International Journal of Educational Management

Teaching activities in higher medical school: innovations and management features

Olga Mikhailovna Kolomiets, Tatijana Mikhailovna Litvinova,

Teaching activities in higher medical school: innovations and management features

Olga Mikhailovna Kolomiets and Tatijana Mikhailovna Litvinova
I M Sechenov First Moscow State Medical University, Moscow, Russian Federation

Received 21 November 2017
Revised 29 January 2018
16 March 2018
23 April 2018
Accepted 24 May 2018

Abstract

Purpose – The purpose of this paper is to reveal the essence of innovations and their application in teaching in connection with the student's educational outcomes.

Design/methodology/approach – The sample of the study consists of 588 third-year students of the I.M. Sechenov First Moscow State Medical University. The paper describes the use of innovations in teaching in the context of the competence-activity approach, which implements the psychological process of learning of social experience in the practice of education.

Findings – This paper reflects the content of a scientific research on a relevant topic in the field of modern education – the implementation of four innovations in teaching, the guarantee that each student masters the educational outcomes that meet the requirements of the Bologna Declaration to the quality of training of graduates and the development of competence-based education ideas. The paper presents the learning and professional activities that focus on constructing a mental image of educational outcomes in the student's mind and independent training that focus on automating the student's activity, with a view to solving the practical tasks of modeling socio-professional situations on the basis of the mental image in the mind.

Research limitations/implications – There are some limitations with this research. The sample is small and this makes broad generalization difficult. In total, 588 participants (both Russian and foreign) from 611 upper-year medical students of State Medical University were involved in research work. This may have functioned as a measurement ceiling. With that, all the proposed tools are universal. The authors tried to describe their specific in as much detail as possible. The findings are also consistent with the urgent publications of researchers in the field. Thus, the authors believe there will be no problems with their implementation in other medical universities.

Practical implications – The practical value of the study is that it shows medical university professors a model of teaching activities, which guarantees that each student achieves educational outcomes of the planned quality.

Originality/value – The authors propose new didactic means, which help to manage each student's activities according to individual educational trajectory.

Keywords Medical students, Educational management, Competence-activity approach, Innovative teaching, Psychological process of learning of social experience

Paper type Research paper

Introduction

Nowadays, one of the main goals of development of the educational system in any country is to ensure the quality of graduates (Plaksiy, 2012). One way of solving this problem in the pedagogical community is for teachers to consider the implementation of innovations in the educational process (Han *et al.*, 2013; Epstein, 2007; Peshkova and Samarina, 2018). However, their active use turned out to be inefficient. The analysis of the practice of application of innovative approaches, technologies, methods, ways, means and forms in medical education shows that they are incapable of providing a complete solution to the problem of high quality of students' educational outcomes (National doctrine of education development of the Russian Federation, 2000).

The authors report no conflicts of interest.

International Journal of Educational Management
Vol. 33 No. 4, 2019
pp. 651-662

0951-354X
DOI 10.1108/IJEM-11-2017-0323

The reasons behind this are as follows:

(1) the empirical "nature" of innovations, which are the result of teaching experience and are not meaningful from the perspective of psychological and pedagogical sciences (Van Melle *et al.*, 2014);

(2) the lack of conformity of the innovations to the psychological nature of a specific educational outcome that a student needs to master (Greeno, 2010); and

(3) the inadequacy of the essence of innovation to the process of students' learning of the educational material and their mastery of educational outcomes, which are psychological in nature (Maxwell and Blashki, 2016).

The implementation of the function of innovation as a powerful resource for providing social order in the medical educational system depends on the activities of the teacher, who is a key figure in the educational process of higher medical school (Bollag and Feletti, 1991; Marton *et al.*, 2015). The effectiveness of innovations is determined by their methodological framework, focus on the learner's educational outcomes and learning activities (Meats *et al.*, 2009).

One can note that the activity must be meaningful to the learner, and it is the nature of the learning outcome that makes it so. Learners must be interested in achieving the outcome, either because it reflects their own developmental goals, or because they see its place in a wider curriculum to which they have committed themselves (Beetham and Sharpe, 2013).

Mental models, scaffolding, mental scheme, melting, anchoring, tables, structural-logical schemes are regarded as an innovative concepts important for current educational development (Gagne, 2011). The study of their functions, structure and content allows concluding that they are merely illustrative examples of specific subject knowledge and certain "methodological instructions" developed by medical teachers. Scientific knowledge for learning is presented in the form of generalization in summative form, which the teacher chooses at his or her discretion. Therefore, they do not reflect the systemic foundations of the studied object (Epstein and Hundert, 2002). In addition, the activities, which the medical student has to master, are presented in the form of algorithms or a list of instructions, specific steps, tasks, etc. (Dreyfus, 2004). During the learning process, they are generally conveyed to the learner while requiring their awareness and understanding (Walpole *et al.*, 2017); their use causes certain difficulties and mistakes in the educational process; they do not provide each medical student with an accurate, quick, deliberate organization of his or her activities (de Bruin, 2010).

One area where affective outcomes are now openly and successfully sought is health sciences. Doctors, nurses and health-related professionals are trained to heal but their training also seeks to ensure that they display caring attitudes towards their patients. Educating professionals to care involves setting learning outcomes that include affective attributes and using appropriate and effective assessment practices (Howe, 2003; Shephard, 2008).

The aim of this research was to determine the general effectiveness of the use in the educational process of a number of innovations that would improve the quality of medical students' educational outcomes. The main hypothesis was as follows:

H1. The content of the teacher's professional activities in the structure of teaching should correspond to the psychological process of learning.

The first innovation was an organization and management by a lecturer the student's theoretical, educational-research activity for the study of scientific information and the formation of subjective knowledge in individual "indicative schemes" on the basis of general scientific methods (system-activity, system analysis and system synthesis). The next innovation was aimed at construction of a mental image of educational outcomes (that were

"visualized" in the individual indicative schemes) in the student's mind on the base of step-by-step learning-professional activities of each student. An important innovation aimed at the development of students "professional thinking, his mental activity was the organization and management of the process of learning of structural stages and components of the content of each type of professional activity (in the structure of educational outcomes), in accordance with its psychological structure and content. Last innovation implemented in our research was aimed at automating the students" activity for the solution of practical tasks and developing their practical skills based on the mental image in their minds.

Methods

The top-priority problem in the studies of foreign authors in the field of medical education is to ensure the quality of students' educational outcomes in the learning process. Scientists directly associate the solution of this problem with the development of a teacher's professional activities (Greeno, 2010), new educational technologies (Kirschner *et al.*, 2007) and training materials in the educational process (Posner and Keele, 2003).

The cultural-historical theory of social experience assimilation was used to determine the content of four innovations in teaching activities and implement the principle of natural law in education – the student's educational–professional activity should correspond to the psychological nature of learning. The formation of the psyche in its indicative function determines the efficiency of any human activity, which is mediated by psychic reflection, the real function of which is that it orients the subject in the objective world (Leont'ev, 2004). The psyche is the subjective image of the objective world, which is formed through active activity of the subject as opposed to passive reception of information through explanation or information conveyance. The brain is a natural prerequisite of the psyche, since it carries out the physiological processes of reflection, but does not form its psychological content (Vygotsky, 1982).

The teacher's understanding of the psyche as an indicative activity allows him or her to organize the learning of medical educational material without relying on his or her inherent abilities and current level of development. The teacher's understanding of the psyche allows him or her to organize learning through purposeful development of his or her ability to construct an indicative activity, which is then automated and transformed into a mental image that focuses the students on their practical activities (Kolomiets, 2016).

One of the main research tasks was to develop psycho-didactic means to control the vocational activity of each student on an individual educational path: indicative schemes collection of a student specialized in a certain field; student's training notebook on a certain discipline; logical tasks collection; educational–professional assignments collection; teacher's manual for student's research activity organization on a certain topic/discipline, etc. (Kolomiets, 2016). The teachers organized learning activities with the use of innovative technologies for third-year students (588 persons) majoring in pharmacology at classes during one semester at the I.M. Sechenov First Moscow State Medical University. The sample cannot be considered random, since we have focused on senior students who are most involved in practical classes.

The organization and management of learning-research activity (LRA) were organized on the base of the technology of organization of LRA at lectures with following didactic means (on electronic media): student's training notebook with the program of LRA detailed in structure and complete in content, ensuring that each student achieved the same results; teacher's manual for the organization of student's learning-research activities on discipline (containing normative examples of accomplishment of learning-research tasks); collection of individual indicative schemes "Students" educational outcomes on discipline "pharmacology."

In accordance with the technology of organization of LRA, the following actions were as follows (see the below list).

The steps of organization of LRA:

(1) To determine the motive of LRA.

(2) To conduct self-organization of the LRA through the following operations:
   - to define the aims and tasks of the LRA;
   - to determine the subject of the LRA;
   - to select methods and means of implementation of the LRA; and
   - to choose the forms of materialization of LRA product.

(3) To implement the LRA through the following operations:
   - to pick out the knowledge elements that constitute the content of the educational outcomes from the educational and scientific material;
   - to process the knowledge elements (compression, generalization, grouping, classification, establishment of links, creation of definitions, etc.); and
   - to express them with scientific semiotic means.

(4) To conduct self-monitoring, self-evaluation, and self-correction of the LRA on the basis of the Teacher's manual for the organization of students' learning-research activities on discipline "pharmacology" containing the normative examples of solution of learning-research tasks (on electronic media), using a single educational portal or e-mail.

(5) To summarize the knowledge elements in terms of technology and methods by which they were obtained, and systematize them the form of indicative tables and indicative maps in the Collection of individual indicative schemes "Students" educational outcomes on discipline "pharmacology".

(6) To conduct self-monitoring, self-evaluation, and self-correction of the content of the Collection of individual indicative schemes on the basis of the Collection of didactic indicative schemes "Design of students" educational outcomes on discipline "pharmacology," made by the teacher, containing regulatory indicative schemes, indicative tables and maps (on electronic media), using a single educational portal.

(7) To reveal the content of the planned characteristics of the educational results and assessment scales and to construct indicative schemes.

(8) To show the system of subjective knowledge that constitutes the structure and content of educational outcomes (based on the Collection of individual indicative schemes "Students" educational outcomes on discipline "pharmacology").

(9) To perform reflection of the student's LRA – to assess the conformity of its product to the student's goal.

The management of system organization of subject knowledge in individual indicative schemes by each student was organized on the base of the method of system synthesis. The elements of knowledge about an object were systematized in indicative tables and elements of knowledge about various activities of the same type were systematized in one invariant indicative map with following didactic means: collection of individual indicative schemes "Students" educational outcomes on discipline "pharmacology."

The process of mastering by students the professional activities (incoming along with system knowledge in the content of educational outcomes) and the development of their professional thinking was organized based on procedures of system-activity method in accordance with which the structural stages and components of the content of each professional activity were as follows (Kolomiets, 2016) (see the below list).

The procedures of system-activity method:

(1) at the motivational stage to determine what the subject of activity needed to do, since any activity was a human activity aimed at satisfying his or her needs;

(2) at the indicative stage to analyze the conditions of implementation of future activities, to select the "known," "hidden," and "required" conditions; to set aims based on the "required" conditions; to establish links between the "known," "hidden" and "required" conditions;

(3) at the planning stage to plan technologies and methods of implementation of the activity, the means and forms of its organization; the selection of knowledge due to be used during the implementation of activities;

(4) at the performance stage to implement the planned activity;

(5) at the evaluation stage to carry out self-control activity to identify mistakes;

(6) at the self-assessment stage to assess mistakes to show the reasons behind the mistakes and their nature;

(7) at the self-correction stage to correct mistakes; and

(8) at the reflection stage to evaluate the compliance of the resulting product of the activity to the aim of its subject and the result of the activity to the motive of its subject.

Direct control over the educational–professional activity of each medical student on an individual educational trajectory was organized by means of psycho-didactic tools (Leont'ev, 2004) that had been developed by teachers of histology, pathology, pharmacy, pharmacology, obstetrics and gynecology, endocrinology, phthisiology, anesthesiology and resuscitation, cardiology, internal diseases, etc., under the direction of O. Kolomiets, the author of the competence-activity approach in education (Kolomiets *et al.*, 2014).

It must be said that there are some limitations with this research. Our sample is not quite large, and this makes broad generalization difficult. In total, 588 participants (both Russian and foreign) from 611 upper-year medical students of State Medical University were involved in research work. This may have functioned as a measurement ceiling. With that, all the proposed tools are universal. We tried to describe their specific in as much detail as possible. Our findings are also consistent with the urgent publications of researchers in the field. Thus, we believe there will be no problems with their implementation in other medical universities.

Results

The individual masters social experience during the educational process in the universal form of theoretical activity, in which the student learns not only the object of study, but also methods, means, forms, and other conditions of theoretical activity, i.e. its methodological tools (Reshetova, 2002). In order to do so, it is necessary first to organize the construction of the "image" of the object, which materializes in the form of an "individual indicative scheme" (Kolomiets, 2016), which subsequently "is transplanted" into the internal, mental plan of the student, as "[…] the ideal is nothing but the material world reflected into the human head and transformed in it" (Marx, 1983).

Later on, during the process of exteriorization, this image performs the indicative function in relation to students' practical activities, since "all human activity is mediated by psychic reflection of reality, the function of which is that it orients the subject in the objective world" (Leont'ev, 2004). The student uses the mental image in his or her further practical activities, which becomes a tool for this activity during the process of exteriorization.

Thus, the mastering of educational results by the student in accordance with the psychological nature of learning is carried out first at the stage of interiorization and then at the stage of exteriorization.

Interiorization stage

The first innovation we used in the educational process was the organization of the students' LRA. Its function was to implement the first stage of the process of interiorization. It was aimed at forming the system of the student's subjective knowledge about the structure, content, and characteristics of educational outcomes. Therefore, the subject of the student's LRA was only the objective content of the scientific knowledge about a specific subject area, which was the structure and content of educational outcomes.

In accordance with the requirements of the process of interiorization, the students' LRA and systematizing of knowledge elements could be performed in the material or materialized form; loud socialized speech, "speech to oneself," inner speech, and written speech (Kolomiets, 2016). At first, the students' activity could be a joint activity of the teacher and students at a training session. Then the student could perform his or her activities individually using the internet, a comprehensive educational portal, and e-mail. The didactic means (on electronic media) for the organization and management of LRA were as follows: student's training notebook with the Program of LRA detailed in structure and complete in content, ensuring that each student achieved the same results; teacher's manual for the organization of student's LRA on discipline (containing normative examples of accomplishment of learning-research tasks).

Using of indicative map

The second innovation that was used in the educational process was the organization of subject knowledge in individual indicative schemes. It was based on the system synthesis method of the elements of knowledge about an object in indicative tables and elements of knowledge about various activities of the same type in one invariant indicative map. Each student could create indicative tables that established internal system links between knowledge elements that promoted the formation of his or her systemic view of the object under consideration and the development of system thinking. Knowledge about the structure and content of the activity that is used for solving various practical problems of the same type was systematized in one indicative map. The number of indicative maps was determined by the number of invariant activities.

The content of each indicative map created by a student represented the universal model of the activity. At the motivational stage, the learner determined for him- or herself what he or she needed to do, since any activity was a human activity aimed at satisfying his or her needs. At the indicative stage, it was necessary to analyze the conditions of implementation of future activities, to select the "known," "hidden," and "required" conditions. The students set their aims based on the "required" conditions. After that, the subject was determined by establishing links between the "known," "hidden" and "required" conditions.

The planning stage included the planning of technologies and methods of implementation of the activity, the means and forms of its organization. It also included the selection of knowledge due to be used during the implementation of activities. At the performance stage, the planned activity was implemented. At the evaluation stage, self-control activity was carried out to identify mistakes, which were assessed at the self-assessment stage. It showed the reasons behind the mistakes and their nature. The errors were corrected at the self-correction stage. The last stage was reflection, where the compliance of the resulting product of the activity to the aim of its subject and the result of the activity to the motive of its subject were evaluated.

The indicative map represented all the structural stages of human activity, linked and arranged in a sequence: aim, object, technology, method, way, means, form, actions and operations, product and result. Each of them performed a specific function, had a specific place within the activities, and was connected with other components via links. Thus, the indicative map serves as a vector for the independent construction of human activities as opposed to the pure performance of activities according to instructions. In this research, it was used the competence-activity approach – the disclosure to the learner of the personal meaning of everything that he or she was doing in the educational process. The teacher organized the conditions that helped the student to identify the personal meaning of his or her learning-research activities through self-monitoring, self-evaluation and self-correction of results. The student performed self-monitoring based on comparisons of responses in the learning-research tasks, as well as the content of the constructed indicative tables and indicative maps with the regulations, which the teacher had, to find deviations from them.

In this research, we used the competence-activity approach – the disclosure to the learner of the personal meaning of everything that he or she was doing in the educational process. Then, the teacher organized the conditions that helped the student to identify the personal meaning of his or her learning-research activities through self-monitoring, self-evaluation and self-correction of results. The student performed self-monitoring based on comparisons of responses in the learning-research tasks, as well as the content of the constructed indicative tables and indicative maps with the regulations, which the teacher had, to find deviations from them.

At the end of the reporting activity, the teacher organized the students' reflection on their learning-research activities, during which everybody examined the compliance of the product received to their goals and that of the result to their motive.

The teacher could organize the students' learning-research activities and building of individual indicative tables and indicative maps, followed by self-control, self-evaluation and self-correction both in class and beforehand, remotely, by using the single educational portal and e-mail. Each learner could perform his or her theoretical activity consciously, without failures or mistakes, all while producing new knowledge elements and building system links between them, which amounted to the full content of the educational outcomes.

The third innovation was aimed at implementing the second stage of the process of interiorization - the construction of a mental image of educational outcomes in the student's mind. When teaching the discipline, the teacher organized learning-professional activities for each student for "transplanting" the system image of a specific educational outcome that was "visualized" in the individual indicative schemes.

The students performed the activity in stages in three directions simultaneously: they solved logical and practical problems of modeling social and professional situations with varying degrees of reliance on individual indicative schemes; they performed the activity in different forms of speech: loud speech, "speech to oneself," inner speech; the nature of their activities changed from joint activity of the teacher and other students to individual activity. Direct control of the training activity ensured the formation of the subject image of educational outcomes in "the mental plan" of the student on the one hand and developed skills of solving learning-professional tasks on the other hand.

Automating the students' activity

The fourth innovation that was implemented in our study was aimed at automating the students' activity for the solution of practical tasks of modeling socio-professional situations and developing their practical skills based on the mental image in their minds, using it to open the "field of activity" (Galperin, 2006) in accordance with the psychological characteristics of the process of exteriorization. The independent training-practical activity of students was carried out in three directions simultaneously: from the slow form to the

automated form; from internal, mental form of speech to "clean thought"; from the conscious form to the unconscious form. It was performed in material and materialized forms, individually, on the single educational portal or using e-mail.

The students' activity that implemented the process of exteriorization was organized on the basis of the technology of phased automation of activities for solving professional tasks based on the image of educational outcomes in the human mind. In order to enable each student to perform the activity and to manage it, the teacher used the following teaching means: collection of professional tasks on discipline "pharmacology"; teacher's manual for the organization of students' independent training-professional activities on discipline "pharmacology" (with normative examples of solution of professional practical problems and regulatory assessment criteria for students' activities of self-monitoring, self-evaluation); the diagram of measurement and evaluation of students' level of educational outcomes.

Direct control over independent training-professional activities in our study enabled the teacher to automate the activity of students to solve practical tasks of modeling socio-professional situations based on the mental image in their mind.

The implementation of the described innovations in teaching in the context of the psychological process of learning on the basis of interiorization and exteriorization was successfully carried out thanks to the fifth innovation that was used in our study – the development of psycho-didactic means, which enable the teacher to include each student in different types of learning-professional activities and to manage them in the classroom and during their independent work. Thus, the collection of individual indicative schemes "Students" educational outcomes within a particular discipline (Ilyasov and Galatenko, 1994) was developed to form the subjective psychological image of the objective educational outcomes in its indicative function in each student's mind. The student's training notebook with the program of LRA on discipline "pharmacology" was developed for the organization and management of each student's cognitive activity with the educational-scientific information, his or her mental, psychological activity.

Control experiment

Finally, the comparative analysis of the students' results was conducted based on two different courses of students: the training of course "A" (307 persons) was carried out with the use of innovative technologies, while the training of course "B" (281 persons) was carried out without the use of innovative technologies. After training, the number of students with a minimum level of educational outcomes was 2 percent of course "A" students vs 18 percent of course "B" students. The number of students with a basic level of educational outcomes was 36 percent of course "A" students vs 52 percent of course "B" students. The number of students with a high level of educational outcomes was 62 percent of course "A" students vs 30 percent of course "B" students (see Figure 1).

The students' need to seek assistance was been eliminated by the use of individual indicative schemes. The number of mistakes in the solution of practical professional tasks reduced significantly when compared to the previous learning period. The number of repeat exams and tests reduced significantly. Each student's independent work with the learning material took place online and became more effective as a result of their developed academic independence. A "zone of the nearest professional development" was formed (Kolomiets, 2016), which provided further individual work on the educational program for each student. Students could demonstrate their "ability to learn" using their individual indicative schemes. The motivation for self-organization of future professional activity increased. The students' conceptual apparatus changed. Their theoretical and system-activity thinking helped them to organize their learning activities correctly and properly, in the required form. Each student was able to demonstrate his or her awareness of the personal meaning of the results of the educational activities based on self-monitoring, self-evaluation and self-correction.

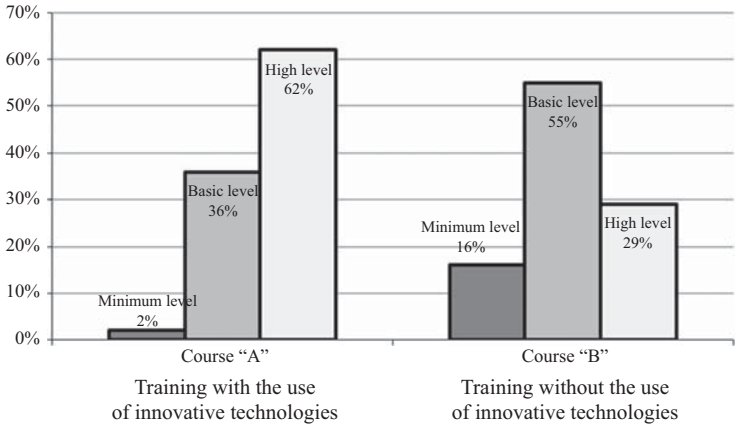

Figure 1. Comparison of students' educational outcomes after training

The result of this was a high effectiveness of each student's learning-professional activity and the high level of his or her educational outcomes, the teacher's moral satisfaction with the process and the results of his or her professional activities and good competitiveness of the graduates of the medical university on the labor market (Kolomiets *et al.*, 2014).

Discussion

All-encompassing process of globalization forced European countries to realize the necessity of creating a common area in education, including medical education and spreading it across the world (Swing, 2010). Today, the international labor market sets forth new requirements to medical school graduates: a high level of professionalism, ability to work effectively at the start of the career, competitiveness, etc. (Plaksiy, 2012; Han *et al.*, 2013). This has led to a shift in the criteria of the quality of education from curricula, duration of training, etc., to the evaluation of the final product, i.e. the level of readiness of prospective doctors and pharmacists for practice (Shumway, 2004). Additional professional examinations and accreditation procedures are widely introduced (Liaison Committee on Medical Education, 2013). This situation necessitates the determination of measures for improving the quality of teaching activities, which would guarantee that each medical student achieves educational outcomes of the planned quality (Nechaev, 2014).

One way of solving this problem is to use of innovative technologies (Renner and Marek, 2000). Foreign studies note that innovation in medical education is not something that happens very often (Savage and Brommels, 2008). Teachers use innovations to improve: skills based on development programs for medical students (Marton *et al.*, 2015); teaching methods: to change from a primarily lecturing format to a format that uses small groups; to minimize the repetition of topics in both theory and laboratory classes; to encourage students learn more on their own, etc. (Peshkova and Samarina, 2018). Innovative information technologies are used to give the students some choice in the topics and resources they study and some credit for the work they do during the year, especially as it relates to their contributions to the small groups (Dreyfus and Dreyfus, 2006). Some innovative technologies are aimed at individualizing the educational process and implementing the requirements of students in self-learning and self-improvement under the guidance of a professional teacher. Teachers use technologies to develop skills of independent acquisition and use of knowledge and orientation in the stream of information, which makes the student not simply a consumer of educational services, but a subject of the learning process (Swing, 2010).

Innovative technologies that are used in Russian medical education are also focused on the formation of the student as a subject of the learning process, while reducing the number of classroom hours and increasing the number of hours of independent work at a single educational portal in the context of new requirements to the professional training of medical university graduates (Kolomiets *et al.*, 2014; Kolomiets, 2014).

The performance indicator of innovation technologies used by the teacher is the level of quality of each student's educational outcomes, which will be high if the use of the innovation corresponds to the psychological characteristics of the teaching and learning of social experience.

Conclusion

The demonstrated structure and content of the teacher's professional activities in the structure of teaching is a vector for any teacher in the organization of each student's independent training-professional activities and pedagogical activities, the nature whereof should correspond to the psychological process of learning. The presented training materials can be used by any teacher to develop his or her own teaching means. The materials of this research can be used in studies that aim to increase the effectiveness of the educational process and reveal the methodological basis of its organization as an important resource. The practical value of the study is that it shows medical university professors a model of teaching activities, which guarantees that each student achieves educational outcomes of the planned quality. In further research, the involvement of administrative personnel and students' community in order to support the changes resulting from the application of innovations can be examined. It will be also good to consider the invest in time, personnel and other resources for the universities in case of implementation of the proposed innovations.

References

Beetham, H. and Sharpe, R. (Eds) (2013), *Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning*, Routledge, Abingdon.

Bollag, U. and Feletti, G.I. (1991), "The process of change in medical education in Switzerland", *Teaching and Learning in Medicine: An International Journal*, Vol. 3 No. 3, pp. 128-132.

de Bruin, L. (2010), "Competences in education and recognition – copyright education, audiovisual & culture executive agency", available at: www.core-project.eu (accessed June 16, 2017).

Dreyfus, H.L. and Dreyfus, S.E. (2006), *Mind Over Machine: the Power of Human Intuition and Experience in Medical Education*, Basil Blackwell, Oxford.

Dreyfus, S.E. (2004), "The five-stage model of adult skill acquisition", *Bulletin of Science, Technology & Society*, Vol. 24 No. 3, pp. 177-181.

Epstein, R. and Hundert, E. (2002), "Defining and assessing professional competence", *JAMA*, Vol. 287 No. 2, pp. 226-235.

Epstein, R.M. (2007), "Assessment in medical education", *New England Journal of Medicine*, Vol. 356 No. 4, pp. 387-396.

Gagne, R.M. (2011), *The Conditions of Learning*, Holt, Rinehart & Winston, New York, NY, pp. 17-29.

Galperin, P.Y. (2006), "Psychology of thinking and studies of the gradual formation of mental actions and concepts", *Research of Thinking in Soviet Psychology*, pp. 87-89.

Greeno, J.G. (2010), *Trends in the Theory of Knowledge for Problem Solving, Problem-Solving and Education*, Lawrence Erlbaum Associates, Hillsdale, NJ, pp. 9-23.

Han, H., Resch, D.S. and Kovach, R.A. (2013), "Educational technology in medical education", *Teaching and Learning in Medicine*, Vol. 25 No. 1, pp. S39-S43.

Howe, A. (2003), "Twelve tips for developing professional attitudes in training", *Medical Teacher*, Vol. 25 No. 5, pp. 485-487.

Ilyasov, I.I. and Galatenko, N.A. (1994), *Curriculum Scheduling on the Subject: Guide for Teachers*, Logos Publishing House, Kiev, p. 208.

Kirschner, P., Vilsteren, P. and Hummel, H. (2007), "The design of a study environment for acquiring academic and professional competence", *Studies in Higher Education*, Vol. 22 No. 2, pp. 151-171.

Kolomiets, O.M. (2014), "The technology of self-organization of medical University teaching activities by the teacher", Teaching manual: Medical Information Agency Publishing LLC, p. 176.

Kolomiets, O.M. (2016), "The organization of educational and professional activity of a student in teaching on the basis of the competence-activity approach", *Pedagogical Journal*, Vol. 5, pp. 47-58.

Kolomiets, O.M., Makatsaria, N.A. and Hamani, I.V. (2014), "Development of new types of didactic means by a teacher of a medical institution as a factor of development of his or her professional pedagogical competence", *Obstetrics, Gynecology and Reproduction*, Vol. 8 No. 3, pp. 71-75.

Leont'ev, A.N. (2004), *Activity. Consciousness. Personality*, Academy Publishing Center, Moscow, p. 352.

Liaison Committee on Medical Education (2013), *Standards for Accreditation of Medical Education Programmes Leading to the MD Degree*, Functions and Structure of a Medical School, LCME, Washington, DC.

Marton, G.E., McCullough, B. and Ramnanan, C.J. (2015), "A review of teaching skills development programmes for medical students", *Medical Education*, Vol. 49 No. 2, pp. 149-160.

Marx, K. (1983), "Capital", Politizdat, Vol. 1, p. 580.

Maxwell, J. and Blashki, G. (2016), "Teaching about climate change in medical education: an opportunity", *Journal of Public Health Research*, Vol. 5 No. 1, pp. 14-20.

Meats, E., Heneghan, C., Crilly, M. and Glasziou, P. (2009), "Evidence-based medicine teaching in UK medical schools", *Medical Teacher*, Vol. 31 No. 4, pp. 332-337.

National doctrine of education development of the Russian Federation (2000), "Resolution of the Government of the Russian Federation No. 751", National Doctrine of Education Development of the Russian Federation up to 2025, Moscow.

Nechaev, N.N. (2014), "The activity of a university professor as an evolving process", Psychology: NSEI HPO "MPSU" Voronezh MODEK, pp. 184-205.

Peshkova, G.Y. and Samarina, A.Y. (2018), "Digital economy and recruitment potential: strategical interconnection and prospects", *The Education and Science Journal*, Vol. 20 No. 10, pp. 50-75, available at: https://doi.org/10.17853/1994-5639-2018-10-50-75

Plaksiy, S.I. (2012), "The Bologna process in Russia: pros and cons", *Knowledge, Understanding. Skill*, Vol. 1, pp. 8-12.

Posner, M.I. and Keele, S.W. (2003), *Skill Learning*, Second Handbook on Research on Teaching, Rand McNally, Chicago, IL, pp. 805-831.

Renner, J.W. and Marek, E.A. (2000), "An educational theory base for teaching", *Journal of Research in Teaching*, Vol. 27 No. 3, pp. 241-246.

Reshetova, Z.A. (2002), "The psychological activity theory and the activity approach to teaching", Formation of System Thinking Textbook for Universities: UNITY-DANA, pp. 10-57.

Savage, C. and Brommels, M. (2008), "Innovation in medical education: how Linköping created a Blue Ocean for medical education in Sweden", *Medical Teacher*, Vol. 30 No. 5, pp. 501-507.

Shephard, K. (2008), "Higher education for sustainability: seeking affective learning outcomes", *International Journal of Sustainability in Higher Education*, Vol. 9 No. 1, pp. 87-98.

Shumway, J.M. (2004), "Components of quality: competence, leadership, teamwork, continuing learning and service", *Medical Teacher*, Vol. 26 No. 5, pp. 397-399.

Swing, S.R. (2010), "Perspectives on competency-based medical education from the learning sciences", *Medical Teacher*, Vol. 32 No. 8, pp. 663-668.

Van Melle, E., Lockyer, J., Curran, V., Lieff, S., St Onge, C. and Goldszmidt, M. (2014), "Toward a common understanding: supporting and promoting education scholarship for medical school faculty", *Medical Education*, Vol. 48 No. 12, pp. 1190-1200.

Vygotsky, L.S. (1982), *Obras Escogidas*, Vol. 2, Visor Distribuciones, Madrid.

Walpole, S.C., Vyas, A., Maxwell, J., Canny, D.J., Woollard, R., Wellbery, C., Leedham-Green, K.E., Musaeus, P., Tufail Hanif, U., Pavão Patrício, K. and Rother, H.-A. (2017), "Building an environmentally accountable medical curriculum through international collaboration", *Medical Teacher*, Vol. 39 No. 10, pp. 1-11.

Corresponding author
Olga Mikhailovna Kolomiets can be contacted at: kolomietsolga@yahoo.com; kolom-olga@mail.ru