

SCIENTIFIC JOURNAL

**HIGHER ECONOMIC - SOCIAL SCHOOL IN
OSTROLEKA**

4/2021(43)

Łomża, 2021

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HIGHER SCHOOL OF AGRIBUSINESS IN LOMZA
18-402 Łomża, ul. Studencka 19, tel./fax. +48 86 216 94 97
www.wsa.edu.pl



Punkty Informacji Europejskiej w Ostrołęce
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Publikacja wydana ze wsparciem
finansowym
Komisji Europejskiej w ramach projektu
Europe Direct

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HIGHER SCHOOL OF AGRIBUSINESS IN LOMZA
Łomża, 2021

ISSN 2391 - 9167

SCIENTIFIC JOURNAL – nr 4/2021(43)

Lidiia Muzyka

Zhytomyr Ivan Franko State University, Zhytomyr, Ukraine

**THE PECULIARITIES OF APPLICATION OF MODERN
METHODS WHEN TEACHING BIOLOGICAL CHEMISTRY AS
MEANS TO DEVELOP POSITIVE MOTIVATION FOR
ACADEMIC AND PROFESSIONAL PURSUITS OF BIOLOGY
MAJORS**

Introduction

The level of organization of the academic process at university must comply with the international standards of higher education, ensure active and motivated acquisition of professional knowledge by students and the acquisition of high-quality education [Dubinin et al., 2016; Kolesnik, 2016].

When speaking about the higher education quality requirements, the process of development of important professional and personal qualities of a future expert, such as readiness for continuous professional growth, social, and professional mobility plays a significant role [Miller et al., 1998]. However, the development of positive learning motivation is the necessary condition for personal development and effective professional training of higher education seekers [Bondar, 2017; Holovska, Lazorenko, Chernieva, 2020].

In the system of higher education, professional motivation is understood as a set of factors and processes that, reflected in the mind, motivate and guide students to study future professional activity. Professional motivation is an internal driving factor in the development of professionalism, as only the high level of its development makes the effective development of professional education and personality culture possible [Miller et al., 1998; Shevchenko, 2019].

However, when conducting classes, professors often encounter a lack of regular and purposeful learning activities of students, impaired attendance, which may be due to weak motivation. That is why the task of a modern professor is to assess the motivation of a student to study, forecast its dynamics, and apply effective methods and techniques for its development and improvement. One of the effective mechanisms to increase the level of interest and motivation of students to study is the integration of traditional effective learning technologies with the innovative ones, which results in the emergence of experts of the required

level of training. The innovative teaching methods activate cognitive activity, encourage the learner to use creativity and mental activity in the process of acquiring knowledge and skills [Dubinin et al., 2016].

In this regard, the study of the role and the effectiveness of modern teaching methods as a means of increasing the educational and professional motivation in students is relevant and substantiated.

Research Objective, Subject and Methods

The research objective is to analyze the motivation to academic and professional activities in Biology majors and determine the peculiarities of application of modern teaching methods of Biochemistry as means to increase it.

Subject of research: the peculiarities of academic and professional activity of Biology majors when learning the academic discipline of Biological Chemistry.

Research methods: theoretical (analysis of the literature to study the problem, generalization of existing experience to determine the theoretical and methodological problems of the research); empirical (diagnostic) questionnaires.

To assess the level of professional motivation and the effectiveness of active and interactive teaching methods when teaching Biochemistry, a study was conducted with the participation of 53 Biology majors at the second and the third years of study at Zhytomyr Ivan Franko State University, aged 19-21, including 47 females and 6 males.

For the purpose of assessment of the professional motivation in students, diagnostic tools, which included two methods, were used: [Badmaeva, 2004]:

1. The methods of studying the factors of students' learning activities (modification by Rean A., Yakunin V.);
2. The methods for diagnosing students' learning motivation "(A.A. Rean and V.A. Yakunin, modified by N.C. Badmaeva).

The Results of the Research

It is known that the motivation of students to learn is determined by a large number of factors due to personal motives for learning success and the ability of teachers to inspire and motivate students to become experts in their field [Kolesnik, 2016]. Moreover, it varies at different stages of the learning process depending on the year of study [Bondar, 2017].

The article explores the level of motivation to academic and professional activity of Biology majors in the second and the third years of study majoring in 091 Biology at the undergraduate (Bachelor's) level at Zhytomyr Ivan Franko State University.

Students were given a questionnaire outlining 16 factors and asked to choose five most significant of them that motivate them to study.

As a result of the research, it was found that for the vast majority of surveyed students (73.58%) the main factor for learning is to master the

profession, gain professional knowledge, develop professionally important qualities and acquire skills and abilities of a highly qualified expert (Fig. 1).

Such results are extremely important, because they indicate that today's students are focused on becoming valued competitive experts in the future. Approximately 62.26% of respondents among the most important factors for their academic activities indicated a desire to gain deep and solid knowledge

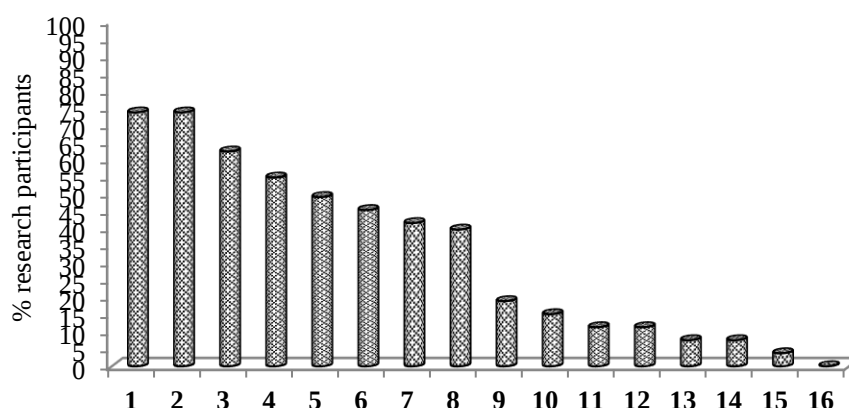


Fig.1 Distribution of the most and least significant factors among biology students of the undergraduate (Bachelor's) level of higher education:1 – to become a highly qualified expert; 2 – to ensure the success of future professional activities; 3 – gain deep and solid knowledge; 4 – get a diploma; 5 – constantly receive a scholarship; 6 – successfully continue their studies; 7 – get intellectual pleasure; 8 – successfully study, pass exams with "good" and "excellent" grades; 9 – not to do academically poor during the studies; 10 – gain the approval of parents and others; 11 – be constantly ready for the next class; 12 – to achieve the respect of professors; 13 – keep up with classmates; 14 – comply with pedagogical requirements; 15 – avoid condemnation and punishment for poor academic progress; 16 – be an example for classmates.

Source: own research based on a survey among students of Zhytomyr Ivan Franko State University

In addition, 54.71% of research participants are focused on studying at the university to obtain a diploma, which indicates that they have motivation to study due to parents' imposition and lack of self-motivation to do so. And this, unfortunately, in modern conditions is often one of the main factors, and the very fact of obtaining a diploma is the ultimate objective for many students. I note that for 16.7% of respondents there is an external motive of parental approval.

Criticism of teachers or colleagues, condemnation and punishment for poor academic progress have a rather low level of significance for the students, and in their opinion a very insignificant factor is the acquisition of authority among peers (0% of students).

The level of significance of communicative, professional educational-cognitive, and social factors, motives of avoidance, prestige and creative self-realization in students has been established. To achieve this, respondents in the second and the third years of study were offered 34 statements about the motives of academic process, which they had to evaluate based on a 5-point system (1 point corresponded to the least significant factor, 5 points - the most significant one).

The results of the research demonstrated that the average motivation of the second- and third-year students was similar. Based on the results of the study, it was found that Biology majors in their second and third years of study are guided, to a greater extent, by professional and communicative motives (Fig. 2).

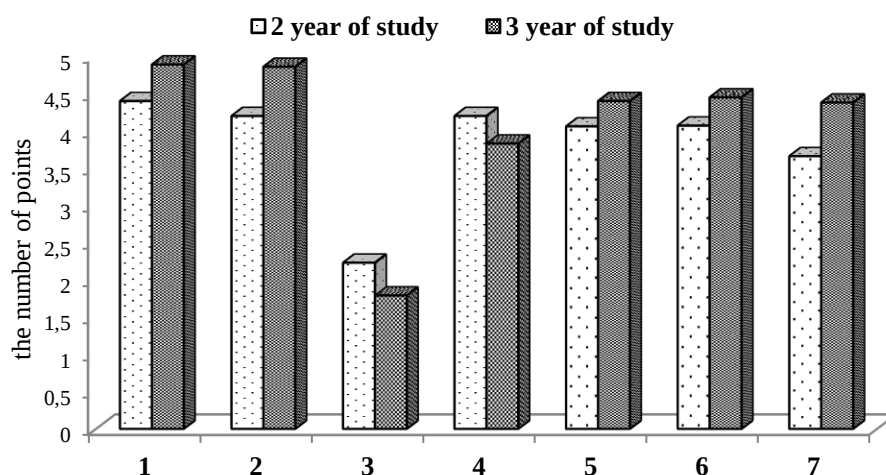


Fig. 2 Motivation to academic and professional activity of university students in different years of study (1 – professional factors; 2 – communicative factors; 3 – avoiding failure; 4 – prestige; 5 – creative self-realization; 6 – educational-cognitive factors; 7 – social factors).

Source: own research based on a survey among students of Zhytomyr Ivan Franko State University

On a 5-point scale, the level of professional motivation is 4.4 and 4.9 points for the second and third year, respectively. This indicates that mastering the profession, acquiring deep solid knowledge and the desire to become a highly qualified expert for the respondents are highly prioritized, i.e., they have motivation to study at the university. A rather high level of significance of the communication motives testifies to the desire of the respondents to communicate with people and to earn respect in the team. In an almost equal ratio and at a fairly high level are educational and cognitive motives and motives for creative self-realization. The motives for avoiding failure (2.23 and 1.79 points for the 2nd and 3rd year, respectively) were the least significant, regardless of the year of study,

which indicates that the majority of respondents are focused on success rather than prevention of failure, i.e., the students are not afraid to make mistakes on the way to their goal.

I shall note that for students in their third year of studies, social motives for learning are quite important, which indicates that the respondents think about the possibility of staying in the profession in order to obtain financial benefits or a certain standing in society.

In general, it can be noted that among third-year students the motivation to study at the university is slightly higher than among second-year students. Exceptions to the general dynamics were the motives of prestige and motives of avoiding failures, the significance of which was 10 and 25% higher among students in their second year of study, respectively, which may indicate a better understanding of the value of higher education and the need for knowledge and skills in third-year students.

Thus, the results of the research revealed a fairly high level of educational and professional motivation of students of the discussed major, which is explained by the fact that training during these years is professionally oriented and allows students to feel the need to master the chosen profession.

However, to maintain such high performance, it is necessary to maintain a balance between tradition and novelty of teaching, the balance between theoretical and practical information, to ensure the possibility of active independent participation of students in acquiring the knowledge and mastering the skills [Shevchenko, 2019] and the search for and implementation of such pedagogical technologies that would meet the needs of students and contribute to the effective implementation of educational goals.

In the second and the third years of study the discipline of Biological Chemistry is taught for major 091 Biology of Zhytomyr Ivan Franko State University, the study of which is one of the current problems of general training of classical biological majors at the universities, because understanding the nature and relationship of biochemical processes in the body contributes to the development of clinical thinking in a modern biologist. The study of Biological Chemistry by university students is carried out in accordance with the curriculum and aims to obtain knowledge of its main sections and the development of key competencies.

Biological Chemistry is traditionally a subject difficult to understand and master. That is why, for successful mastering of the discipline during the first classes it is critical to correctly focus students on the importance of the subject, the need to attend lectures, regularly prepare for the classes and explain the importance of independent work on the material studied.

A very important factor that will contribute to the successful mastery of the discipline is the development of positive motivation for students to study it,

which can be achieved through the use of pedagogical technologies that could interest students and motivate them to study the subject.

The most effective form of learning is a combination of modern innovative methods and techniques with traditional teaching aids. That is why in the process of teaching Biological Chemistry a significant place is occupied by technologies of problem-based, project-based and interactive learning with the use of information and communication tools.

In addition, an important element in the development of scientific thinking of modern biologists and the development of their professional motivation is the implementation of biochemical workshops and experiments, which contributes to the necessary practical skills of biochemical research, the ability to interpret basic biochemical parameters and use laboratory data to assess the state of human health.

Laboratory classes in Biological Chemistry are organized in such a way that during them students acquire skills of independent search for answers to questions, problem solving, group conferences, creating multimedia presentations, research tasks, the ability to analyze facts, summarize and draw logical conclusions, which undeniably contributes to the development of their professional competencies.

Active forms of learning cause certain difficulties for students, overcoming of which requires integrative knowledge and allows to connect the acquired knowledge with clinical disciplines, which creates additional motivation for learning [Herush., Hryhorieva, Davydova, 2016]. In addition, the teaching of Biochemistry uses the method of computer testing as an innovative method of assessing knowledge, which will provide adequate information about the quality of student learning.

To find out the opinion of students on the effectiveness of innovative technologies and teaching aids in the study of Biological Chemistry, 53 Biology majors in their second and third years of study, majoring in 091 Biology, were interviewed. According to the respondents, the effectiveness of the use of active and interactive methods is quite high and significantly increases the motivation and level of satisfaction with the profession (Table 1).

Table. 1 The effectiveness of active and interactive teaching methods when teaching Biochemistry

Criteria	Points
Availability and awareness of the perception of educational material	9,2
Self-development and self-education, systematization of students' knowledge	9,1
Development of creative activity and creative thinking	9,3
Analytical skills development	9,4
Increasing motivation and level of satisfaction with the profession	9,5

Source: own research based on a survey among students of Zhytomyr Ivan Franko State University.

Among the methods and techniques used in the teaching of Biological Chemistry, the respondents consider a biochemical workshop and case study to be the most effective, and the least effective is the use of professionally oriented computer presentations (Fig. 3).

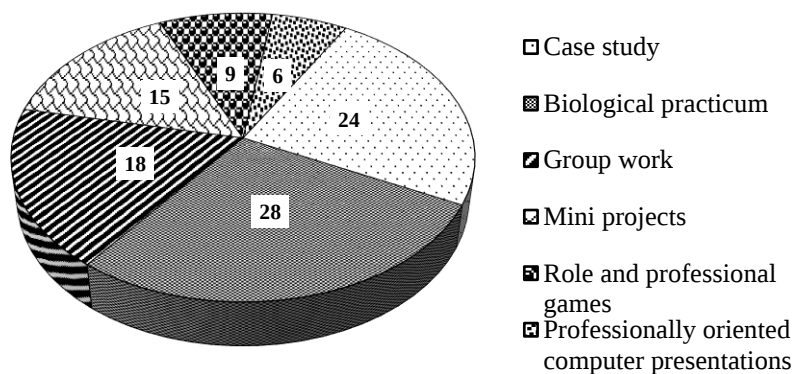


Fig. 3 Efficiency of use of various innovative methods (%) according to research participants.

Source: own research based on a survey among students of Zhytomyr Ivan Franko State University.

Conclusions

1. The study of Biological Chemistry develops competencies that are needed in the learning process to study other disciplines and in the professional activities of the future biologist.

2. An important factor that determines the success of student learning is their motivation. It was determined that all research participants who participated in the questionnaire are highly motivated and are characterized by a fairly high level of professional motivation.

3. The predominance of professional factors and a fairly high significance of educational and cognitive motives is an indicator of the correct choice of profession and the formation of a positive attitude towards it.

4. The development of the motivational component of professional competence of Biology majors has been established and their interest in studying Biological Chemistry with the use of innovative technologies and means has been analyzed. The effectiveness of the use of active and interactive teaching methods in the opinion of the students is quite high and significantly increases the motivation and level of satisfaction with the profession.

5. Among the methods and techniques used in teaching Biological Chemistry, the students consider biochemical workshops and case studies to be the most effective, and the least effective - the use of professionally oriented computer presentations.

6. The conducted research can become the basis to continue exploration on problems of motivation of students - future experts, for revealing of methods and ways to increase their theoretical knowledge and practical skills.

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Abstract

In the course of this research motivation to academic and professional activities among students who major in 091 Biology of Zhytomyr Ivan Franko State University has been assessed. The results, obtained upon the completion of diagnostic assessment of various factors of motivation and their significance in students during the second and the third years of study, have been analyzed. The findings demonstrate that the motivation to academic and professional activity in students in the second and the third years of study is similar and quite high. Regardless of the academic year the prevalent factors that motivate students to engage in academic process are professional and

communicative, which attests to a positive attitude of the research participants to the selected profession and essentially their strong motivation to studying at the university. The least significant, regardless of the year of study, are the reasons to avoid failure. The mechanisms to increase professional motivation in students when teaching Biological Chemistry by means of application of innovative teaching methods were analyzed. The role of modern teaching methods of Biochemistry as means to acquire integral and professional competencies and positive motivation development to academic process in Biology majors who pursue undergraduate (Bachelor's) degree has been studied.

Keywords: academic motivation, professional motivation, active educational methods, innovative technologies, Biological Chemistry.