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# Effect of Critical Thinking on the Adaptation of a Young Science Teacher

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Abstract. Many young science teachers who start their career in schools are dissatisfied with their work there, which leads to major problems on the governmental scale. Hypothesis states that one of the important factors influencing the level of adaptation for novice teachers is critical thinking. There were four main factors of critical thinking valuable for novice teachers established. They include: logic, rational, creative and reflective thinking. Diagnostic tools with scientific content and a young teacher survey were developed for each factor of critical thinking. On different stages of the study there were total of 470 students and science teachers participating. The result of the study conducted via different diagnostic tests supports given hypothesis. The development of each component of critical thinking is affected by activities that a novice teacher performs. Activities include selection of the study materials for classes, creation of questions and possible answers for student and etc. Reflexive thinking was revealed to have a dominant role in school activities performance and general satisfaction of teachers with work at school.

### **INTRODUCTION**

When young teachers begin their professional activities, they find themselves in a new environment and face numerous difficulties: in planning and conducting lessons, in building relationships with students, colleagues, parents of students, administration, with paperwork, etc. Not all of them cope with the difficulties of this period, even the most talented and knowledgeable of their discipline leave school in the first 3-5 years of work. The problem is acute both at the state level, since public funds are wasted on the training of teachers who "do not fit" into the realities of the modern school, and at the level of the individual teacher, for whom the years of study at the university turn out to be largely useless, hopes are crumbling, professional crisis.

The retention of teachers in the workplace is directly related to the degree of their satisfaction with their work [1]. Studies devoted to this problem usually focus on low wages as one of the main causes of dissatisfaction [2]. But future teachers are most often guided by personal motives when choosing a profession, rather than financial ones [3; 4]. Dissatisfaction with working conditions arises not only due to low wages, but also due to the high extracurricular workload with large volumes of documentation and reporting, poor social security, difficulties with the student population, insufficient resource and technical base of the school, insufficient administrative support [2; 5]. But these problems relate to the entire teaching staff of a given educational institution, and the degree of satisfaction with their work among teachers of one school and even of the same age (age, as studies have shown [2], is of significant importance) vary very significantly. That is, the degree of job satisfaction is greatly influenced by the teacher's personal qualities and his ability to adapt to this work.

Two groups of works are devoted to solving the problem of adaptation of a young teacher. In the research and practical developments of the first group, there is a search for an answer to the question: "How to help overcome the

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difficulties of a teacher in the first years of his work at school?" To this end, the difficulties faced by a young teacher are monitored, and special support programs for a novice teacher are being developed, and the institution of mentoring is being developed [6]. In reality, such mechanisms are completely absent in most Russian schools.

The second group of studies is devoted to the prevention of the difficulties of a young teacher and is built in line with the issues of the competence approach: "How to bridge the gap between what is taught in the university and what is really required in the course of professional activity" [7]. Moreover, in many cases, personal competencies are more important than professional ones. For example, the study [8] argues that the main factors contributing to the adaptation of teachers to the school environment are their professional love, interest in students, effective communication, self-confidence and empathy.

In the overwhelming part of the works of the second group, certain methods and techniques for improving either the subject or methodological training of a teacher are proposed.

However, in a rapidly changing world, when educational and methodological information is constantly updated and the teacher must learn constantly, an increasing role is played by a factor that can have a significant impact on the adaptive capabilities of a young teacher and his satisfaction with his activities. This factor is critical thinking. Critical thinking «is becoming a key focus of research and policy in higher education» [9, p. 574]. In the 21st century, the concept of critical thinking has been named a key skill in education, working life and civil society [10], a fundamental educational ideal [11]. This concept has been actively developing in the last half century.

The study of critical thinking skills among students - future teachers of mathematics, physics, computer science, biology, geography, chemistry, natural science and astronomy - was carried out at the Department of Space Physics of the Moscow State Pedagogical University. When searching for tools for diagnosing the level of thinking, it was revealed that, despite many years of practice in teaching critical thinking, there is still no consensus in the scientific community regarding a single definition of the concept of "critical thinking" and methods of its diagnosis. As Halonen notes [12], as many people research critical thinking, there are so many definitions of it. Analysis of almost 90 different definitions found in dictionaries and subject literature (definitions of the IGI Global resource and individual researchers), showed that all definitions can, to one degree or another, be attributed to one of two categories: universal definitions (interdisciplinary) and context-dependent (disciplinary) definitions, specific to the content of a certain academic discipline, on the content of which critical thinking skills are taught [13]. Context-sensitive definitions are more specific and better suited to diagnostic purposes, but they are significantly influenced by the specifics of the discipline. For integrated natural disciplines, no definitions have been identified on the basis of which diagnostic tools can be created.

In the course of pedagogical practice, it was noticed that students in whom one or another indicator of critical thinking prevails (universal 35 indicators proposed by [14]) cope better with certain types teacher's activity, and the degree of development of these indicators in general correlates with the teacher's professional readiness. But, firstly, pedagogical practice and real work at school are by no means identical concepts, and, secondly, on the basis of these universal indicators, it was not possible to compile a diagnostic toolkit that allows one to establish not only qualitative, but also quantitative relationships between critical thinking and the success of certain activities. Therefore, there was a need to find out how, after graduating from a pedagogical university, students are adapted to the conditions of a modern school and how satisfied they are with their activities, as well as to develop a context-dependent definition of critical thinking that corresponds to the goals of measuring the level of critical thinking among teachers of natural science subjects.

The purpose of the study described in the article was to identify the correlation between the level of development of critical thinking and the characteristics of the professional adaptation of a young teacher, first of all, his satisfaction with his activities.

To achieve this goal, it was necessary to answer the following questions:

- What components of critical thinking are most relevant to science teachers?
- What materials should be used to diagnose the level of development of these components and characteristics of a young teacher's adaptation to school conditions?
- What diagnostic results should be chosen as variables for establishing correlations, how to establish whether they correlate with each other and to what extent?

#### **RESEARCH METHOD**

The number of studies on which types of thinking can be considered critical is increasing all the time [9]. But since critical thinking is manifested in connection with a specific activity or subject area, and not in isolation [15] and critical thinking in chemistry differs from critical thinking in business no less than these disciplines themselves [13], it is important to define what constitutes critical thinking from the standpoint of natural sciences. *Therefore, the first stage of the study* was associated with identifying the components of critical thinking that are most significant for teachers of natural sciences. For this, a survey was conducted of 49 graduate students and 3 professors of the Institute of Physics, Technology, Information Systems of Moscow Pedagogical State University, 33 students of the Faculty of Physics, Mathematics and Natural Sciences of the Peoples' Friendship University of Russia and 26 potential employers of these students. The purpose of this survey is to find out what the respondents understand by the term "higher order thinking" (the term "critical thinking" in Russian is often perceived not as a synonym for higher-order thinking, but as a cognitive ability to see difficulties, flaws and errors, to question information). As a result, the following most common essential characteristics and operations of critical thinking were identified: logic, rationality, objectivity, the skill of analysis and introspection, the ability to see problems, put forward and test hypotheses, carry out research, high ability for self-learning and self-improvement.

Based on the synthesis of the results of this survey and analysis of almost 90 definitions of critical thinking, logical, rational, creative and reflective thinking were identified as the main components of critical thinking most significant for teaching science. It is important to note that these components of critical thinking are closely related to the scientific method formed within the natural sciences: on the one hand, critical thinking is the cognitive basis of the scientific method, and, on the other hand, learning based on following the scientific method develops critical thinking [16].

In this study, logical is understood as a kind of thinking, which is characterized by the ability to correct reasonable reasoning using evidence to obtain a reasoned conclusion from the existing premises. In the implementation of the scientific method, it prevails at the first stage - the stage of considering the problem, collecting information and understanding it.

Creative thinking is aimed at generating new ideas, knowledge, discoveries or non-standard ways of acting. According to Torrance, creative thinking has four dimensions: fluency (generating ideas), originality (generating unusual ideas), development (persistence in adding details to products), and flexibility (generating different categories of ideas). Note that the question of the relationship between critical and creative thinking has long been controversial [17]. But the scientific method is unthinkable without the creation of ideas, hypotheses, therefore, from the standpoint of natural sciences, creative thinking is a component of the critical. It is creative thinking that allows you to put forward hypotheses, which are then tested using rational thinking.

Rational thinking means thinking that allows you to see objects and events in their true light and adequately analyze them, relying not on emotions, feelings, impressions, state of mind, but on pragmatism and prudence [18].

Reflexive thinking is focused on comprehending one's own actions, self-observation, self-knowledge and is focused on making decisions [19]. In scientific activity, reflection is a criticism and analysis of knowledge obtained as a result of the application of the scientific method, and the very activity of obtaining this knowledge.

The second stage of the research was associated with the development of diagnostic materials for research purposes. To assess the characteristics of the adaptation of a young teacher to school, a special questionnaire was developed, and the diagnosis of the components of critical thinking of students (future teachers of natural science subjects) required the solution of additional problems. At first, to determine the levels of logical, rational, creative and reflective thinking, standard psychological tests were used (mainly the tests indicated in the second column of Table 1). However, difficulties arose along the way.

First, the testing procedure itself requires a significant amount of time, and the content of standard tests is not related to the content of the disciplines studied in the master's program, therefore, their repeated use to track the dynamics of thinking characteristics in the process of studying natural sciences is not possible.

Secondly, the test form of tasks excludes the possibility of generating one's own ideas, which is not compatible with the creative component of critical thinking, and the argumentation of the choice of the answer, which is important for evaluating rational thinking. Some of the standard tests that are used in the study of thinking in students of natural sciences (for example, Test of Logical Thinking (TOLT) and the Group Assessment of Logical Thinking (GALT)), in addition to multiple choice of the answer to the question itself, offer a choice of several alternatives to justify this answer. The fact that the students do not formulate the justifications themselves, but only choose from those already available, reduces the diagnostic function.

In this regard, it was necessary to identify the types of tasks with natural science content to assess the level of development of logical, rational, creative and reflective thinking, to develop sets of tasks of each type and assess their validity. To assess the validity on the same sample of students, we used standard psychological tests and the tasks of natural science that we developed. 332 students of the MSPU and RUDN University, studying natural sciences, took part in the experiment to test the tasks and assess the validity.

For all created sets of tasks with natural science content, the criterion validity coefficient V was determined according to the algorithm described in [20] when determining the validity of tasks for evaluating logical thinking. In this case, the validity is considered low if  $V \in [0, 0.3)$ , average if  $V \in [0.3; 0.6)$  and high if  $V \in [0.6; 1]$ .

At the third stage of the research, the assessment of the level of formation of the components of critical thinking of graduates of the master's program "Modern Natural Science" in the direction of "Pedagogical Education" and questioning them, but already at the stage of work at school as young teachers of physics, biology, astronomy, natural science, chemistry, mathematics and computer science. At this stage, 52 undergraduates of 2015-2020 years of graduation were involved. Data for each student was collected over two semesters as part of the study of three science disciplines and in the course of project activities. Participation in the experiment is voluntary, the results are presented anonymously.

After graduating from the magistracy, students began to work as teachers of natural science subjects in schools and colleges in Moscow and the Moscow region, and they were asked to take a questionnaire. The questionnaire included questions about job satisfaction at school, difficulties in interacting with the administration of the educational institution, colleagues, students and parents of students, how successfully, from their point of view, they cope with various activities, etc. The experience of teachers who took part in the survey was from 1 to 5 years. Participation in the survey is voluntary, the results are presented anonymously.

The processing of the results of this stage of the study consisted in establishing correlations or their absence between the answers to the questionnaire questions and the results of assessing the levels of development of various components of critical thinking. The assessment of the tightness of the connection between logical, rational, creative, reflexive thinking and the characteristic types of teacher activity was assessed by the value of the correlation coefficient *r*. The values of *r* are taken modulo and reflect both the forward link and the reverse link:  $r \in (0; 0.3]$  - the link is very weak, which was not taken into account in this study,  $r \in (0.3; 0.5]$  - the link is weak,  $r \in (0.5; 0.7]$  average relationship. No stronger direct or feedback relationships were found in the study.

### MATERIALS USED FOR DIAGNOSIS

To diagnose the level of development of critical thinking components, the tools developed at the second stage of the study were used. It included both *standard tests and specially designed tasks* [21] taking into account the specifics of studying natural science disciplines (Table 1).

The peculiarity of the tasks from the right column of the table is that they allow you to simultaneously assimilate the material of natural science disciplines and diagnose the level of development of a particular type of thinking. At the same time, it was assumed that the «testing students on higher order thinking skills may reinforce these skills among them» [22].

For example, during the diagnosis of creative thinking, students were given the following task: "During the Apollo space mission, it turned out that the lunar dust formed as a result of the meteorite bombardment was sticky and abrasive. It surrounds the surface of the Moon with a cloud, covers up solar panels, scratches research instruments and face glasses of astronauts' helmets, weakens the seals of spacesuits, and affects the mucous membranes of astronauts. This created significant difficulties that impede the planned studies of the lunar surface. Suggest possible ideas for solving the problem of moon dust". In the course of completing this task, students receive new astronomical knowledge for them, and the number of ideas proposed by the student serves as one of the indicators of the level of development of his creative thinking.

At the third stage of the study, when diagnosing students' thinking, not only the results obtained with the help of specially designed tasks, but also the results of standard thinking tests indicated in Table 1 were taken into account. Thus, for each student, a profile of his thinking was built, indicating the degree of development of each of the components critical thinking.

To identify the characteristics of successful adaptation to school, *a questionnaire for a young teacher* was developed. It included 18 questions aimed at finding out how satisfied the respondents are with work at school and what kind of difficulties they experience, what should be changed during the preparation of master's students so that adaptation to school is more successful, why they like or dislike working at school. The respondents were controlled

by such variables as the subject taught, the status of the educational institution, professional experience (length of service).

Component	Standard tests	Types of specially designed items
Logical	Test of Logical	1) tasks for the interpretation and analysis of information such as "continue the
thinking	Thinking, Group	logical sequence", "insert the missing", "find an analogy", etc.; 2) tasks for the
	Assessment of	formulation of inferences and their argumentation; 3) tasks for constructing an
	Logical Thinking	algorithm.
Rational	Comprehensive	1) the task of carrying out the calculation and calculation when making a decision in
thinking Assessment of		the given conditions; 2) the task of choosing a solution (based on facts or emotions);
	Rational Thinking,	3) the task of predicting potential risks and difficulties in a given situation; 4)
	intuitive thinking	planning task; 5) the task of choosing arguments (based on rationalism or emotions).
	test	
Reflective	Karpov's	1) the task to assess the correspondence of the obtained results to the hypothesis and
thinking	questionnaire,	self-analysis of the activity; 2) a task for self-assessment of knowledge, development
	Leontiev's	of a strategy for obtaining new knowledge, posing questions to understand the
	differential	essence of the problem; 3) the task for the ability to objectively evaluate the results
	reflexivity test	and determine further areas of work; 4) the task on the ability to understand the
		discrepancy between the results and expectations; 5) the task for the ability to
<i>~</i> .	-	objectively assess their activities as a whole.
Creative	Torrance test	1) the task of putting forward the maximum number of differing ideas that are
thinking		adequate to a certain condition; 2) the task of developing the proposed idea of solving
		the problem, allowing alternative solutions; 2) the challenge of ingenuity in creating
		models and conducting experiments, including the design of the experiment to test
		the hypothesis; 3) the task of the ability to come up with a quasi-scientific research
		on a given unusual topic and containing all the attributes of scientific research
		(description of the relevance, problem, contradictions, goals, hypotheses, tasks,
		research methods, experiment, analysis of results and conclusions); 4) the task of
		identifying new areas of application of a certain product of scientific or engineering
		activity; 5) the task of the ability to come up with a way to explain the complex
		concepts of natural science in an accessible and visual way.

**TABLE 1.** Critical Thinking Component Diagnostic Tools.

When questioning, the dependent variable was the degree of satisfaction, which was determined by the respondents on a 10-point scale. The coding was carried out according to the direct principle: 1 point meant the teacher's complete dissatisfaction with the work at school. Self-assessment of the complexity of various activities related to preparation for lessons was coded according to the reverse principle: 1 point meant a complete absence of problems and difficulties in the implementation of this type of activity ("very easy"), and 5 - serious difficulties ("very difficult").

The respondents were asked to determine whether interaction with the administration of the educational institution, colleagues, students and parents of students causes difficulties (each item separately). 5 variants of answers were offered "Does not cause", "Basically there are no difficulties", "Difficulties arise often", "It is very difficult to interact", "There is a serious conflict".

Predictive variables were introduced to determine the effect of employment satisfaction on job satisfaction: for example, the presence or absence of a classroom teacher, workload (in hours per week). The influence of teaching a non-core subject was taken into account by introducing a question about all subjects taught (33% of respondents teach several subjects) and then the coincidence or discrepancy of the university direction of training in bachelor's and master's degrees and real practice was determined.

The survey data were supplemented by the information available at the department about the academic performance of each of the participants in the experiment.

## **RESULTS AND THEIR INTERPRETATION**

The result of the first stage of the study was the introduction into the practice of teaching teachers of natural science subjects of the context-dependent definition of critical thinking as thinking, which is characterized by the ability to correct reasonable reasonable reasonable reasonable reasonable conclusion from the existing premises, the ability to see objects and events in their true light and adequately to analyze them, relying not on emotions, feelings,

impressions, state of mind, but on pragmatism and prudence, which allows you to generate new ideas, knowledge, discoveries or non-standard methods of action and which is focused on understanding your own actions, self-observation, self-knowledge. This definition corresponds to four types of thinking: logical, rational, creative, reflective.

At the second stage, four sets of diagnostic tasks were developed for each type of thinking and their criterion validity was checked. Let us explain how the criterion validity of tasks with natural science content was determined to assess the level of formation of creative thinking.

The average scores given to students for completing assignments were compared with the scores for the Torrance test and the scores given by experts for the work of students on a natural science project (the number of generated project ideas, both for themselves and for classmates, the novelty and originality of these ideas, novelty and originality design methods, non-standard approaches to the definition of experiments to evaluate the hypothesis and the idea of creating equipment for experiments, creating a questionnaire in a playful way).

The correlation of assessment methods for each of the students who took part in the experiment is clearly shown in Fig. 1. The height of the columns corresponds to the average scores received by each of the students: a) exhibited by experts; b) when performing the Torrance test; c) when performing the created set of creative tasks.



FIGURE 1. Comparison of the results of assessing students' creative thinking by three different methods. On the vertical axis - the score of students on a 10-point scale, on the horizontal axis - the student's ordinal number.

The analysis showed a fairly high correlation ( $V \ge 0.6$ ) of the diagnostic results using the created set of creative tasks with natural science content with the results of two independent tools for assessing creative thinking (Table 2). The correlation coefficient for the expert assessment turned out to be higher, since it covered practically the same types of students' activities (generating project ideas, experimental designs, etc.) as the assignments, but not on theoretical material, but on practical.

TABLE 2. Numerical coefficients of valid	ity of tasks	for assessing	creative thinking.
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Independent assessment tools	Torrance test	Experts
Validity coefficient	0.60	0.72

The obtained data give grounds to assert that the created set of tasks can serve as a tool for diagnosing the creative thinking of students. Similarly, the criterion validity of sets of tasks for assessing the level of formation of logical, rational and reflective thinking was proved.

At the third stage, the answers of teachers to the questionnaire and the results of diagnostics of critical thinking were analyzed, and the correlation coefficients were calculated for various parameters.

The degree of satisfaction with work at school among the surveyed teachers is above average and amounts to 7.36 out of 10. The level of critical thinking of graduates of the master's program is also quite high - the average indicators for all four components of critical thinking are in the range from 7 to 8 points out of 10. Results of the analysis of the relationship components of critical thinking with the satisfaction of young teachers from work at school (Fig. 2) showed that satisfaction is most closely associated with reflexive thinking (coefficient of communication r = 0.57) and rational thinking (r = 0.53). The coefficient of connection with the level of development of creative thinking is slightly lower (r = 0.45). The connection with logical thinking turned out to be extremely weak (r = 0.16). The data obtained suggest that the components of critical thinking are not in equilibrium: the reflexive and rational components are more significant for the adaptation of a young teacher. Note that Robert Hugh Ennis, the largest researcher of

critical thinking, defined critical thinking first as "reasonable reflexive thinking" [19, p. 10], and later - as a type of rational and reflective thinking.



FIGURE 2. Correlations of young teachers' satisfaction with their professional activities with the level of development of critical thinking components.

The results obtained allow us to conclude that the level of formation of critical thinking is an essential factor in the adaptation of a young teacher: the higher this level, the greater satisfaction from professional activity the teacher experiences. A detailed analysis of individual portraits of thinking and job satisfaction of the teachers participating in the study revealed an interesting circumstance.

There were small groups of teachers (4 people each) who deviated quite significantly from the revealed trend. The first group had a level of satisfaction lower than expected according to the data on critical thinking, and the second higher. Attempts to find general correlations among the respondents of these groups with at least one of the factors presented in the questionnaire (difficulties in communicating with the administration, parents, etc.) were unsuccessful. However, our experience of communicating with them at the stage of studying for a master's degree allowed us to single out common personal qualities: students of the first group were characterized by high responsibility and diligence, and students of the second, on the contrary, a certain carelessness, and in each of the groups there were students with different academic performance. Apparently, this is due to the fact that students, finding themselves in a new environment of school life, overflowing with various tasks that require immediate solutions, are physically unable to fulfill them. For the overly responsible students of the first group, such a situation is stressful, and for not too responsible and executive students of the second group, it is habitual.

Correlations of young teachers' satisfaction with their professional activities with working conditions in a particular educational institution are shown in Fig. 3, from which it can be seen that the links with the presence of classroom leadership and the size of the workload (the number of teacher hours per week) are very weak (r < 0.3). Also, on average, very weak links between job satisfaction and the presence of difficulties in interacting with the administration, students and their parents (were taken into account separately), and the correlation coefficient of satisfaction and interaction with colleagues is practically zero. Nevertheless, teachers who indicated the presence of significant problems in interaction with the administration, colleagues, students and their parents (problems in two or three positions at once) have a statistically significantly lower satisfaction score (6.5) than in the sample as a whole. The main decrease in the score is due to difficulties with the administration and, slightly less, with the parents. Thus, the influence on satisfaction of any of the factors indicated in the studies [2, 5] as significant, in our study turned out to be weaker than the influence of the level of development of critical thinking.



**FIGURE 3.** Correlations of young teachers' satisfaction with their professional activities with the working conditions in a particular educational institution (the value of the correlation coefficient is taken modulo, for the values associated with the presence of problems it is negative).

In the open answer to the question «continue the phrase: "I like working at school because ..." 50% of the answers were associated with positive emotions from communicating with children, and one person mentioned the team and administration. The rest of the answers are related to self-development (18%), love for the subject taught and the work itself (not routine, not monotonous) (14%), convenient schedule and decent salary (11%), the importance of this work for society (3.5%).

In the open answer to the question «continue the phrase: "I don't like working at school because ..." respondents noted that too much time to work is due to a large load (25%), a large amount of reporting and work, not directly related to children's training (18%), lack of necessary logistical support (7%).

The result concerning the relationship between job satisfaction at school for young teachers and their academic performance in master's studies was quite unexpected (Fig. 4). It should be noted that the Master's degree subjects were aimed at forming exactly those domains of knowledge that were allocated by Shulman: pedagogical knowledge, subject matter knowledge, curricular knowledge, knowledge of students, knowledge of schools, pedagogical content knowledge [23]. The coupling coefficient turned out to be close to zero. That is, the impact of academic performance is negligible in comparison with the impact of the level of development of critical thinking and the impact of problems of interaction of young teachers with participants in educational relations (with students, their parents, colleagues and administration).



**FIGURE 4.** Correlations of the satisfaction of young teachers with their professional activities with the level of development of critical thinking and other factors (the correlation coefficients with the value of the workload and interaction problems are negative and in the figure are taken modulo).

The data obtained suggest that the success of the adaptation of a young teacher depends more on personal qualities and critical thinking than on the existing baggage of subject and professional knowledge. Soft Skills, recognized by the OECD as a critically important factor in employment in the modern world [24], and in the field of teacher education we studied, turned out to be more important than Hard Skills.

In the course of the questionnaire survey, young teachers assessed the complexity of various types of their professional activities on a 5-point scale. Analysis of the results obtained (Fig. 5) showed the presence of weak (thin lines,  $r \in (0.3; 0.5]$ ) and medium (thick lines  $r \in (0.5; 0.7]$ ) links between various components of critical thinking and types of teacher's activities. Associations with values r < 0.3 were not taken into account. The correlation coefficients are negative here, since the coding of the questions was inverse.

The figure shows that there are no unambiguous connections «type of activity - component of thinking»: almost all types of teacher's activities require the use of several components of critical thinking, and each component is involved in many types of activity. The greatest difficulties for young teachers were caused by the activity of «correcting their actions taking into account the analysis of previous lessons» (average score of 1.67 out of 5), which showed stable connections with the maximum number of critical thinking components.



FIGURE 5. Visualization of the tightness of connections between the components of critical thinking and the teacher's activities.

Among the four identified components in terms of the number and quality of connections, reflexive thinking stands out, followed by rational thinking. That is, the higher the level of development of these components, the less difficulties a teacher has when performing professional activities. This result indirectly explains the fact (Fig. 1) that the satisfaction of a young teacher correlates most of all with reflexive thinking and slightly less - with rational thinking.

#### CONCLUSION

One of the important tasks of a pedagogical university is to prepare future teachers to adapt to their work and receive satisfaction from it in the best possible way. This is important not only for the young teachers themselves, but for the entire school, since the attitude of less satisfied staff is transmitted to the entire teaching staff and significantly affects student success.

The study exhibits that the ways to solve adaptation difficulties lies not only in the traditionally developed directions rather for improving the subject and methodological training of students in pedagogical universities. It creates a comfortable environment for teachers at initial stages of work, but also for development a relatively new framework in the formation of soft skills, in particular critical thinking.

According to the results of the study, it can be concluded that the success of adaptation of a novice teacher of natural science subjects is related with the level of development of critical thinking significantly stronger than with academic performance at the stage of training in a pedagogical university or various factors of school life (workload, personal/professional relationships, etc.). Therefore, it is important to develop critical thinking skills among students of pedagogical faculties.

For future science teachers, this formation can be presented within the framework of basic disciplines, since the elements of the methods of science and critical thinking are closely related. Assistance can be provided by the tasks developed within the framework of the study, which serve for both, diagnosis and the development of logical, rational, creative and reflective thinking.

Correlation analysis revealed the special role of the latter. Reflexive thinking has the largest number of connections with a variety of teacher activities and the highest correlation coefficient with a young teacher's overall job satisfaction. Therefore, there is a recommendation for teachers working in pedagogical universities to pay more attention to the formation of skills of introspection, adequate self-esteem and the ability to objectively compare the expected result and the final outcome to determine further improvement areas in their work.

Personal properties are also of great importance. Thus, the conducted research gives some grounds to assume that such a valuable quality for employers as a young teacher's responsibility, the desire to do everything according to instructions and on time, turns out to be largely negative for the teacher himself: in the course of adaptation to school life, he is dissatisfied with his work. Therefore, it is possible to advise the school administration to take this fact into

account and at the first stages of work not to overload teachers with a heightened sense of responsibility with various assignments and tasks, to give them the opportunity to gradually adapt.

The results of the study can help to find alternative approaches to increasing the satisfaction of young teachers with their work: not only through reducing the academic and extracurricular workload, reducing the volume of reporting, increasing salaries, improving the resource and technical base of the educational institution, but also through the development of critical thinking components at the learning stage. at a pedagogical university. Supplementing the methodological and subject training of the future teacher with measures to develop soft skills, in particular critical thinking, can provide a synergistic effect and significantly facilitate adaptation to professional activity.

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