

Psychological and Pedagogical Conditions and Means of Development of Professional Reflection of Teachers in the System of Methodical Work

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Abstract: *The article considers general psychological and methodical patterns of mathematics teachers' professional reflection in the system of methodical work. It proves the hypothesis that one can model and implement specific psychological and pedagogical conditions, thus promoting the development of professional reflection. Besides, the article shows that the specified pedagogical conditions for the successful development of professional reflection of teachers of mathematical disciplines in the system of methodical work are: ensuring awareness of the teacher of mathematical disciplines of the content, structure and means of development of professional reflection; formation of an objective self-assessment of the personality and own professional activity of teachers of mathematical disciplines; introduction of individual and group means of development of professional reflection in the system of methodical work of pedagogical college; creation of a reflective environment in the system of methodical work of a pedagogical institution. Psychological and pedagogical means for the development of professional reflection of teachers of mathematical disciplines in the system of methodological work of a pedagogical college are: means of individual reflection (repetition technique, counselling, individual reflection games, solving reflective problems, keeping a reflection diary); collective means of developing professional reflection of the teacher (reflective debates, reflex interviews, reflective classes, consultation, tutorial, group reflection games, development of programs for monitoring their (or colleagues) actions in professionally significant situations with subsequent analysis of the received materials, training on the development of professional pedagogical reflection); introduction of a special training course "Development of professional reflection of teachers of mathematical disciplines in the system of methodical work of the pedagogical college".*

Keywords: *mathematical disciplines; pedagogical college; formation of objective self-assessment; professional activity of teachers; individual and group means; reflection environment.*

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Introduction

It is now recognized that pedagogy is a pervasive psychological and neuropsychological interdisciplinary field in the narrow sense (as opposed to education studies). Therefore, this article considers, first of all, psychological principles of reflection as a natural human phenomenon based on subjectivity, self-concept and one's emotional and rational attitude towards themselves and the world. Teacher's professional reflection is characterized by a conscious and methodical (professional) nature, and yet its basis is universal. Therefore, it is expedient to consider psychological approaches towards reflection, extrapolate them to methodological settings of future mathematics teachers' professional activities and create relevant psychological and pedagogical conditions for developing professional reflection.

The authors of the article believe that professional reflection of teachers is based on professional self-esteem of a teacher, that is judgments about their own importance in relation to generally accepted norms, criteria and goals, ideas about the levels of their own achievements, moral principles, rules of conduct. The main parameter of professional self-esteem is the degree of adequacy. Adequacy characterizes self-esteem in terms of its compliance or discrepancy with the actual degree of a certain quality of the subject of self-esteem. An important criterion for the adequacy of the teacher's self-esteem can be the comparison of this self-esteem with the assessments of others on the basis of reflective analysis. In this regard, self-esteem may be adequate or inadequate, underestimated or overestimated. The problem of studying professional self-esteem is closely related to the awareness of the level of achievement of the individual - the difficulties in achieving the goals he sets for himself. The discrepancy between achievements and real opportunities leads to the fact that the teacher begins to misjudge himself, as a result of which his behavior becomes inadequate - there are emotional breakdowns, increased anxiety and more. Self-esteem is externally expressed in how the teacher evaluates the opportunities and performance of others.

The experience of pedagogical activity becomes useful in the case when its analysis is carried out, achievements and failures are defined, actions on its improvement are planned not once a year or a month, but daily. The progressive educator is constantly looking for answers to the following questions: "What did I plan to do?", "What tools and methods did I use?", "What did I get as a result?". Finding answers to these questions, the teacher can move forward in professional development. However,

Shchedrovitsky (1974) points out that the main psychological complexity of professional reflection is a reflexive going beyond one's own activity, which requires additional procedures and additional logical knowledge. The authors of the article believe that additional procedures, means of professional reflection of the teacher are understanding, problematization, adjustment of activity, an estimation and discussion of the received result.

In this regard, this research is rather dualistic. On the one hand, it analyzes and takes into account reflection (professional or that in a broad sense). On the other hand, it attempts to model relevant psychological and pedagogical conditions for developing professional reflection (on the example of mathematics teachers).

In the context of the study of professional reflection of a teacher is important to characterize the psychological and pedagogical conditions conducive to the development of professional reflection of the teacher.

Philosophical Dictionary defines "condition" as a category that reflects the universal relationship of a thing to the factors by which it arises and exists (Shynkaruk, 1986).

In psychology, "condition" means a set of phenomena of the external and internal environment that probably affect the development of a particular mental phenomenon (Konyukhov, 1996).

In the dictionary of education and pedagogy "condition" is defined as a set of variable natural, social, external and internal influences that affect the physical, mental, moral development of man, his behavior; education and training, personality formation (Polonsky, 2004).

Psychological and pedagogical conditions are defined rather differently in pedagogy. Many scholars have considered their multimodal characteristics (Nerubasska, & Maksymchuk, 2020; Melnyk et al., 2019; Sheremet, Leniv, Loboda, & Maksymchuk, 2019; Gerasymova et al., 2019; Onishchuk et al., 2020; Maksymchuk et al., 2020; Marcos, Miguel, & Tillema, 2009). Babansky (1987) defines psychological and pedagogical conditions as the corresponding pedagogical circumstances that contribute (or counteract) the manifestations of pedagogical patterns caused by the action of factors. Semenova (2006), in the dictionary-handbook of professional pedagogy defines "Psychological and pedagogical conditions", views them as circumstances on which depends a holistic productive pedagogical process of professional training, mediated by the activity of the individual, a group of people.

Taking into account the above definitions of the concepts "conditions" and "psychological and pedagogical conditions", the term "Psychological and pedagogical conditions for the development of

professional reflection of a teacher" is understood as a set of influences of the external and internal environment of a pedagogical institution, contributes to the development of professional reflection of a teacher (which, in turn, is mediated activity of a teacher, a group of teachers).

Therefore, the article aims to justify the hypothesis that one can create a reflexive environment in the system of methodical work in educational institutions by organizing the specified pedagogical conditions for developing professional reflection of mathematics teachers in the system of methodical work, which will be specifically formulated in further discourse.

Psychological Principles of Teachers' Professional Reflection

Since the late 20th century, psychological views on reflection have gradually shifted from a theoretical study of the phenomenon to the following practical context, namely, how to use reflection in conscious actions and professional activities to optimize it. Mälkki (2011) claims that "reflection is facilitated in many practices and there is abundant research on the issue" (p. 4). Although this concept is rather popular, the ultimate mechanisms of reflection in educational practice remain unclear. Mälkki (2011) states that the prevailing theories inform of the process in its ideal form; however, to a great extent, they fail to offer conceptual tools for understanding and working with the actualities of reflection" (p. 4). Therefore, it is important to understand the reflection of adults as the subject of professionalization and offer specific tools for working with reflection. In this research, reflection is viewed as a natural and conscious process of thoughts, doubts and assumptions, which orient feelings, thoughts, actions and behaviour through self-prism.

Empirical studies prove the multifaceted and multimodal nature of reflexive mental phenomena, which manifest themselves in a variety of events: critical and threatening situations, situations of choice, chaos, goal setting, planning, activity, behaviour and purposeful activity. The main determining factor is the context in which one's psychological phenotype exists. Therefore, the authors of the article hypothetically assume that educational conditions (specially created or random) direct the reflection mechanism of the actors in the educational process differently. However, they can be modelled and predict optimal results.

The most relevant psychological theory of reflection today is transformative learning, which assumes that "the challenges of reflection are

fundamentally connected to the way the biological life-support system affects our thinking through emotions” (Mälkki, 2011, p. 5).

Psychological mechanisms of reflection are currently used as a preparatory tool for “engaging employees in innovative work behaviour” (Messmann, & Mulder, 2015). The psychodiagnostic of professional behaviour of German teachers proves that they reflect on social context, self-realization, work assignments, expected outcomes and, most importantly, development and innovation. Thus, one can conclude that reflection is a resource for professional development and internalization of innovative experience. It is, therefore, “a “vital component of work routines, organizational cultures and job training” (Messmann, & Mulder, 2015, p. 125).

The psychological basis of the reflexive learning concept involves cognitive needs and self-identification, which result in interest, evaluation and motivation. In pedagogical practice, however, the results of such processes may be the opposite (Calderhead, 1989). There appears to be a need to elaborate teacher training programmes in the light of empirical research on “learning how to learn”, which considers an individual profile, context or didactic goals.

If reflection is considered a key concept in teacher education, one cannot ignore its cyclical model, which brings one to oneself. This mechanism can be used in teaching and learning by focusing on self-affirmation and the realization of internal motivational resources of future teachers. According to Korthagen, & Vasalos (2005), the self-concept can have a decisive impact on the functioning of student teachers since they can do what is expected of them, at the same time not feeling involved. In such cases, a more fundamental form of reflection is required, which is “basic reflection” (Korthagen, & Vasalos, 2005). The main contradiction here is between the subjective meaning of the activity and the fundamentality of educational problems.

No less important are psycho-social mechanisms of reflection on changes in behaviour and activity. Social interaction and reflection are considered important mechanisms to support appropriate behaviour. Ploderer, Reitberger, Oinas-Kukkonen, & van Gemert-Pijnen (2014) identify five key approaches among these systems, such as “social impact, social support, collective use, reflection in behaviour and reflection in action”.

Finally, interpersonal and intrapersonal dilemmas arising in professional communication because of teachers’ reflection seem to be important for educational use. On the one hand, such situations are developmental. On the other hand, as noted by Pareja Roblin, & Margalef

(2013), collective efforts on common goals reveal differences in beliefs and expectations, which created conflicts and tensions, which sometimes hindered teachers' willingness to work together. However, such situations are stimulating since they create a cognitive dissonance between personal beliefs about teaching and learning and the opinion of others about it. At the same time, both parties were reflected not so much educational as psychological practice (teacher sessions, interviews and discussions) which show critical extra- and introverted reflection.

Thus, pedagogical reflection of the teacher provides both generalization of own experience, and understanding of experience of others (Mitina, 2004). In the conditions of activity of pedagogical establishment generalization of own experience, exchange and understanding of experience of colleagues occurs during self-analysis of the spent classes, the analysis of open classes, at meeting of subject-cycle commissions, in the course of participation in scientific and methodical seminars, trainings, debates, during certification.

Therefore, the teacher's professional reflection includes the psychological component. It is the core of each personality, which later acquires a self-formed diffusive or professional status. Still, it is vital to consider psychological patterns of reflection in the methodological context.

Psychological and Pedagogical Conditions and Means of Developing Professional Reflection in Mathematics Teachers in the System of Methodical Work

Based on the analysis of theoretical sources and practice of pedagogical colleges, the authors of the article have identified the following psychological and pedagogical conditions for *the successful development of professional reflection of teachers of mathematical disciplines in the system of methodical work*: ensuring the teacher's awareness of mathematical disciplines of the content, structure and means of development of professional reflection; formation of an objective self-assessment of the personality and own professional activity of teachers of mathematical disciplines; introduction of individual and group means of development of professional reflection in the system of methodical work of pedagogical college; creation of a reflective environment in the system of methodical work of a pedagogical institution.

Obviously, the features of professional reflection of teachers of mathematical disciplines are determined by the content of the subject and the dominant teaching methods, the feedback is important - the level of knowledge of students of the subject.

The authors of the article agree with Elentaeva (2015), who believes that the purpose of reflection is not just to leave the lesson with a fixed result, but to build a semantic chain, to compare the ways and methods used by others with their results.

Such means of reflection as understanding, problematization, adjustment of activity, estimation and discussion of the received result are rationally applied. In the context of Piskunova's research (2005), one should talk about the reflective-project activity of the teacher. Reflection is the basis of pedagogical design at all stages: from goal setting to obtaining and analyzing the result, which can be represented as the following chain: purpose of pedagogical activity - reflective analysis of the situation - selection, design and construction of means of pedagogical activity on the basis of reflection on the adequacy of these means to the goal - project implementation - reflection on the distinction between project and implementation (goals and results).

A clear illustration of this pedagogical reflection can be a popular practice among American teachers to study any practical professional problem. During the school year, school teachers carry out theoretical and practical experimental study of the problem, following the stages of research planning, conducting and preparing a scientific report established by the scientific standard. Preparation and presentation by the teacher of such research work is one of the possible strategies for improving his professional skills. Prepared scientific reports are published in special collections.

Therefore, an important condition for the successful development of professional reflection of teachers of mathematical disciplines in the system of methodical work is *to ensure awareness of the teacher of mathematical disciplines of the content, structure and means of professional reflection.*

For the purpose of continuous professional development the teacher of mathematical disciplines carries out self-esteem of professional activity for the purpose of its perfection. Self-esteem of the result of their own activities is associated with the assessment of achievement and reflects satisfaction or dissatisfaction with their own achievements. Along with this, the teacher conducts a self-esteem of professional potential, i.e. their own ability to achieve goals.

Adequate self-esteem involves a person's recognition of both their strengths and weaknesses, mistakes, analyzing their causes, so as not to repeat them again. By knowing and evaluating oneself, a person can more consciously, rather than spontaneously, control his behavior and engage in self-education. Therefore, the authors of the article believe that the next condition for the development of professional reflection is *the formation of an*

objective self-esteem of the individual and their own professional activities of teachers of mathematical disciplines.

Another important condition for the development of professional reflection of a teacher is *the introduction of individual and group tools for the development of professional reflection in the system of methodical work of the pedagogical college.*

Psychological and pedagogical means of developing professional reflection of teachers of mathematical disciplines in the system of methodical work of the pedagogical college are the following: means of individual reflection (repetition technique, counseling, individual reflection games, solving reflection problems, keeping a reflection diary); collective means of developing professional reflection of the teacher (reflective debates, reflex interviews, reflective classes, consultation, tutorial, group reflection games, development of programs for monitoring their (or colleagues) actions in professionally significant situations with subsequent analysis of the received materials pedagogical reflection); introduction of a special training course "Development of professional reflection of teachers of mathematical disciplines in the system of methodical work of the pedagogical college".

Consider a means of developing professional reflection - the development of programs to monitor their actions (or the actions of their colleagues) in professionally significant situations, followed by analysis of the received materials. The program is a pre-thought out plan of any activity, work (Bilodid, 1977). In this case, a special role is played by: self-observation as a purposeful, according to a pre-designed plan, recording of the studied phenomena, and further analysis of what is found in its result. It is important that the conclusions drawn from the observation of their actions and the actions of colleagues are further used for practical purposes. These programs allow you to evaluate the results of their professional activities, to understand their own importance in the team, to form areas of self-realization as a teacher.

It is advisable to use for the development of professional reflection such a tool as keeping a reflection diary, in which the teacher can objectively assess their experience, activities, truthfully identify successes and failures, form new ways to implement professional plans, predict strategies to improve activities. The reflection diary provides several areas: self-knowledge (determination of personal qualities and problems that concern), analysis of professional opportunities (detection and adjustment of professional development), development of reflective skills (development of reflective skills).

Such a diary may contain a number of questions about the forecast of professional activities: «"What are my professional opportunities as a teacher?", "What changes can I make in my own professional activity in order to improve it?", etc. The authors of the article claim that a reflective diary is an effective means of developing professional reflection.

There are a number of exercises aimed at developing the participant's competencies as a teacher who is ready for reflection, realizes his professional knowledge and skills, rethinks the stereotypes of his own behavior, makes informed decisions, plans and organizes professional activities, is ready for creativity in work, is capable of self-esteem, introspection, self-knowledge and self-actualization, understands the internal state and reasons for the behavior of another person, the mechanism of organizing collective activities, coordinates various social roles in the group.

Kondratets (2012) states that reflection is a way to professional development, and considers the possibility of learning to reflect, while offering exercises "My goal", "Shine of success", "Flower of success". Shindina (2016) offers a set of exercises aimed at developing reflection: "Self-portrait", "Without a mask", "Carousel", "Quality", "Commission shop", "What step am I on?", projective drawing "I such as I am", "Three names", figurative-reflexive procedure "Tree", figurative-reflexive exercise "Give yourself a name". Rau (2014) prepared classes for teachers with elements of training "Development and improvement of reflective abilities of the teacher", which uses a number of exercises "Goal Tree", "Dishwasher", "Group work", "Glass doors", "Reflection in a circle". These exercises are performed in pairs or in groups. The tasks of these exercises are quite diverse:

- describe yourself to a stranger (appearance, walk, manner of speaking, clothing style);
- continue the unfinished phrase without prior preparation;
- to find out the state, mood and feelings of one of the participants with the help of questions that need to be answered "Yes";
- it is easy to get in touch, get acquainted, maintain a conversation and say goodbye to the next meeting with a stranger;
- identify their best and worst qualities and rank them;
- indicate your location on a step of ten steps;
- write down three variants of your name and describe yourself according to the specified names;
- present yourself in the form of a tree and describe it;

- draw a tree that symbolizes the scale of achievements, and mark the place where the participant is;
- introduce yourself to the dishes and give clear instructions for its care;
- act as an educator (give a task) or a pupil (perform the task);
- without words and at a distance to describe to a colleague the place and time of the next meeting;
- to express compliments to each other;
- draw the sun and write down the components of professional success on the rays;
- draw a flower and on the back of the petals write down the obstacles that prevent success;
- draw a circle, which schematically means the day, and divide it into parts that determine the amount of time spent on work, family, friends, leisure, household chores, etc.;
- to answer a number of questions that relate to the most important case at this time for the participant;
- write a text about what worries the participant the most;
- discuss quotes from famous people.

Discussion of the results is carried out during the task or after the exercise by all participants. The time for the task is given from 3-4 minutes to 15-20 minutes, depending on its complexity.

One of the means of developing professional reflection is to conduct training on this topic, which will have a clear purpose, content that meets a number of rules, structure and methods (verbal, visual, demonstration, interactive, technological).

In Wikipedia (2004), one can find that “training” is a planned process of modifying (changing) a learner's attitude, [knowledge](#), or behavioral skills through learning [experience](#) in order to achieve effective performance in one activity or field. Bevz, & Hlavnyk (2005) note that training is at the same time: an interesting process of getting to know yourself and others; communication; effective form of knowledge acquisition; a tool for the formation of skills and abilities; form of experience extension. Sydorenko (2007) understands training as learning technologies of action on the basis of a certain concept of reality in an interactive form. Semenova (2006) believes that training is an organizational form of teaching and educational work, which, based on the experience and knowledge of its participants, ensures the effective use of various pedagogical methods by creating a positive emotional atmosphere in the group and is aimed at obtaining formed skills and life competencies.

Training as a group of methods aimed at developing the ability to learn and master any complex activity is considered by Emelyanov (1985). Training is a form of integrated use of interactive learning technologies. On the other hand, training is a group educational event aimed at changing the skills of participants and their attitude to something and based on methods of interactive learning and learning through experience. Psychological training is a form of active learning of behavioral skills. At the training, the participant is invited to perform certain exercises aimed at developing or demonstrating psychological qualities or skills (Wikipedia, 2004). Based on these statements, one can conclude that training is one of the means of forming and developing professional reflection of the teacher, which helps not only to teach but also to consolidate in the minds of the changes that occur in the personality of the specialist.

Each training has a specific purpose. This can be informing, acquiring new skills and abilities, reducing something undesirable, mastering new technologies, finding effective ways to solve problem situations, forming a positive attitude towards yourself, others and life, and so on. Based on this, the authors of the article note that training sessions on this issue are aimed at teaching participants the technology of reflection and reflective analysis of professional activity.

The content of the training (stages, topics, ideas, questions, patterns of phenomena) is important for its effectiveness and must meet such requirements:

- be as planned as possible;
- close to the needs and problems of the participants;
- correspond to the level of development of participants;
- should be not only useful, but also absolutely necessary for participants;
- meet the values, knowledge, skills and abilities of positive behavior.

The training has a structure and usually consists of three blocks: introductory, basic and final. The introductory block includes acquaintance with trainers, participants, rules of carrying out and the purpose of training. The basic block of training is the implementation of the goal by performing specific tasks (exercises), during which the assessment of the level of awareness of participants, updating the problem, providing information, acquiring practical skills and presenting the result. The final block includes the results of the training and assessment of changes in the level of awareness of participants.

Techniques, methods used during the training are various: information messages, conversations, mini-lectures, lecture-dispute, problem

lecture, discussions, work in small groups, the method of specific situations (case method), moderation method, "snow bullet", "brainstorming", projective drawing, situation analysis, game methods, tasks for self-knowledge, etc. When choosing training methods use the following rules: compliance with the objectives of the training, the level of the group, the qualifications of the coach and the size of the group, taking into account the training time.

The considered content, structure and methods of training should be applied during drawing up and carrying out of trainings on development of reflection of professional activity.

Reflective debates form the participants' need for reflection. Debate - discussion of any issue, exchange of views (Zyazyun, Kramushchenko, & Krivonos, 2004). A problem situation (on the content or behavior of a person in this situation) is created, which is solved with the help of questions to identify the problem and the necessary actions to overcome it. Debate is characterized by the existence of rules by which clashes of different points of view are ensured, which are supported by certain arguments. Thus, the debate is a rather complex process, which includes preparation, the debate itself, the analysis of the debate held and the improvement of the skills of the debate. The process of development of reflection is observed during the analysis of the given problem situation, construction of a line of defense of the point of view, the analysis of the conducted debate process.

Another means of developing professional reflection is a reflexive interview or reflexive listening - feedback from the person speaking. It is used both to clarify what is heard and to analyze what the speaker has said. During the reflexive interview, the listener actively uses the verbal form to understand what he has heard, using a number of questions: "What did you mean by that?", "I didn't understand what you meant?", "Is that all you wanted to say?", "Won't you say it again?" or a series of phrases of this type: "In your opinion,...", "As I understand it,...", "In other words, you think...". In addition, the listener can use expressions to reflect the feelings of the respondent or summarize what was said: "Apparently, you feel...", "I think you now feel...", "If you summarize what you said, then...", "Your main ideas is ...". With the help of a reflexive interview, a person who answers a number of questions, during the interview gets into a state of self-actualization and conducts self-analysis of their actions.

One of the ways of developing professional reflection - a reflexive tutorial allows you to develop in the professional field by analyzing the activities carried out as a result of answering a number of important questions relating directly to professional activity: the correct choice of the

type and structure, techniques and methods of professional activity in terms of its goals and objectives, features and difficulties of professional activity, the possibility of its implementation in a different way.

The basis of reflexive games is the participant's acceptance of a certain role in solving the problem of the simulated problem situation, as well as the subsequent group analysis of actions that took place during its implementation. Reflective games allow you to learn to determine the motives of another person's actions and analyze his behavior.

Among the means that allow you to develop the ability to reflect is a reflexive consultation. In this case, the word "consultation" is used figuratively to replace the word meeting. A "reflexive consultation" is held in the form of a discussion of a specific problem by a group of professionals, its analysis, and the search for effective solutions. This encourages professional reflection on yourself and your colleagues in the current situation.

Analysis of specific situations is one of the means of developing professional reflection. It is carried out concerning the educational situation which is reported by the chairman of the subject-cycle commission, the methodologist. After that, the situation is discussed, then options for possible solutions are proposed, as a result of which the optimal ones are chosen. During the analysis of a specific pedagogical situation, teachers solve the following tasks that contribute to the development of professional reflection: highlighting a set of pedagogical problems of the situation, determining its characteristics and structure, identifying the causes that led to the pedagogical situation, the consequences that led to its emergence, the specified situation, construction of system of estimations of its components, preparation of forecasts concerning probable, potential and desirable future, development of programs of activity in this concrete situation. In this way, teachers learn to analyze pedagogical situations in which they find themselves, draw conclusions and plan further professional activities in order to improve.

These psychological and pedagogical tools for the development of professional reflection are aimed at developing teachers' ability to assess personal and professional qualities, analyze their actions and effectiveness of their own activities, comprehend professional tasks, integrate their practical experience and theoretical knowledge as criteria for assessing the pedagogical situation. As a result of creating a reflective environment, different types and kinds of professional reflection are activated.

The specifics of the application of psychological and pedagogical tools for the development of professional reflection in the system of methodical

work of the pedagogical college are as follows: preliminary instruction of the heads of subject-cycle commissions on the essence, content and methods of using reflection tools; the validity of their choice in accordance with the forms of methodical work; differentiation of reflective means depending on the level of development of professional reflection of teachers; their application taking into account the peculiarities of the profession.

Undoubtedly, professional reflection is considered by scientists as a professionally significant quality of a teacher and one of the main factors of his professional growth, as an important factor in pedagogical skills is the ability to analyze their own activities and the work of colleagues. Analysis of scientific research shows that the ability to reflect does not develop spontaneously with the acquisition of professional experience. It can be developed under certain specially organized conditions. There is a need to create a reflective environment - an environment in which the teacher, along with the learning process conducts a constant analysis of their own professional qualities, pedagogical competencies and the search for solutions to problem situations of professional activity. Creating a reflective environment will fill the process of teaching teachers with personal content, will promote interest in professional self-development and increase the effectiveness of their own activities. Therefore, it can be argued that the creation of a reflective environment is one of the important tasks of the system of methodical work of higher education and one of the main conditions for the development of professional reflection of a teacher is *to create a reflective environment in the system of methodical work of a pedagogical institution*. In this study, the authors of the article rely on the interpretation of the reflective environment, who characterize it as a system of conditions for the development of personality, opens up the possibility of self-exploration and self-correction of socio-psychological and professional resources and contributes to the emergence of the need for reflection (Khlusova, 2011). The reflexive environment is characterized by the maximum consideration of the requests and needs of all participants in the pedagogical process, and on the basis of this, the relations of the subjects with each other and with the surrounding society are regulated. When interpersonal interactions are established, a certain reflexive environment inherent only in these interactions is formed. A correctly built reflexive environment just starts to act and becomes active (Khlusova, 2011).

The created reflection environment cannot be controlled from the outside. This environment operates through self-regulation. For the teacher, the reflective environment allows a conscious choice of means of self-development and self-realization. Therefore, a necessary condition for the

development of professional reflection is the creation of a reflective environment. According to Kondratets (2014) "it is in the reflexive environment that specially organized reflexive activity will be effectively carried out, which is an important condition for the development of professional reflection, has a purposeful, transformative, conscious nature." Sushchenko (2011) understands the reflection environment as a set of conditions for long-term interaction of subjects and a set of specific forms of interaction, where self-realization of subjects, mutual exchange of means, reflection of oneself and others are possible. Gura (2008) interprets the reflexive environment as a system of conditions for personality development that open the possibility of self-research and self-correction of socio-psychological and professional resources, the main function of which is to promote the individual's need for reflection - the basic mechanism of self-development.

The subject of creating a reflective environment among college teachers who teach one subject (e.g., mathematics) is the subject-cycle commission.

The authors of the article assume that the arsenal of means of forming a reflective environment will be significantly enriched, and the effect will increase if the meetings of the subject-cycle commission use a number of special tools to develop professional reflection of the teacher, namely the inclusion of reflective procedures in the structure of various forms of methodical work: meetings of subject-cycle commissions, attestations, analysis (self-analysis) of classes.

The main areas of work of the subject-cycle commission, which allow to develop professional reflection of the teacher: educational work (systematic analysis of the content of curricula, changes to make logical content of the topics studied, based on their own experience and experience of colleagues, establishment of interdisciplinary links, analysis of individual work of the teacher with students, study and introduction of experience of work with gifted youth, differentiated training of students, methods of individual consultations); methodical work (study of innovative technologies and their introduction into the educational process, improvement of methodical skill of teachers, formation of motivation of scientific and research activity at the teacher, development of separate methods of teaching of disciplines, writing of developments on the basis of own experience, organization of open classes and their analysis, discussion at meetings of the commission of mutually visited classes, organization of seminars, round table discussions on discussion and generalization of experience of separate teachers, involvement of teachers in participation in

work of regional and regional methodical associations of higher educational institutions of I-II level accreditation); organizational work (development of the main directions of work and the actual organization of the commission). In their work, subject-cycle commissions of college teachers use various forms of conduct, which in turn allow to develop the ability to reflect: meetings, joint meetings with other commissions, open meetings, attendance by teachers, reviews-competitions of methodological developments, methodical reports and abstracts, pedagogical researches, methodical weeks of the cycle commission, discussions, seminars, "small pedagogical council", etc.

During the attestation of teachers a directly reflective environment is created. Moreover, during the certification a wide range of professional activities of the teacher is analyzed: documentation (implementation of plans, programs), statistical data in the period between certifications (dynamics of the level of student achievement, their participation in competitions and Olympiads), participation in methodological activities.

A reflective environment can be created if you do not conduct the usual analysis of the lesson, and create a situation of self-reflection. This can be done by analyzing the lesson according to the following plan (including in the analysis a number of questions that encourage reflection):

1. The topic of the lesson, its place in the system of classes. (How do you assess your own level of knowledge on the topic of the lesson?).

2. The purpose of the lesson, the task. Reasons for success or failure of each task. (What changes would it be appropriate to make?).

3. Organization of students to work in class. (Are students prepared for the class? What are the reasons? Which of the following reasons could you attribute to the objective, and which points depended directly on you? In what form and by what methods was the inspection carried out? How was the result of the knowledge test summed up? How effective was this work? What would you like to change in the organization of this stage? Which of the techniques you used to organize students were the most effective and least effective and why?).

4. Conducting classes directly. (What is the degree of complexity of the new material for students? What difficulties in introducing new material did you predict? What predictions came true and which did not? Why? What unforeseen difficulties arose in the real educational situation? Did you manage to cope with them? How? What methods of organizing attention in class did you use? How did you manage to ensure stability, timely switching of attention and concentration of attention at the lesson, at its various stages? How successful have you been? What would you change? How did

you create an attitude towards the perception of new material? How effective and why? What methods of updating previously acquired knowledge did you use and with what result? What are the reasons for this or that effectiveness? What types of memory did you rely on and in what tasks? How correct was your choice? What types of memory development was provided by the offered tasks? What types of thinking did you mainly rely on during your work? Did you create a problem situation? What were the difficulties in mastering new concepts by students?, etc.)

5. Emotional background of the lesson. (What emotional background dominated the class and for what reasons? How satisfied are the students with the class and why? How satisfied are you with the class and why?)

It is advisable to create discussions during the various forms of methodical work to use discussions, which are held in order to form the participants' own view on this problem, identify ways to solve it, understanding professional activities. Discussions provide an opportunity to develop the ability for self-assessment and self-analysis. During its holding, participants form a willingness to rethink the experience and effectiveness of their own professional activities, awareness of the content of their actions.

Another means of creating a reflective environment is a creative report of the teacher, which encourages the analysis of their own professional activities and is aimed at finding, supporting and disseminating promising pedagogical experience of the teacher. Conducting a creative report includes the collection and processing of information and coverage of promising pedagogical experience of the teacher. During the preparation and analysis of the creative report, different areas are identified: scientific, methodological, practical.

Pedagogical readings provide analysis, comprehension and generalization by teachers of pedagogical experience, which encourages the teacher to professional reflection and is a means of creating a reflective environment. After all, the teacher must identify from the system of their own achievements the most important, which will be useful to colleagues.

Conclusions

Thus, professional-pedagogical reflection is based on homogeneous mechanisms of reflection as such. However, the level of teachers' awareness, the conflict between their philosophy and worldview (including the understanding of educational activities) and the fundamental realities of the educational process make their reflection a resource and an area of active

development. However, it is possible only due to motivation and intention for such development, as well as sufficient flexibility, which helps one to overcome conservative personal attitudes.

The specified pedagogical conditions for the successful development of professional reflection of teachers of mathematical disciplines in the system of methodical work are: ensuring awareness of the teacher of mathematical disciplines of the content, structure and means of development of professional reflection; formation of an objective self-esteem of the personality and own professional activity of teachers of mathematical disciplines; introduction of individual and group means of development of professional reflection in the system of methodical work of pedagogical college; creation of a reflective environment in the system of methodical work of a pedagogical institution.

The generalization of the received theoretical material and the gained empirical experience is carried out in the course of development of the maintenance and structure of a special educational course "Development of professional reflection of teachers of mathematical disciplines in system of methodical work of pedagogical college". The next step is the construction of a structural and functional model for the development of professional reflection of teachers of mathematical disciplines in the system of methodological work.

References

- Babansky, Yu. K. (1987). *Intensifikatsiya protsessa obucheniya* [Intensification of the learning process]. Znaniya. http://www.ahmerov.com/book_563.html
- Bevz, V., & Hlavnyk, O. (2005). *Osnovni polozhennya shchodo provedennya treningiv* [Basic provisions for conducting trainings]. Retrieved from <http://ru.osvita.ua/school/method/technol/598>
- Bilodid, I. K. (1977). *Slovyk ukrayinskoyi movy* (T. 1-11) [Dictionary of the Ukrainian language (Vol. 1-11)]. Naukova dumka. http://ukrlit.org/slovyk/slovyk_ukrainskoi_movy_v_11_tomakh
- Calderhead, J. (1989). Reflective teaching and teacher education. *Teaching and Teacher Education*, 5(1), 43–51. [https://doi.org/10.1016/0742-051X\(89\)90018-8](https://doi.org/10.1016/0742-051X(89)90018-8)
- Elentaeva, Zh. (2015). *Professionalnaya refleksiya kak faktor razvitiya innovatsionnogo potentsiala pedagoga* [Professional reflection as a factor in the development of the teacher's innovative potential]. Retrieved from <http://collegu.ucoz.ru/publ/67-1-0-19896>
- Emelyanov, Yu. N. (1985). *Aktivnoye sotsialno-psikhologicheskoye obucheniye* [Active social and psychological education]. Publishing House of Leningrad

- University.
<http://lib.mgppu.ru/opacunicode/app/webroot/index.php?url=/notices/index/IdNotice:14766/Source:default>
- Gerasymova, I., Maksymchuk, B., Bilozero, M., Chernetska, Yu., Matviichuk, T., Solovyov, V., & Maksymchuk, I. (2019). Forming professional mobility in future agricultural specialists: the sociohistorical context. *Revista Romaneasca pentru Educatie Multidimensionala*, 11(4), 345–361.
<https://doi.org/10.18662/rrem/195>
- Gura, T. E. (2008). *Refleksivne seredovyshche yak skladova rozvyvalnoyi profesynnoi osvity maybutnikh psykholohiv* [Reflexive environment as a component of developmental professional education of future psychologists]. *Sotsialni tekhnolohiyi*, 38, 127–132.
https://virtkafedra.ucoz.ua/el_gurnal/pages/vyp7/konf3/GuraTE.pdf
- Khlusova, A. A. (2011). Refleksivnaya sreda kak komponent tekhnologii formirovaniya refleksivnoy kompetentnosti studentov [Reflexive environment as a component of the technology of forming students' reflective competence]. *Istoricheskaya i sotsialno-obrazovatel'naya mysl*, 3, 1–3.
<http://cyberleninka.ru/article/n/refleksivnaya-sreda-kak-komponent-tehnologii-formirovaniya-refleksivnoy-kompetentnosti-studentov>
- Kondratets, I. (2012). Refleksiya – krayina pedahohichnoho zadzerkallya [Reflection as the country of pedagogical mirror-world]. *Doshkilna osvita*, 7, 28–31.
- Kondratets, I. (2014). Profesiyna refleksiya vykhovatelya-metodysta yak instrument korektsiyi vzayemodiyi z pedahohamy [Professional reflection of an educator-methodologist as a tool for correction of interaction with teachers]. *Vykhovatel-metodyst doshkilnoho zakhladu*, 10, 39–51.
- Konyukhov, N. I. (1996). *Slovar-spravochnik prakticheskogo psikhologa* [Dictionary-reference book of a practical psychologist]. Modek.
<http://catalog.turgenev.ru/Opac/index.php?url=/notices/index/IdNotice:12596/Source:default>
- Korthagen, F., & Vasalos, A. (2005). Levels in reflection: core reflection as a means to enhance professional growth. *Teachers and Teaching*, 11(1), 47–71.
<https://doi.org/10.1080/1354060042000337093>
- Maksymchuk, B., Matviichuk, T., Solovyov, V., Davydenko, H., Soichuk, R., Khurtenko, O., Groshovenko, O., Stepanchenko, N., Andriychuk, Y., Grygorenko, T., Duka, T., Pidlypniak, I., Gurevych, R., Kuzmenko, V., & Maksymchuk, I. (2020). Developing healthcare competency in future teachers. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(3), 24–43.
<https://doi.org/10.18662/rrem/12.3/307>
- Marcos, J. J. M., Miguel, E. S., & Tillema, H. (2009). Teacher reflection on action: what is said (in research) and what is done (in teaching). *Reflective Practice*, 10(2), 191–204. <https://doi.org/10.1080/14623940902786206>

- Mälkki, K. (2011). *Theorizing the nature of reflection*. (PhD thesis). University of Helsinki, Helsinki.
<https://helda.helsinki.fi/bitstream/handle/10138/26421/theorizi.pdf?sequence=1&isAllowed=y>
- Melnyk, N., Bidyuk, N., Kalenskyi, A., Maksymchuk, B., Bakhmat, N., Matviienko, O., Matviichuk, T., Solovyov, V., Golub, N., & Maksymchuk, I. (2019). Modely y orhanyzatsiyone osobyne profesyonalne obuke vaspytacha u pojedynym zemlyama Evropeyske Unyye y u Ukrayiny [Models and organizational characteristics of preschool teachers' professional training in some EU countries and Ukraine]. *Zbornik Instituta za pedagogska istrazivanja*, 51(1), 46–93. <https://doi.org/10.2298/ZIPI1901046M>
- Messmann, G., & Mulder, R. H. (2015). Reflection as a facilitator of teachers' innovative work behaviour. *International Journal of Training and Development*, 19(2), 125–137. <https://doi.org/10.1111/ijtd.12052>
- Mitina, L. M. (2004). *Psikhologiya truda i professionalnogo razvitiya uchiteley* [Psychology of work and professional development of a teacher]. Logos.
<https://www.twirpx.com/file/296369/>
- Nerubasska, A., & Maksymchuk, B. (2020). The demarkation of creativity, talent and genius in humans: a systemic aspect. *Postmodern Openings*, 11(2), 240–255. <https://doi.org/10.18662/po/11.2/172>
- Onishchuk, I., Ikonnikova, M., Antonenko, T., Kharchenko, I., Shestakova, S., Kuzmenko, N., & Maksymchuk, B. (2020). Characteristics of foreign language education in foreign countries and ways of applying foreign experience in pedagogical universities of Ukraine. *Revista Romaneasca Pentru Educatie Multidimensionala*, 12(3), 44–65.
<https://doi.org/10.18662/rrem/12.3/308>
- Pareja Roblin, N., & Margalef, L. (2013). Learning from dilemmas: teacher professional development through collaborative action and reflection. *Teachers and Teaching*, 19(1), 18–32.
<https://doi.org/10.1080/13540602.2013.744196>
- Piskunova, Ye. V. (2005). Professionalnaya pedagogicheskaya refleksiya v deyatel'nosti i podgotovke pedagoga [Professional pedagogical reflection in the activity and training of a teacher]. *Vestnik Tomskogo gosudarstvennogo pedagogicheskogo universiteta*, 1, 62–66.
<http://cyberleninka.ru/article/n/professionalnaya-pedagogicheskaya-refleksiya-v-deyatelnosti-i-podgotovke-pedagoga>
- Ploderer, B., Reitberger, W., Oinas-Kukkonen, H., & van Gemert-Pijnen, J. (2014). Social interaction and reflection for behaviour change. *Personal and Ubiquitous Computing*, 18, 1667–1676. <https://doi.org/10.1007/s00779-014-0779-y>

- Polonsky, V. M. (2004). *Slovar po obrazovanii i pedagogike* [Dictionary of Education and Pedagogy]. Vysshaya shkola. <https://www.twirpx.com/file/1723205/>
- Rau, O. (2014). *Zanyatiye dlya pedagogov s elementami treninga* [Lesson for teachers with elements of training]. Retrieved from <http://www.maam.ru/detskijasad/zanjatie-dlja-pedagogov-s-yelementami-treninga-razvitie-i-sovershenstvovanie-refleksivnyh-sposobnostei-pedagogov.html/2014/>
- Semenova, A. V. (2006). *Slovniki-dovidnyk z profesiynoyi pedabohiky* [Dictionary-reference book on professional pedagogy]. Palmyra. <https://www.pedagogic-master.com.ua/public/semenova/slovník.pdf>
- Shchedrovitsky, G. P. (1974). Kommunikatsiya, deyatelnost, refleksii [Communication, activity, reflection]. *Issledovaniya rechemyslitel'noy deyatelnosti*, 1, 12–28. <https://www.fondgp.ru/publications/%D0%BB%D0%B5%D0%BA%D1%81%D0%B8/>
- Sheremet, M., Leniv, Z., Loboda, V., & Maksymchuk, B. (2019). The development level of smart information criterion for specialists' readiness for inclusion implementation in education. *Information Technologies and Learning Tools*, 72, 273–285. <https://doi.org/10.33407/itlt.v72i4.2561>
- Shindina, I. A. (2016). *Kompleksy uprazhneniy, napravlennykh na razvitiyerefleksii* [Complexes of exercises aimed at the development of reflexion]. Retrieved from <https://nsportal.ru/nachalnaya-shkola/materialy-mo/2016/02/01/kompleks-uprazhnenie-napravlennyh-na-razvitie-refleksii>
- Shynkaruk, V. I. (1986). *Filosofskyy slovnyk* [Philosophical dictionary]. Editor-in-Chief of the Ukrainian Soviet Encyclopedia. https://shron1.chtyvo.org.ua/Shynkaruk_Volodymyr/Filosofskiy_entsykl_opedychnyi_slovnyk.pdf
- Sushchenko, O. H. (2011). Rozvytok profesiynoyi refleksiyi maybutnikh pedahohiv u protsesi fakhovoyi pidhotovky [Development of professional reflection of future teachers in the process of professional training]. *Visnyk Luhanskoho natsionalnoho universytetu imeni Tarasa Shevchenka. Pedabohichni nauky*, 20(231), 95–100. http://nbuv.gov.ua/UJRN/vlup_2012_22%281%29_40
- Sydorenko, E. V. (2007). *Tekhnologi sozdaniya treninga. Ot zamysla k rezultatu* [Technologists of training creation. From concept to result]. Rech. <https://www.twirpx.com/file/387417/>
- Wikipedia. (2004). *Trening* [Training]. Retrieved from <https://uk.wikipedia.org/wiki/2004>
- Zyazyun, I. A., Kramushchenko, L. V., & Krivonos, I. F. (2004). *Pedabohichna maysternist* [Pedagogical skills]. Vyshcha shkola. <https://sociology.knu.ua/uk/library/pedagogichna-maysternist-pidruchnik-iazzyazyun-lvkramushchenko-ifkrivonos-ta-za-red>