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THE RELATIONSHIP OF SUBJECT-METHODOLOGICAL SKILLS, ANALYTICAL AND COMMUNICATIVE COMPETENCIES OF PEDAGOGICAL STUDENTS

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Abstract

The purpose of the study is to identify the relationship between subject-methodological skills and analytical and communicative competencies of students in order to develop recommendations for the selection and design of teacher education content. In order to assess the subject-methodological skills, a test built in the logic of level diagnostics of subject-educational competencies was used. Analytical competence was assessed using an interactive test, communicative competence - through a model professional action with the participation of expert observers. The method of correlation analysis of the competition results was used to answer the question about the relationship between these skills and competencies. The results of the participants of the finals of the All-Russian Olympiad for students "I am a Professional" in the field of "Teacher education (basic)" were analyzed. The analysis recorded the relationship between the subject-methodological skills and analytical competence. The relationship between the subject-methodological skills and communicative competence was not detected. According to the results of the study it can be concluded that the emphasis on subject-methodological skills in pedagogue training does not automatically lead to the formation of communicative competence. Its formation should be organized in a special way, if this result of education is desirable for the educational organization, for example, by means of trainings, workshops, games, as well as pedagogical practice. However, analytical competence can be formed in the process of learning the subject and methodology.

Keywords: Analytical competence, communicative competence, subject-methodological skills, teacher education

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1. Introduction

In 2021, Moscow City University organized the All-Russian Olympiad for students "I am a Professional" in the field of "Teacher education (basic)". The Olympiad is held to identify talented students and provide them with additional opportunities in the profession; to form a talent pool among them with the support of representatives of employers and research organizations; to stimulate creative growth, activity and professional mobility of talented HEE students; to raise the prestige of higher education and identify the need to update higher education curricula to meet changing requirements of professional standards (Ya-professional, n.d.).

Let's consider two stages of the Olympiad - the qualifying stage and the final stage. Within the qualifying stage, the students' subject-methodological skills were assessed by means of test tasks. In the final stage of the Olympiad the students were offered tasks on the analysis of video segments of the lesson in the test form and on conducting a discussion. The first task was held in a real-time mode with the participants loading the results of the solutions after a set period for their completion; the second task was held in an online-conference format. The results are presented in the form of rating tables for each stage with scores.

This article studies the relationship between the results of the test tasks that examine subject-methodological skills and the expert evaluation of the manifestation of communicative and analytical abilities in the final stage. The given research will help answer the question about the new requirements to the construction of the content of teacher education in terms of the formation of universal competencies not directly related to the subject and teaching methodology - whether it is necessary to pay separate attention to this aspect of teaching, or subject-methodological teaching is enough.

2. Problem Statement

HEEs regularly face the problem of designing and updating educational content (Mukhamedov et al., 2020). This can be related both to updating the Federal State Educational Standards (FSES) of higher and general education, professional standards, and the need to respond to new external challenges, changes in the system of division of labor in education. The emergence of universal competencies as an educational result in a HEE can be seen as an attempt to expand the boundaries of teacher education by developing students' abilities to respond flexibly to the changes taking place and giving them the opportunity to go beyond a certain direction of professional training if necessary, to work in a situation of polypositional interaction.

However, it is not quite clear how to shape this type of outcome in the context of current curricula. Professional training requires mastering the necessary theoretical foundation and vocational practice, while the introduction of classes aimed at the formation of universal competences will require the exclusion of any theoretical disciplines or increase the workload on students and teachers.

In this regard, there is a problem of resource allocation within the HEE between teaching the subject and methodology and the formation of universal competencies. At the same time, there is an idea that universal competencies can form on their own in the process of teaching the subject and

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methodology. In this case, we can expect to find a relationship between the test results of subject-methodological and universal competences

3. Research Questions

This research answers the question of whether there is a relationship between subject-methodological skills and analytical and communicative competences of students. The analysis of research shows that the issues of formation and assessment of universal competences in the course of implementation of higher education curricula (Kazakova & Tarkhanova, 2018), including by means of academic and work experience internship (Tarkhanova, 2019), are sufficiently studied. The matrices of formation and assessment of professional competencies in a HEE, including innovative methods, such as game and project methods, have been developed. However, the issue of the relationship between different professional and universal competences in terms of evidence-based pedagogy is not sufficiently elaborated, which makes it difficult to solve the complex task of optimizing higher education curricula under the condition of improving educational outcomes.

4. Purpose of the Study

The purpose of this study is to find the relationship between subject-methodological skills and analytical and communicative competencies of students in order to develop recommendations for the selection and design of educational content in the field of "Teacher education (basic)". Understanding the relationship between different competencies formed in the learning process will allow optimizing the development of educational content, the design of curricula and the selection of teaching methods at the undergraduate level in pedagogical and related areas. The study will allow making further steps to organize training in accordance with FSES of higher education in terms of achieving overall results.

5. Research Methods

5.1. Assessment Methods for Skills and Competencies

The subject-methodological skills in this study in the context of teacher education are understood as, on the one hand, knowledge of the teaching subject at the level equivalent to the field-oriented, and on the other hand - knowledge and ability to apply methodological techniques and tools in relation to the studied subject content taking into account age and other characteristics of students. Knowledge of the subject is a combination of fact-based and tool-based knowledge of the content. That is, the teacher should know the necessary facts from the teaching subject area and ways of solving typical problems. According to the same logic, the methodological component of these skills consists of a theoretical foundation of traditional and activity approach in education and practical skills of applying particular methods and techniques in the situation of a lesson and extracurricular activity.

Nemet (2018) describes pedagogical competence as "a teacher's ability to regularly apply knowledge and skills to help learners learn" (p. 143). It includes knowing the theories and tools of the

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subject being taught, incorporating them into the school, course, and lesson framework, creating educational content in short-term and long-term contexts, and solving learning problems.

According to Pino-Fan et al. (2017) subject-methodological competence in mathematics is composed, on the one hand, of the ability to solve mathematical problems, that is, problems that lie within the studied subject, and, on the other hand, of the application of mathematical tools to solve problems in other subject areas. In the context of assessing the subject-methodological skills of a maths teacher, one might ask whether the teacher is able to apply mathematical methods to his/her own work, such as analyzing data on performance, error rates, and other parameters of the educational process.

Pavlova (2020) describes subject-professional competence on the example of mathematics as an integral characteristic manifested as an objective mathematical action in relation to the material of the school course in mathematics. That is, the author does not distinguish methodological skills as a separate category in isolation from the subject skills, but assumes that the teacher's action should serve as a demonstration of a practical subject action, but deployed on the material available to students.

The indicators of subject-professional competence are considered to be:

- understanding the content of mathematical concepts and statements;
- possession of the ways to obtain mathematical concepts and the ability to justify their validity;
- ability to apply mathematical knowledge to complete tasks from other subject areas;
- organization of educative process in competence-based approach;

Subject-mathematical skills were assessed using a test built in the logic of level diagnostics of subject-educational competencies (Student Achievements Monitoring, SAM) (Nezhnov, 2018). Part of the test tasks examined the knowledge of the subject being taught, part - the knowledge of teaching methodology and the ability to accomplish simple methodological tasks. The subject-methodological test for each subject was developed autonomously. The testing was conducted in computer form.

Examples of tasks in mathematics:

Task 2.2. Tested skill: ability to perform arithmetic operations with numbers and numerical expressions orally and in writing. SAM level - reflexive.

Which of the properties of addition and multiplication are applied in the calculation:

$12*7 + 7*8 = 7*(12 + 8) = 7*20 = 140$

A. Transpose property of multiplication

B. Transpose property of addition

C. Associative property of multiplication

D. Associative property of addition

E. Distributive property of multiplication over addition

(key: A, E)

Task 5.1. Tested skill: analyze the reasoning proposed to the students with confirmation of its correctness or search for an error and its causes; help students to locate the error independently and to correct it. SAM level - formal.

The student has performed calculations:

$9*(2 + 7) = 9*2 + 7 = 18 + 7 = 25$

Describe the error made.

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A. Incorrectly performed addition in parentheses

B. Incorrectly applied distributive property

C. Incorrectly performed multiplication

D. Incorrectly performed addition in the last step

(key: B)

Task 6.2. Tested skill: Objectively assess students' knowledge on the basis of tests and other methods of monitoring in accordance with the actual learning abilities of children. SAM level - reflexive.

Read the task. Specify the skills it may be designed to test.

Two trains left points A and B towards each other. The speed of one is 20 km/h more than the speed of the other, and it traveled 160 km more before the meeting. Find the distance between the points, if the fast train reached the destination point 5 hours earlier.

A. Graphical method of solving tasks

B. Task solving using a table

C. Performing operations on multitudes

D. Operating functional concepts

E. Composing and solving linear equations and their systems

F. Solving quadratic equations

In the international literature, the closest to the context of this study is the definition of analytical competence as a teacher's ability to correctly perceive and evaluate lessons in terms of teaching effectiveness. This construct is considered in two dimensions: content and formal one. The content dimension consists of two factors: pedagogical and content knowledge. The formal dimension is defined as the ability to perform more complex information processing. (Plöger et al., 2020). Thus, a similar approach to the definition of analytical competence, involving didactic intervention, in the example of teachers of mathematics also subdivides its components - subcompetencies: 1) analysis of mathematical activity; 2) analysis and management of the interaction and its impact on school pupils' learning; 3) analysis of norms and metanorms; 4) evaluation of the didactic appropriateness of the teaching process (Pino-Fan et al., 2017).

Analytic competence in this study was understood as the participant's ability to see and recognize the goals and tasks of the teacher and learners in the classroom (Lvovsky & Sanina, 2018), to identify the instructional techniques and technologies the teacher uses (Agapov & Lvovsky, 2018; Lvovsky, 2021; Moscow City University, n.d.). If we correlate this understanding with HE FSES 3++ in the direction of "Teacher education" bachelor degree, analytical competence is a particular case of general professional competence (GPC-7) "able to interact with the participants of educational relations within the implementation of curricula". Analytical competence is also a part of "Systematic and Critical Thinking" group universal competence (OPC-1) "capable of searching, critical analysis and synthesis of information, applying systematic approach to solve assigned tasks" (Portal Federal'nyh gosudarstvennyh obrazovatel'nyh standartov vysshego obrazovaniya, n.d.). The understanding of analytical competence used in the outcomes under consideration does not correspond directly to the specific outcomes from the FSES, but is obviously a combination of these, not less desirable for graduates to master than its components.

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Analytical competence was assessed through an interactive test where participants had to view three segments of a lesson recording and answer questions regarding its various logical and methodological aspects (Zuckerman et al., 2019). The questions related to the type of diagnosis and communication, the teacher's purpose and organization for its achievement, the learner's purpose, the teacher's position, the organization of assessment, the handling of questions, the formation of metasubject outcomes, and the embedding of one lesson's content into a broader context. Checking was performed with the help of "keys", the sum of scores for each participant was counted.

The understanding of communicative competence has significantly transformed and evolved over time. According to the retrospective review conducted by Aniskin and Busygina (2017), pedagogue communicative competence includes several key structural elements:

- language literacy and linguistic capacity, that is, the ability to set out and understand the meaning contained in the statements in oral and written form, understanding of the stylistic features of language, phonetics and other aspects of speech (Bocharnikova, 2009; Petrovskaya, 2007);
- use of language as a tool for managing the educational process, correctness of wording, use of optimal speech pedagogical techniques, effective expression of plans, intentions, evaluations in relation to the educational process, creating the required atmosphere (Zimnaya et al., 2020);
- mastery of the language of the subject area, cultural and scientific terms that form the basis of understanding the subject, transformation of these means in accordance with the age of students, context and other external factors (Leontiev, 1996);

In FSES of higher education communicative competence is understood as "ability to communicate in oral and written forms in Russian and foreign languages to solve tasks of interpersonal and intercultural interaction". In the framework of the Olympiad the understanding of communicative competence was narrowed to oral communication in Russian to solve professional tasks (organization of discussion).

Communicative competence was assessed through a model action with the participation of expert observers. The participants in small groups had to conduct a discussion on general pedagogical topics. Each group had a facilitator who conducted the drawing of lots, gave instructions on how to complete the task and kept track of the time. Each group drew lots to determine a moderator from among the participants, who was assigned with organizing a discussion in 10 minutes for two other participants from their group of three on one of the general pedagogical topics, also determined by lot. For example, participants were asked to discuss whether group work was always appropriate; whether teacher and student goals could be the same; whether the purpose of the lesson or the student initiative was more important; whether the teacher should know more than the students; whether evaluation during the lesson was necessary; and whether the subject teacher should work toward the meta-subject outcomes. Each debater appeared once as a moderator and twice as a discussant. The observers evaluated the participants according to criteria such as retention of position, recording of contradictions, quality of argumentation (Shiyan, 2010), and use of visualization tools. Each criterion corresponded to 3 levels of manifestation. The highest score was given to the moderator who managed to organize the discussion of different points of view, clearly showing the contradiction and providing the opportunity to argue both positions; to record on the "board" the opposing points of view with an indication of the connections and relations

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between them; to manage the discussion, expressing the attitudes to the different points of view, but not defending any of them. Maximum score was awarded to a discussant who had discussed with his/her opponent within the framework set by the moderator; expressed his/her own point of view, quoting or retelling remarks of other participants; offered clear, logically consistent arguments that supported the position expressed; and verbalized a change of position. When calculating the total score, the participant's score in the moderator's position and the maximum of the scores in the discussant's position were summed up.

5.2. Sampling and Data

For the analysis we chose the results of the participants of the finals of the All-Russian Olympiad for students "I am a Professional" in the field of "Teacher Education". These are 50 undergraduate students of pedagogical HEEs or related areas, planning to build a career in education: representatives of 28 different HEEs, future teachers of 12 different subjects. The distribution of participants according to the teaching subjects corresponds to their actual distribution.

Since the tasks for assessing the subject competencies were developed independently, all scores were converted to a percentage of the maximum score. A correlation analysis of the competition results was conducted to answer the question about the relationship.

6. Findings

The relationship (r=0.36) between the subject-methodological skills and analytical competence was recorded. This can be explained, on the one hand, by the fact that the study of the subject and teaching methodology gives the opportunity to better analyze the activities of the teacher, understand his/her intent and identify the techniques that have been studied as part of the methodology training. On the other hand, the correlation of the results can be explained by the similarity in the evaluation format (test in computer form), as opposed to the evaluation of communicative competence, which was performed through observation. The scatter diagram is presented in Figure 1.

It can be noticed that high (more than 80%) results on the test of subject-educational competences are shown only by the participants with a high level of analytical competence. Here we cannot unequivocally judge the direction of the relationship. Perhaps participants with analytical competence are more successful in learning the subject and methodology due to this. For the design of educational content and subsequent research this raises further questions about what qualities of the student or other factors determine their success in the subject and methodology.

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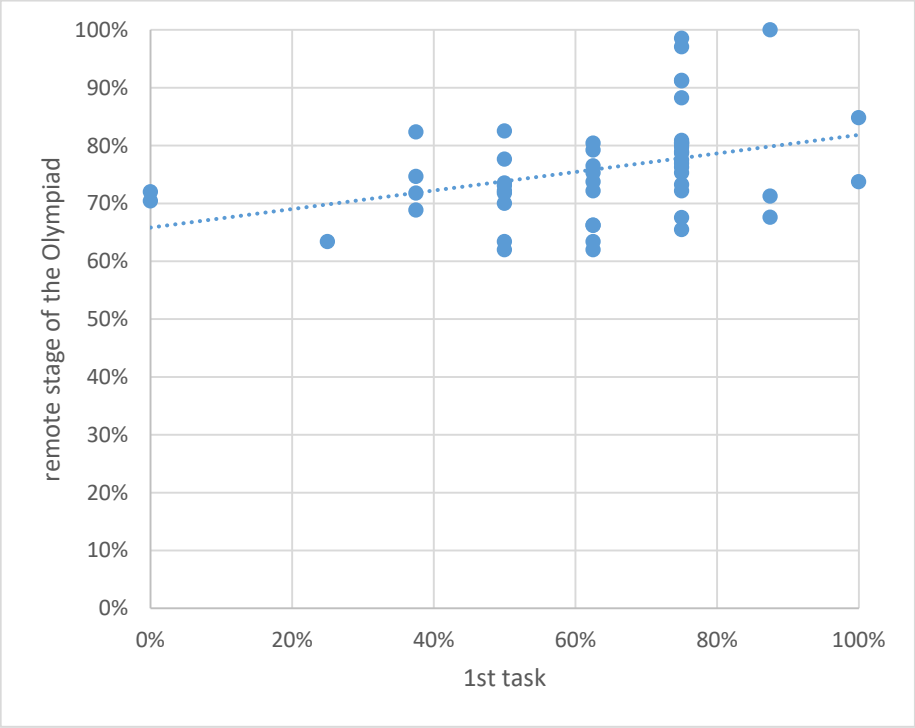

Figure 1. The relationship between subject-methodological skills and analytical competence

No relationship between the subject-methodological skills and communicative competence was recorded (r=0.03). Thence we can conclude that a student's success in subject and methodology does not guarantee his/her ability to build a meaningful dialogue with students and colleagues. The diagram in Figure 2.

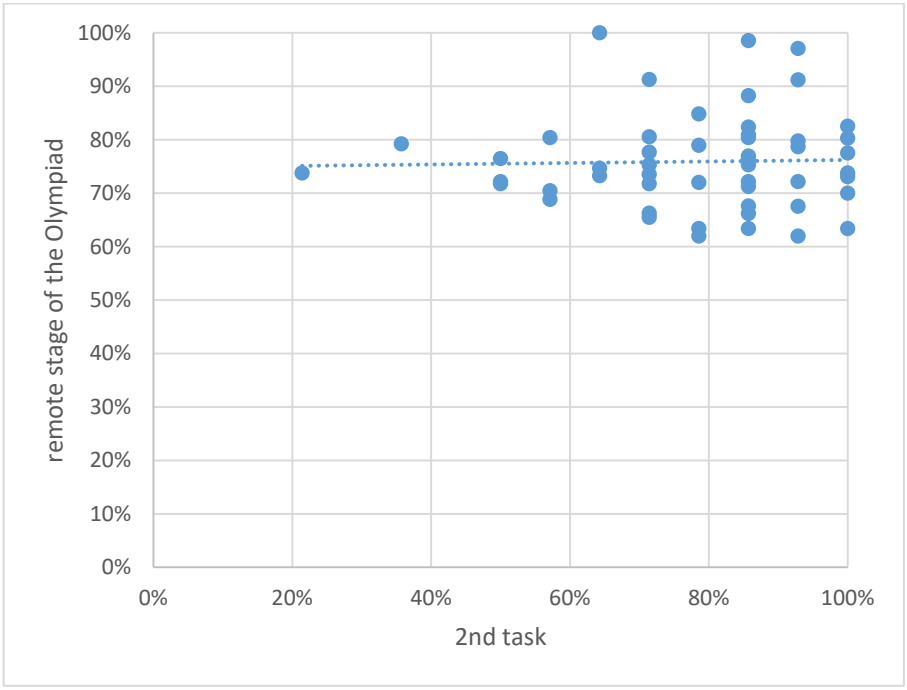

Figure 2. The relationship between subject-methodological skills and communicative competence

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It is worth noting that the students who participated in the finals of the Olympiad were selected on the basis of their results in the test of subject-methodological skills. It means that the conclusions of this article are valid only for the students who are successful in the subject and methodology. The question of whether subject-methodological skills are related to analytical and communicative competence for less successful students requires further study.

7. Conclusion

As a general conclusion of the study, it can be recorded that the emphasis on subject-methodological skills in teacher education does not automatically entail the formation of communicative competence, and special time and resources should be devoted to its formation, if this result of education is desired for the HEE. For example, for pedagogical qualifications, where the ability to build communication and ensure interaction with the participants of the educational process are the required results of mastering the curriculum in accordance with FSES.

This can be done by means of special trainings (Petrovskaya, 2007), workshops (Verbitsky, 2017), games, as well as actual teaching practice. However, we see that analytical competence can be formed in the process of teaching the subject and methodology, for example, when teaching micro- and macro analysis of lessons and classes. During micro-analysis, the remarks of the teacher and the students are analyzed with the help of a previously prepared transcript of the lesson in order to find the "triads" (Teacher's question - learner's answer - teacher's evaluation) as markers of a traditional lesson; teacher's remarks that provoke students' initiative as attributes of a lesson in an activity approach; and reformulation of "unsuccessful" teacher's remarks. An option of macro-analysis of the lesson is the comparison of the lesson plan with its implementation.

In general, the formation of universal competencies within pedagogical and other professional education requires additional study. The relationship between universal competencies and subject-methodological skills as well as the influence of other factors on their formation needs to be further studied. Pedagogical professions and the requirements for them are increasingly transforming, and this transformation should be supported by professional education to maintain and improve the quality of professional activity of the teacher.

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