditions (involvement of master's degree students in the informational-research environment at all stages of professional training; intensification of master's degree students' RA by using innovative educational technologies; focusing master's degree students on self-education by actualizing self-knowledge, creating situations of success and entry into a reflexive position) is necessary and sufficient for the efficient preparation of master's degree students for RAs.

The paper discusses the effectiveness of the work program "Theoretical and Methodological Framework of Research Activity". Its uniqueness lies in the development of students' research activities regardless of their individual abilities, while V.A. Anisimova and A.A. Nain (2012) indicate that the student's research activities development is directly tied to his intuitive qualities and that this process is individual. Theory of V.A. Anisimova and A.A. Nain (2012) limits the production of RAs in the students' majority, unlike the program "Theoretical and Methodological Framework of Research Activity", which provides an integrated approach and offers the following tasks:

- 1) to form a system of master's degree students' knowledge of the methodology and logic of scientific researches, general philosophical, general scientific, and private methods;
- 2) acquaint master's degree students with the methods of working with information sources, with specific research techniques;
- 3) raise the master's degree students' interest in research ethics;
- 4) facilitate the formation of research skills, facilitate the formation of the ability to determine the subject, object, objective, and tasks of the research, to determine and substantiate its relevance, novelty, theoretical and practical importance, to hypothesize, rationalize and validate hypotheses, participate in scientific debates;
- 5) facilitate the formation of research skills of searching for efficient ways to solve specific research problems;

6) acquaint master's degree students with the requirements to the preparation of research papers and the most important aspects of preparing for its defense.

### Conclusion

The structure of the academic course titled "Theoretical and Methodological Framework of Research Activity" was presented; the pedagogical experiment stages that aimed to develop research competence were described; statistical results on the academic course effectiveness were presented.

The formative experiment results showed an increase in the level of master's degree students' preparedness for RAs in all groups. The discrepancy in the preparedness for RAs of students from the control group and the experimental group proves that the introduced pedagogical conditions, both individually and in complex, stimulate the research-level preparedness formation for RAs. The most significant changes occurred in the experimental group, where the entire set of pedagogical conditions was introduced. With a partial introduction, the results were notably worse. The results of experimental data showed that the discrepancies in the preparation efficiency for RAs are significant at the 0.05-0.10 significance level. The experimental data processing by Student's t-test showed that the master's degree students ranking by their preparedness level is determined not by random factors, but by the implementation of the entire set of distinguished conditions, rather than their partial use. The results of the person correlation analysis evidence a positive mutual indicators' influence of preparedness for RAs, i.e. as one indicator grows, so do other indicators.

Crucial methods of forming research competence are the following: the students' inclusion in the information and research environment at all stages of the master's degree course, RA stimulation by implementing innovative technologies in the learning process, and focus on self-education by creating a success situation. The formative stage results showed an increase in the research skills development in the experimental group. Statistical results prove the developed program effectiveness, since deviations were within 0.05-0.1.

This study confirms that the herein developed academic course titled "Theoretical and Methodological Framework of Research Activity" is effective; therefore, it can be used in higher educational institutions to develop research competence in master's degree students.

### Disclosure statement

There were no potential conflict of interest reported by the authors.

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