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## PSYCHODIDACTIC ASPECTS OF FUTURE TEACHERS' CREATIVE COMPETENCE FORMATION

*The aim of the paper is to reveal the psychological peculiarities of the development of creative competence of future Physics and Mathematics teachers. The program which contributes to the development of creative competence of future teachers is presented in the article. The experiment involved 117 students-future teachers majoring in Physics and Mathematics (the experimental group consisted of 68 and was taught according to the designed program, and the control group – 50 persons – was taught using traditional methods). As a result of the experiment, there has been observed the increase of the level of creative competence in the experimental group of students, which is indicative of the efficiency of the designed program. It has been approbated during the courses “Psychology”, “Age Psychology”, “Psychology of Higher School”, “Organization of Scientific Research”, during the meetings of the scientific studio “The Way to Success”.*

**Keywords:** *creative competence, creative educational environment, future teacher, pedagogical creativity, faculty of Physics and Mathematics.*

### Introduction

The formation of a harmonious creative educational environment of a modern educational institution requires deep consideration of psychodidactic aspects of the educational process organization, which contributes to the creative self-realization of every student as future teachers. Despite the great number of psychological and pedagogical research studies on the development of pedagogical creativity, creative skills of students, the issue of forming creative educational environment that promotes the development of creative skills of future teachers of Physics and Mathematics is understudied. The effectiveness of creating such an environment depends on properly selected psychological and pedagogical tools, which should be integrated in the educational process of a university taking into account the specifics of the specialty.

The study of the issue of students' creative competence formation is based on genetic modeling method of researching an integral personality, revealed in the work of S. Maksymenko “Psychology of Personality” [1]; the peculiarities of theoretical model of creative personality defined in the work of V. Prayer “Psychological Theory of Creativity” [2]; features of the development of professional competence of future teachers which are disclosed in the work of S. Panova “Acmeologic Approach to the Study of the Issue of Professional Competence of Future Mathematics Teachers” [3]; the issue of improving the level of professional competence of future teachers in

practice which is presented in the study of O. Tsokolenko “Formation of Professional Competence of Future Physics Teachers in the Process of Pedagogical Practice” [4]; peculiarities of the development of leadership qualities, creativity of students described in the work “Tolerance, Volunteerism and Leadership” by I. Kapustian, S. Yalanska, T. Nikolashina [6].

Despite a number of philosophical, psychological and pedagogical research studies on the formation of creative competence formation in general, the issue of the formation of future Physics and Mathematics teachers' creative competence in particular is still understudied and that is why relevant.

The paper **aims to** reveal psychodidactic aspects of future Physics and Mathematics teachers' creative competence formation.

The objectives of the study are as follows: revealing the essence of the designed program for the development of creative competence of future teachers, determining the results of the implementation of a program for developing the creative competence of future teachers at the Faculty of Physics and Mathematics of a pedagogical higher educational institution.

### Research Methods

Creative competence of future teachers is considered as the highest level of their professional competence, when a person carries out professional activity at the creative basis in a stable and continuous way.

It has been determined that the structure of future teachers' creative competence is based on the main structural components of professional competence: personality-developing; activity-developing; communicative; professional and mastering.

We distinguish the following criteria for achieving creative competence: independence as a criterion for the personality-developing component, whose indicators are value-pedagogical, motivational competencies; mobility in the use of innovative means of work as a criterion for the activity-developing component, whose indicators are psychological and pedagogical, organizational, methodical competencies; communicative skills as the criterion for the communicative component, the indicators of which are verbal-communicative, verbal-cognitive competencies; effectiveness as a criterion for a professional component, whose indicators are didactic, informational competencies, conceptual thinking; readiness for creativity as a criterion for mastering experience, indicators of which are creative thinking, and self-improvement.

There are the following levels of future teachers' professional competence: immature, partly mature, mature (creative competence).

The experiment involved 117 students-future teachers majoring in Physics and Mathematics (the experimental group consisted of 68, and the control group – 50 persons).

Firstly, the respondents were suggested to fill in the questionnaire (designed by us) concerning the formation of creative educational environment at a university.

A modified variant of the "Personality Map" method (according to K. Platonov) was used for examining the level of the respondents' personality-developing component of creative competence.

Activity-developing component (psychological and pedagogical, organizational, methodical competencies) was studied using the document analysis method (according to V. Yadov), and self-monitoring method (according to O. Kulpe).

The study of the professional component of professional competence was carried out with the help of the author's technique "Conceptual Thinking Inventory" and the method of expert evaluation (Delphi method).

The levels of manifestation of didactic, informational competencies were determined on the basis of the expert evaluation (Delphi method) (the role of experts was performed by teachers) during the classes.

Besides, we also applied W. Wundt's technique.

The research results were processed using factor analysis of variance using F-distribution.

### Research Results

According to the first questionnaire (designed by us) concerning the things that in the respondents' opinions will contribute to the development of creative educational environment we have obtained the following results: 93% of the respondents believe that it is creative approach to the assignment and solution of tasks, 96% think that it is teachers' professional self-development, 94% have cho-

sen motivation for studying, 97% believe it is the use of knowledge in psychology in everyday professional activities, 88% have chosen favorable psychological atmosphere in a team, 74% believe it is professional competence of teachers that will make the educational environment creative.

We associate the effectiveness of the formation of a harmonious creative educational environment with the development of the teachers' creative competence. On the basis of definite tendencies, a program for the development of creative competence of future teachers has been created.

The goal of the program is to form a set of indicators for the development of creative competence of future teachers. It involves the creation of special educational environment in the process of teachers training at higher educational institutions with the following characteristics: a) setting oneself up for personal-developing component (value-pedagogical, motivational competence); b) setting oneself up for activity-developing component of creative competence (psychological and pedagogical, organizational, methodical competence); c) formation and development of pedagogical communication as a creative process on the basis of verbal-communicative, non-verbal competences; e) setting oneself up for professional growth on the basis of didactic, information competence, conceptual thinking; e) improvement of pedagogical skills (development of creative thinking, self-development). The integration of psychodidactic means in the educational process of a higher educational institution is considered to be important for the effective implementation of the program [5].

According to the program, the basic psychological conditions of the development of creative competence of future teachers include features of the structure of pedagogical activity; self-regulation; pedagogical activity; occupation-related creative skills.

During the formative assessment the level of personality-developing component of future teachers of Physics and Mathematics was assessed with the help of the modified version of Personality Map method by K. Platonov. Thus, it has been found that there are 6.0% and 51.5% students with a high level of value-pedagogical and motivational competencies (person-developing component) in the control and experimental groups respectively. 47.5% of the future teachers of the experimental group and 80.0% of the control group have the medium level. The low level has been found in 1.0% of the students in the experimental group and 14.0% in the control group.

Activity-developing component (psychological and pedagogical, organizational, methodical competencies) was examined on the basis of document analysis method (according to V. Yadov), and self-monitoring method (according to O. Kulpe). The results of the research have shown that 90% of the students of the experimental group perceive the activity-developing component as significant part of creative competence and 50.0% of the students in

the control group consider the development of a teacher to be an important part of the creative competence.

On the basis of the formative assessment, the distribution of the respondents was determined according to the levels of maturity of the activity-developing component of professional competence. The high level of activity-developing component has been found in 75.0% of the EG respondents and 7.0% of the CG respondents. The medium level has been revealed in 60.0% of the EG respondents and 31.0% of the control group participants. The low level of professional component maturity has been found in 1.0% of the students of the experimental group, whereas in the control group their number is 26.0%.

The obtained data according to the levels of communicative component maturity (the manifestation of verbal-communicative, verbal-cognitive competences) of professional competence show that there are 13.0% of the respondents in the experimental group and 8.0% of the students in the control group who have the high level. The medium level has been found in 72% of the future teachers in the experimental group and 74.0% in the control group. The low level was found in 3.0% and 13.0% respectively.

The study of the professional component was carried out with the help of Conceptual Thinking author's technique and expert evaluation method. The results of assessing the conceptual thinking of students in the control and experimental groups according to the results of the second stage of the research indicate that: 40.0% of the future teachers of the experimental group and 21.0% of the students of the control group have the high level of conceptual thinking. 60.0% of the experimental group students and 60.0% of the control group students have the medium level. There are no students in the experimental group with the low level of conceptual thinking, whereas there are 19.0% students with the low level in the control group.

The level of manifestation of didactic and informational competencies was determined on the basis of the expert evaluation method (5 teachers performed the role of experts). Thus, according to the results of the summative assessment, 60.0% of students in the experimental group and 14.0% of the control group have a high level of manifestation of the respective competencies. The medium level is peculiar for 40.0% of the experimental group of students and 77.0% of the control group respondents. There are no students with the low level in the experimental group, while there are 9.0% of the respondents who had the low level of informative competency in the control group.

These results are indicative of the increase in the level of maturity of professional component indicators of

professional competence in the experimental group. Thus, according to the results of the summative assessment, there are 18.8% and 47.5% students with its high level in the control and experimental groups. The medium level has been found in 52.5% of the future teachers of the experimental group and 68.5% of the respondents of the control group. There are no students with a low level of maturity of indicators of the professional component in the experimental group, whereas in the control group their number is 12.7%.

The distribution of the respondents according to their experience gaining skills was investigated by means of such indicators as creative thinking, self-development skills.

The obtained results regarding the levels of students' creative thinking in the control and experimental groups indicate that 44.0% of students in the experimental group and 20.5% of the students in the control group have a high level of creative thinking. The researchers can comprehend the material in a creative way and are capable of producing new creative ideas. So, 56.0% of students in the experimental group and 64.0% of the control group have a medium level of creative thinking. There are no students in the experimental group with a low level of creative thinking, whereas there are 15.5% of such students in the control group.

Using W. Wundt's technique, it has been found that in the process of performing tasks during the classes students of the experimental group rely mainly on creative, divergent thinking (65.0% of them have a high level), whereas in the control group creative material processing is carried out only by 14.0%. Accordingly, the medium level is peculiar for 34.0% and 46.0% of students, low – 1.0% and 40.0% respectively. Thus, on the basis of the analysis of the results of the formative assessment, it has been revealed that 52.0% and 16.0% of the students of experimental and control groups respectively have a high level of experience acquisition. There are 47.0% and 56.0% of future teachers in the experimental and control groups who have its medium level. The low level has been found in 1% of future teachers of the experimental group and 28.0% of students of the control group.

In the course of the experiment, the distribution of future teachers of the experimental and control groups according to the levels of professional competence maturity has been determined. Thus, in the experimental group, we can see statistically significant differences as compared to the control group between the results of the summative and formative assessments, which reflect the levels of the development of professional competence (Figure 1).

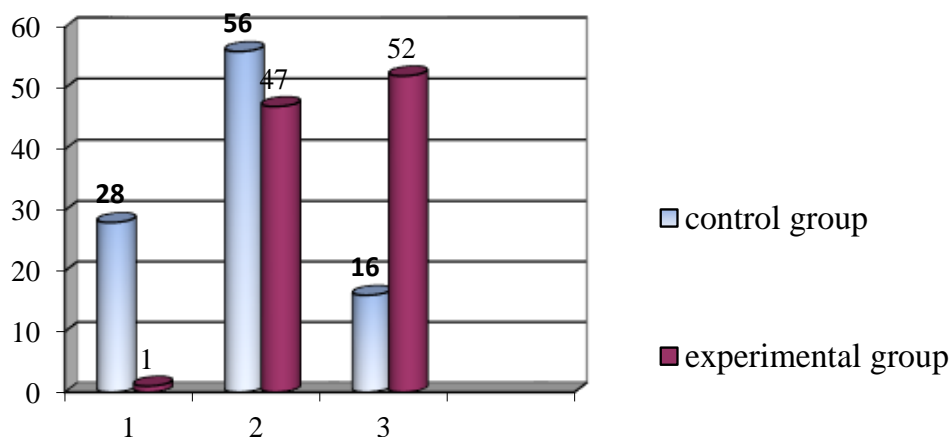


Fig. 1. Levels of Mathematics and Physics teachers' professional competence maturity in the experimental and control groups according to the results of the final assessment: 1 - low level; 2 - medium level; 3 - high level (creative competence)

Fig. 1 indicates that there are statistically significant differences between the results of the summative and formative assessments in the experimental group, which reflect the levels of professional competence maturity. The results of the study were confirmed in the process of factor analysis of variance. Using F-distribution it has been found that  $F_{\text{obt}} < F_{\text{crit}}$ , which allows us to assert the validity of the hypothesis about the influence of factor F (the suggested program of the development of creative competence) on the result of the development of professional competence.

As a result of the experiment, 52.0% of students in the experimental group have a high level of professional

competence (creative competence), whereas only 16.0% of control group students have it.

#### Conclusion

Consequently, the suggested program can contribute to the formation and development of students' creative competence. The development of the creative competence of future Physics and Mathematics teachers is provided by psychodidactic means that form the structural components – the units of the program: unit 1 “Development of professional values and motives of creative activity”, unit 2 “Acquisition of organizational and methodological base”, unit 3 “Mastering pedagogical communication”, unit 4 “Acquisition of content concepts”, unit 5 “Acquisition of the experience of pedagogical activity”.

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#### ПСИХОДИДАКТИЧНІ АСПЕКТИ ФОРМУВАННЯ КРЕАТИВНОЇ КОМПЕТЕНТНОСТІ МАЙБУТНІХ УЧИТЕЛІВ

Незважаючи на значну кількість психолого-педагогічних досліджень з розвитку педагогічної творчості, творчих здібностей студентів, магістрантів, аспірантів педагогічних вищих навчальних закладів, проблема розвитку творчої компетентності майбутніх учителів залишається не достатньо вивченою. Мета статті полягає у розкритті психологічних особливостей розвитку творчої компетентності майбутніх учителів, зокрема, фізиків та математиків. Завдання дослідження полягають у розкритті змісту авторської програми розвитку творчої компетентності майбутніх учителів, визначенні результатів впровадження програми розвитку творчої компетентності майбутніх учителів на фізико-математичному факультеті педагогічного вишу. Для розв'язання поставлених завдань було використано комплекс методів дослідження. Теоретичні: теоретичний аналіз, синтез, індукція, абстрагування, порівняння, узагальнення, систематизація; емпіричні: анкетування, тестування, метод експертних оцінок, інтроспекція; статистичні. Представлено програму, що сприяє розвитку творчої компетентності майбутніх учителів. Авторська програма передбачає створення спеціального навчально-виховного середовища у процесі підготовки вчителів у вищих навчальних закладах з такими характеристиками: а) установка на особистісно-розвивальний компонент (ціннісно-педагогічна, мотиваційна компетенції); б) установка на діяльнісно-розвивальний компонент творчої компетентності (психолого-педагогічна, організаційна, методична компетенції); в) формування та розвиток педагогічного спілкування як творчого процесу на основі вербально-комунікативної, невербальної компетенції; д) установка на фахове зростання на основі дидактичної, інформаційної компетенції, понятійного мислення; д) поглиблення опанування педагогічного досвіду (розвиток творчого мислення, компетенції самовдосконалення). Розкрито результати констатувального етапу дослідження, формувального експерименту з розвитку творчої компетентності майбутніх учителів фізики та математики. Засоби авторської програми використовувалися під час вивчення курсів «Психологія», «Вікова психологія», «Психологія вищої школи», «Організація наукових досліджень», під час засідань наукової студії «Шлях до успіху». В результаті формувального експерименту з'ясовано зростання основних структурних компонентів професійної компетентності у майбутніх учителів експериментальної групи: особистісно-розвивального; діяльнісно-розвивального; комунікативного; фахового; опанування досвіду.

**Ключові слова:** творча компетентність, креативне освітнє середовище, майбутній учитель, педагогічна творчість, фізико-математичний факультет.

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