

Scientific Co-Creation as Method for Development of Creative Competence in Future Educators

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Abstract — The article presents the experience of organizing scientific co-creation as a method for development of creative competence in future educators. Study model is described, which consists of a combination of components: target, methodological, content, organizational and resultative. The study objective was the organization of scientific co-creation as a method for development of creative competence in future educators. The methodological component is characterized by its approaches (competence-based, systemic activity, hermeneutic) and principles (of openness, continuity, flexibility, comprehension, dialogue, dominance of the other co-creator, reflexivity and metaphor). The content component is represented through scientific research essence of the subjects "Fundamentals of Research Activity" and "Development of Educator's Creative Competence in Scientific Co-Creation". The organizational components reflect the implementation of scientific co-creation method via continuous (monitoring and dialogue) and consecutive ("encounter", comprehension, deliberation, activity) phases, which are methodologically grounded in key provisions of hermeneutic approach. The study was based on participation of students enrolled in the education program 44.03.01 Pedagogic Education (academic bachelor's course), academic profile Preschool Education, a total of 89 students. By using reproductive, heuristic, research and reflexive methods, as well as particular forms and means (junior researcher's portfolio and author's tool "Creative Diary"), we have obtained the following results. Positive changes were detected at all levels of creative competence (low, medium, high) among students of the groups (Group 1, Group 2, Group 3), while trends toward higher levels of development for each component of creative competence were observed at the same time (inherently creative, communicative, team competences and personal qualities (motivation to succeed, intellectual curiosity, risk tolerance, self-starter quality)).

Keywords — *scientific co-creation, creative competence, scientific co-creation phase.*

I. INTRODUCTION

Current transformations in sociocultural, political and economics domains of human activity suggest a new approach to specialist training. Changes in present-day education, in particular, in preschool education, have created the demand among preschool educational institutions for an educator featuring high level of professional competence, ability to implement modern curricula of preschool education, or their adapted versions, to set up cooperation with children of various categories, including children with special education needs, and conduct education activity in line with the individual development direction, establish partnership relations with children's parents, accomplish various types of tasks, demonstrate teamwork, create new pedagogical products, participate in research and methodological community of educators, implement innovative pedagogic technologies, exhibit appropriate mobility and creative properties etc. These requirements and ongoing changes in contemporary Russian preschool education require a relevant perspective onto training future educators and a new approach to education progress organization. Among other options to accomplish this task, the authors of this study consider organization of scientific co-creation to be a method establishing cooperation among subjects of the education process aimed at developing creative competence in future educators.

We define creative competence as the totality of creative, communicative, teamwork competences and personal qualities (motivation to succeed, intellectual curiosity, risk tolerance, self-starter quality), which are aimed at accepting and creating a new pedagogic product,

generating new ideas, solving pedagogic challenges, being potentially instrumental in further development of creative competence among students [1].

Research co-creation is a method of cooperation among subjects of pedagogic process within scientific research activity, implementation of which involves several phases: continuous (monitoring and dialogue) and consecutive (“encounter”, comprehension, deliberation, activity), which are methodologically based on key provisions of hermeneutic approach [1].

This study was performed on the basis of the Chair of Psychology and Pedagogy of Preschool Education, Pedagogical Institute, Federal State Budgetary Educational Institution of Higher Education “Irkutsk State University” with participation of students of the 3rd and the 4th year in the education program 44.03.01 “Pedagogic Education (academic bachelor’s course)”, academic profile Preschool Education, total of 89 students (2017, 2018).

II. MATERIALS AND METHODS (MODEL)

The set of methods used in the study comprised the study model consisting of the following components: target, methodological, content, organizational and resultative.

The objective of the study was the organization of scientific co-creation as a method for development of creative competence in future educators.

The methodological components included the following approaches and principles. Our study was based on fundamental provisions of the three approaches: competence-based, hermeneutic and systemic activity approach. Within the framework of competence-based approach (A.G. Bermus [2], V.I. Zagvyazinski [3], E.F. Zeer [4], E.E. Symanyuk [4], I.A. Zimnyaya [5], A.V. Khutorskoi [6], K. Keen [7], R.J. Mirabile [8], L.M. Spencer [9], S.M. Spencer [9] et al.), we have defined the topical competence of a future educator – creative competence, while focusing on personality development based on self-implementation and self-actualization principles.

In relation to hermeneutic approach (M.M. Bakhtin [10], A.A. Brudni [11], A.F. Zakirova [12], Yu.V. Senko [13], M.N. Frolovskaya [13], F. Schleyermacher [14] et al.), we organized the process of comprehension during dialog communication, recognition by each subject of the essence of phenomena, activities, actions, search of meaning through emotional and ethic affection. The lecturer and the student deployed their intent to familiarize themselves with another’s personality and culture, assumed the position “Me and Another”, and cooperated in the context of understanding and learning within the “reciprocal text” and “living” knowledge [13]. This distinctive meta-activity resulted in “New Knowledge”.

Systemic activity approach (A.G. Asmolv [15], S.V. Dmitriev [16], N.G. Kudryavtseva [17] et al.) was implemented in individualization and differentiation of education process during the development of creative competence in students, organization of their active cognitive activity, building individual pathways toward the development of creative competence, developing intellectual creative products, which, in turn, implied progress to an activity-based result.

When identifying the principles of our work, we based our conclusions on the provisions of stated approaches and results of pedagogic deliberation style research, as defined in the studies of Yu.V. Senko and M.N. Frolovskaya [13]. We referred to principles of openness, continuity, flexibility, comprehension, dialogue, dominance of the other co-creator, reflexivity and metaphor.

The essence of the openness principle consisted in ongoing bilateral exchange with the environment (information research domain), establishing personal responsibilities for joint activity results. The principle implied the choice of various activity aspects (teams, topics of scientific research work, project, article etc.), implementation of variable individual pathways to development of creative competence, research and academic trajectories.

The principle of continuity was oriented at self-development and self-education of students (in combination with the principle of “lifelong learning”). Initiating this principle was determined by the specific nature of the competence being developed – creative competence, which is the unique competence of a future educator implying ongoing development and personality improvement up to self-actualization level.

The principle of flexibility inferred adapting the future educator to perpetually changing conditions, integration of knowledge from various domains, diversifying activity areas, establishing individual pathways to monitoring-based development of creative competence.

Following the conclusions of Yu.V. Senko and M.N. Frolovskaya, we understand the dialogue base principle as “... more than a plain exchange of knowledge, but rather an exchange of personal meanings; a joint search capable of becoming a shared theory, a foundation for co-creation by the subjects of pedagogic process” [13]. In turn, the following were recognized as characteristic features of the dialog: “working with unknown result, where the search itself becomes the dialogue’s object; mutual understanding, intuition-based and improvisation-based mutual diffusion; game beyond the rules; breaking frameworks, stepping down from the position of possessing knowledge, avoiding “correctness” and “truth” stereotypes; unity, confrontation, dialectics of the relations “I – you – he, we – you – they; helping another to understand oneself, people, the world” [13]. The principles of dominance of the other co-creator implied “equality of the positions held by dialogue participants, their equal value and orientation at Another” [13]. The metaphor principle was related to “building the image of the subject (I am seeing something as...), an attribute of “living knowledge” [13], while reflexivity principle comprised the “analysis of not only one’s own activity and its results, but also other activity” [13].

These principles were aimed at self-development and self-education of personality and defined the interconnection of general and subject-specific development and education objectives and all elements in the comprehension and dialogue system. They reflect the strategy of contemporary Russian education relative to the problems of organizational forms diversity and consideration of individual aptitudes of each subject of education progress, which ensure the growth of creative potential, enrichment of interaction forms with

all subjects of the education process in cognitive, scientific research, creative activity etc.

The content component of the model is represented through essence of the disciplines “Fundamentals of Research Activity” (subject of the basic part of curriculum for education program 44.03.01 Pedagogic Education, course offered in the 3rd or 4th year) and “Development of Educator’s Creative Competence in Scientific Co-Creation” (subject of the elective part of curriculum for education program 44.03.01 Pedagogic education, course offered in the 4th year).

The potential of these subjects in organization of the scientific co-creation with the objective to develop creative competence of future educators was confined in the scientific research type of activity. The students studied fundamentals of scientific and research activity, the notion of “creative competence”, worked in teams on preschool education projects, wrote articles and abstracts of reports for publication in scientific magazines, and spoke at conferences of various levels. In the course of teaching these subjects, we have formed general professional competences (GPC) and professional competences (PC): preparedness for psychological and pedagogical support of education and personal development process (GPC-3), preparedness to use systemic theoretical and practical knowledge to define and resolve research tasks in education domain (PC-11), ability to manage academic and research activity of students (PC-12). After completion of these subject courses, contests of projects related to preschool education problem were organized.

The organizational component of the model was based on implementation of scientific co-creation, which, being a special method of cooperation among subjects, functions as the normative model of activity process for accomplishing scientific research tasks and implies special organization, specifically, the existence of particular phases. In this case, we understand the term “phase” as “a period, a stage in development of any particular phenomenon, a step; moment, particular fragment in development or change of something, as well as the position, form of anything at that moment” [18].

Below we provide the logic and organization of the defined phases. The way to accomplishing the target (development of creative competence in future educators) began with continuous phase “monitoring”, which implies conducting diagnostics, assessment and prediction of creative competence level among students – future educators. This phase was implemented with a set of diagnostic methods selected based on the essence of creative competence and its structural components (inherently creative, communicative, team competences and personal qualities (motivation to succeed, intellectual curiosity, risk tolerance, self-starter quality). We have used qualitative (observations, discussion, creative tasks, analysis of activity results, analysis of cooperation etc.) and quantitative diagnostic methods (Johnson’s creativity survey (as modified by E.E. Tunik, personal creativity diagnostics (E.E. Tunik), non-verbal creativity diagnostics (E. Torrens, adapted by A.N. Voronin), diagnostics of verbal creativity (S. Mednik, adapted by A.N. Voronin), L. Mikhelson’s communicative abilities test, “Assessment of

communicative and organizational aptitudes in the process of primary professional consultation” test (Communicative and Organization Aptitudes (KOS) method by V.V. Sinyavski, B.A. Fedorishin), emotionality diagnostics (V.M. Rusalov), empathy capabilities level diagnostics (V.V. Boiko), team roles identification test (R.M. Belbin), expert diagnostics of interaction in small groups (A.S. Tchernyshov, S.V. Sarychev), A. Mekhrabian’s achievement motivation diagnostics, personal diagnostics for success motivation by T. Elers, personal risk tolerance level diagnostics (A.M. Schubert)). All diagnostics was based on the following conditions: a complete absence of competitive motivation and criticism of all actions by subjects, as well as strict orientation at creativity.

Assessment of creative competence development level (low (N), medium (borderline low and borderline high (C1, C2), high (B)) was performed on the basis of our own development – a “tree” of all possible combinations of target indicators for creative competence of a future educator. It consists of a hierarchic structure created by dividing the future educator’s creative competence levels into possible combinations of each competence’s levels and personal qualities. The creative competence level of a future educator serves as the foundation of the possible combinations “tree”, and the defining criterion (due to a specific component of future educator’s creative competence, specifically, creative competence proper) is the level of creative competence proper (low, medium, high). Personal qualities are represented in combinations at a low level of creative competence as low and medium levels, and at medium and high levels - as low, medium or high. In this manner, definition of future educator’s creative competence depended on a particular combination of its level indicators.

The results of diagnostics and assessment were used to predict creative competence levels in students. At a later point, an individual education pathway was compiled for each of the students, which served as the basis for further research and issue of recommendations for work in a future team.

Then, the consecutive phase of “encounter” took place, defined as “coming at a single point approached from different directions” [18]. This notion is closely related to the term “encounter group” (C.R. Rogers) [19]. Taking into account fundamental principles of personality-centered approach of C.R. Rogers, specifically “empathy, congruence and unconditional positive acceptance” [20], the following conditions were included into the scientific co-creation phase covered by the present study. Congruence means continuous encouragement of the team toward “open exchange of opinions”, drawing attention of the lecturer and team members to the “process and dynamics of immediate interpersonal interaction”, which functions as space for perception of feelings, and where all subjects deploy their preparedness to share the feelings, to engage in reflection and self-reflection. An unconditional positive attitude means acceptance, understanding, respect, and includes readiness to reflect various feelings – joy, excitement, passion, indignation etc. Empathy implies perception of the subject’s inner world as one’s own, although the quality “as if it were” remains. Subjects may empathize (share the same feelings) or sympathize (possess feelings different to the other person).

“Encounter” in scientific co-creation as a method of interaction between subjects presumes the situation of their unification for the sake of joint activity, based on inclusion into the emotional and moral experience, comprehension of the meaning of phenomena, “engagement” of the principles of congruence, empathy and unconditional positive attitude of subjects. The task of this phase was to consolidate the subjects of scientific co-creation into teams using the following formats: “lecturer-student”, “student-student(s)”, “students-lecturer”. This phase is based on the principles of hermeneutic approach and it implies “entry” of the subject into Another’s world, implementation of didactic and understanding contexts, emergence of the so-called “live” knowledge [13]. Within the framework of didactic context, the educator brings into the education contents his/her own vision, emotional and value attitude, doubts, questions, finds his/her ideas in that fragment of culture, organizes a joint activity for comprehension of the education contents. The understanding context implies the result of educator’s and students’ activity built on the basis of complex dialogue-shaped interaction between own and external experience, words and actions, thoughts and emotions at various levels of comprehension, which implies creation of “reciprocal” texts, a search of own meaning, correction of didactic context. Therefore, the “encounter” phase is the fundamental and key phase in understanding the entire essence of scientific co-creation.

The following consecutive phase – understanding – occurs “smoothly”, without clear-cut boundaries, due to the complicated structure of human relationships. It continues the “encounter” phase by enriching it with individual and axiological meanings. Understanding is based on intimate comprehension of Another’s “self” and on empathy. In this case, subjects try to place themselves in Another’s place and use their own internal experience to understand, feel the motives, aspirations, meanings etc. In this phase, team members work with ideas, inferences, notions, text, where the latter is viewed as “spiritual message of the author”, and while creating the overall design of future activity, they analyze the situations “what would be if ...”, interpret etc.

As applicable to the pedagogic activity, the meaning of the notion of pedagogic understanding is used, i.e. “conditions of productive addressing of the immediate participants of the education process to each other” [13]. This understanding presumes active involvement and change of roles for all subjects of activity to accomplish these objects and tasks. In this situation, the educator’s position is to serve as a research consultant, mentor, tutor, organizer of the new format of communication and interaction among students. As observed by I.S. Ogonovskaya: “Educator – is a director, who seeks to engage students into the process of joint creation, seeks to establish a contact of spirit and trust with them. While communicating with children, being a member of various groups and communities, he/she gains the understanding of one’s own qualities and properties, evaluates oneself, reconsiders goals and learns to change” [21]. Psychological and pedagogic conditions for such understanding include the presence of the single object of communication; presence of a single system of coding for participants of joint activity; common knowledge of Another’s psychology: “synchronism” of perception. Understanding functions as

the initial stage of deliberation, which sets the task: to understand Another and oneself.

Following this, the phase of deliberation occurs as a special object of personality’s self-consciousness and the supreme form of human creative activity. During implementation of this phase, we took into consideration the fact that it manifests itself as internal and external activity of personality, “mental” activity, and in which understanding of each other, qualities and objects of people’s joint activity plays the significant role. This phase is the space for implementation of the continuous and integral process of joint acquisition of knowledge, compassion, joint activity, understanding of the objective works in its meanings and values, the reflexive activity of each subject of scientific co-creation. These scientific principles enabled us to enrich the process of scientific co-creation organization as a method of cooperation between subjects and stimulate their activity to accomplish the common goal – to create the product.

The activity phase occurred after the deliberation phase. In accordance with the nature of scientific research activity in our study, the components of activity (objective, means, results, the process of scientific research activity as such) corresponded to its essential characteristics. The subject in this phase, having passed through “encounter”, comprehension and deliberation phases, where they actively enriched each other with personal, value and moral meanings, and entered Another’s world, learned to understand Another’s “self”, already possessed the “accepted” characteristics to a various extent. In parallel with such “enriched” activity, yet another specific result appeared – the pedagogic product presented in different forms: idea (thought) presented in written form, scientific text (article, report, abstract), model, project documentation etc.

Yet another phase occurred along with the continuous phase of monitoring – dialogue, which penetrates all phases of scientific co-creation. In dialogue, subjects cooperated with others and with oneself at the level of meanings, implemented the comprehension process; subjects developed their own position, their own “self” identity, accepted and sustained Another’s position, implemented the aspiration to comprehend another personality and culture. It is worth noting that “dialog-based nature of education, in its turn, is one of the vital pre-conditions for successful development of personality, which will not merely reproduce the memorized content, but rather independently set research tasks and accomplish them” [22].

In this way, the presented the logic and organization of scientific co-creation represented integrity of interrelated phases, which are methodologically based on principles of the hermeneutic approach.

The following methods, forms and means were used in organization of scientific co-creation. Several methods were used: reproductive (lectures with errors, working with scientific text etc.), heuristic (method of heuristic questions, brainstorming, problem situations analysis, synectics, empathy, debates, mental cards, “Turnover”, “Cause and effect diagram” tools etc.), research (project method, interpretation, comprehension, modeling, experiment, conferences, contests etc.) and reflective methods (interaction and activity results analysis method). A lot of

attention was dedicated to heuristic and research methods, which enabled active development of students' deliberation abilities, intuitive activity procedures in search of scientific research, pedagogic and creative tasks, and assisted in finding original solutions to creative tasks of various complexity level, problem expression extent, including in a new situation, which is especially significant for development of such specific competence type as creative competence. Various trainings for interaction, communication, empathy, creativity and teamwork were used, as well as a range of assignments, e.g. "Incredible situation", "Solving a problem", "Methods of action", "Cross sense", "Photo riddles" etc. In this manner, by using an entire set of methods based on flexibility, openness and variability, we developed every competence (inherently creative, communicative and team competence) and personal quality (motivation to succeed, intellectual curiosity, risk tolerance, self-starter quality), which comprise the structure of creative competence.

Research co-creation was organized in individual, group and frontal formats: "lecturer-student", "student-student(s)", "students-lecturer". Principal tools for organization of scientific co-creation consisted of junior researcher portfolio and author's tool "Creative Diary", which represents personal notes made by students along the individual pathway toward the development of creative competence, a unique guidebook for self-diagnostics and creation of a new product. The contents and organization of these tools are reflected in sections: "Diagnostics or how to get to know yourself", "Advice and recommendations for creativity development", "Individual program of creative competence development", "Creating a pedagogic product".

The resultative component of the model represented the final goal – development of creative competence in future educators.

III. RESULTS AND DISCUSSION

This study was organized in two stages over a period of two years (2017, 2018). At the first stage of our study (2017), we performed primary diagnostics with students of the 3rd (Group 1) and the 4th (Group 2) year, 39 and 34 students, respectively (total of 73 students). The following results were obtained: Group 1 included 31 (79.5%) students with low creative competence development level, 8 (20.5%) – with medium level, 0 (0%) – with high level. Group 2 included 22 (64.7%) students with low creative competence development level, 12 (35.3%) – with medium level, 0 (0%) – with high level. (see Table 1).

TABLE I. RESULTS OF PRIMARY DIAGNOSTICS OF CREATIVE COMPETENCE AMONG STUDENTS OF GROUP 1, GROUP 2, GROUP 3 (NO. OF STUDENTS, PERCENTAGE)

Year/level	high	medium	low
Group 1	0 (0%)	8 (20.5%)	31 (79.5%)
Group 2	0 (0%)	12 (35.3%)	22 (64.7%)
Group 3	1 (6.25%)	7 (43.75%)	8 (6.25%)

Therefore, no students with a high level of creative competence were found based on primary diagnostics results. In Group 2, the percentage of students with the medium level was higher than in Group 1, while the largest number of students with low level were found in Group 1.

This is consistent with the fact that Group 2 was in its final year of studies. In defining the levels of creative competence, we also took into consideration the development levels of each the group's structural components: inherently creative, communicative, team competences and personal qualities (motivation to succeed, intellectual curiosity, risk tolerance, self-starter quality).

Next, based on the results of diagnostics and assessment, we built the forecast for individual pathways to developing creative competence for each of the students, and incorporated them into scientific co-creation, through implementation of the subject "Fundamentals of Research Activity".

Upon completion of the experiment, the following results were obtained: 16 (41%) of students with a low level of creative competence development remained in Group 1. The number of students at medium and high levels increased, amounting to 20 (51.3%) of students with medium level and 3 (7.7%) – with high level. The number of students in Group 2 with low creative competence development level became 7 (20.6%), with medium level – 22 (64.7%), and with a high level – 5 (14.7%) (see Table 2).

TABLE II. RESULTS OF REPEATED DIAGNOSTICS OF CREATIVE COMPETENCE AMONG STUDENTS OF GROUP 1, GROUP 2, GROUP 3 (NO. OF STUDENTS, PERCENTAGE)

Year/level	high	medium	low
Group 1	3 (7.7%)	20 (51.3%)	16 (41%)
Group 2	5 (14.7%)	22 (64.7%)	7 (20.6%)
Group 3	6 (37.5%)	8 (50%)	2 (37.5%)

As evident from Table 2, students with a high level of creative competence development appeared in both groups (Group 1 – 7.7%, Group 2 – 14.7%). This level in Group 2 became especially significant because based on particular structural components of creative competence, students of Group 2 originally demonstrated medium and high results. Medium level of creative competence was found in more than 50% of students in both groups. A certain number of students remained at a low level (Group 1 – 41%, Group 2 – 20.6%). These students, however, developed positive trends across all structural components of creative competence. Accordingly, based on the results of this stage of the study, efficiency of the work performed can be evaluated.

At the second stage of our study (2018), we worked with students of the 4th year, a total of 16 students (Group 3), a part of which already participated in the first stage of our study (Group 1). According to primary diagnostics results, low level of creative competence development level was found in 8 (50%) students, medium level – 7 (43.75%), high level – 1 (6.25%) (see Table 1).

Next, we built the forecast for individual pathways to development of creative competence in these students, and included their scientific co-creation on the basis of the elective subject "Development of Educator's Creative Competence in Scientific Co-Creation". In the course of this subject's program, students learned the theoretical fundamentals of developing creative competence of a future educator and gained the experience of such development using creative methods, tools, technologies and instruments (junior researcher's portfolio and "Creative Diary").

The repeated diagnostics revealed the following results: low level of creative competence development remained in 2 (12.5%) students, the medium level was found in 8 (50%) of students, and high level – in 6 (37.5%) (see Table 2). The obtained positive results of this stage of the study were significantly high, which was consistent, in our view. Firstly, these students have developed high motivation in choosing this elective subject, since they already had partial information about the upcoming activity and had the relevant experience. Secondly, the subject constituted a targeted, systemic activity aimed at development of a relevant competence, as well as presence of a specific result – a pedagogic/research/scientific-research product, which is especially relevant at the final year of studies.

The results of the experiment also included qualitative indicators. Students have been able to reach the new level of scientific discussion in the domain of preschool education, were able to sustain a scientific discussion with lecturer with ease, were able to provide evidence to support their ideas, plans, models, project, and assumed various team roles being able to operate in different teams. They created a bank of pedagogic ideas, resolved new tasks and analyzed situations, presented scientific ideas in various formats (articles, reports, abstract, projects, contest applications etc.), delivered high-quality presentations at conferences and contests, built their junior researcher portfolios and filled out the “Creative Diary”.

IV. CONCLUSION

Therefore, positive qualitative and quantitative results in both study groups enabled the authors to conclude that scientific co-creation organization is an efficient method for developing creating competence in future educators. We believe that the activity undertaken within the framework of this study enabled us to resolve a set of present-day tasks related to training of future educators: developing professional competence, orientation of the existing standard of higher education at creative development among university graduates, organization of the education variability through the principles of dialog, flexibility, continuity, openness, implementation of individual education pathways, implementation of new methods and forms for organization of education process, development of scientific and scientific research components of the university etc.

Nevertheless, this study does not claim to provide a comprehensive solution for developing creative competence of a future educator but rather presents one of the possible options to resolve this problem in the setting of Russian university education.

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