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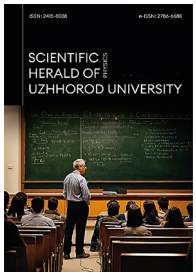

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Development of reflection of future biology teachers in the educational process

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Abstract

Relevance. The relevance of this study is underscored by the pivotal role of teachers in fostering educational innovation and amalgamating diverse pedagogical traditions.

Purpose. The purpose of this study is to explore the development of reflective abilities in future biology teachers during their university training in Kazakhstan.

Methodology. The main research methodology employed in this study involved the use of surveys administered via Google Forms. Participants included 18 secondary school biology teachers and 63 third-year biology students in Kazakhstan. For teachers, open-ended questions were utilized to gauge their perspectives on the role of reflection in teaching, while students responded to statements via a structured questionnaire.

Results. The results of the survey revealed insufficient levels of reflective activity among both biology teachers and students. These findings underscore the need for targeted interventions aimed at bolstering reflective practices within teacher training programs. Subsequent analysis oriented towards enhancing methodological training through various strategies, including optimizing the educational environment, incorporating innovative teaching methodologies, and fostering inclusive dialogues on pedagogical challenges.

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Conclusions. In conclusion, the study delineates a strategic roadmap for enhancing reflective teaching practices among future biology educators. By cultivating introspective skills and fostering inclusive dialogue, educators can optimize professional responses, mitigate pedagogical crises, and bolster the efficacy of instructional decision-making

Keywords: educational process of a teacher's university; competencies; methods of teaching biology; questionnaire

Introduction

The need to modernize pedagogical education is determined by objective reasons: the long-term requirements of the development of an individual, society, the state, and the immanent laws of its development. Specialists who have received systematic pedagogical training are the spokesmen for the ideas of modernizing education and preserving its best traditions. Currently, the issue of improving the professional training and activities of teaching personnel is being actively discussed. Educational standards include a set of competencies that allow a teacher to successfully solve professional problems, while reflection is involved in the analysis and solution of these problems. Reflection is a means of experiencing and modelling reality and acts as a component of personality self-regulation. Reflection as a component of the training of future teachers makes it possible to improve the personal and professional qualities of students in teacher's universities. Reflective learning has been widely recognized by many researchers as a psychological and pedagogical basis for improving the quality of education, as well as the professional development of teachers [1-2].

Various aspects of pedagogical reflection are investigated, constituting a whole complex of psychological and social issues related to the teaching activity of a teacher. M. Jacobs *et al.* [3] argue that reflective learning provides information about how teachers meaningfully communicate with students, thereby contributing to rational learning practices; allows to update the teaching practice. Reflective learning, according to R. Akbari [4], would help teachers to reject the stereotypes that they learned during their formative years. Teachers would integrate knowledge with their practical experience and make informed choices based on real professional situations.

Reflection would help the teacher objectively assess whether he or she is able to avoid clichés in methods of solving problems, choosing a textbook, in self-education, etc. That is, the teacher's reflection is a necessary property of practical thinking, manifested in the awareness and assessment of specific situations of reality. Reflection would allow the teacher to check whether he or she can openly discuss personal and professional problems with others, whether he or she is able to accept criticism and remarks [5-9]. Reflective comprehension of their profession gives teachers an opportunity not only to realize their own motives, but to improve themselves. Professional reflection allows interacting with the motives and goals of other people, thereby developing communicative skills.

According to G. Žibėnienė & M. Barkauskaitė [10] Personality development is considered in two aspects:

– at the enculturation stage, when a person appropriates methods and forms of activity, traditional cultural values, norms of behavior;

– at the stage of cultural transformation, i.e., a certain personal level has already been reached and the ability to develop oneself and improve the world around appears, transforming personal culture, creating a new one.

Both aspects of personality development are united by the fact that a person has new opportunities. To a large extent, the emergence of these possibilities is facilitated by the reflective abilities. Thus, the practice of systematic introspection would allow the future teacher to begin the difficult path of self-cognition and self-improvement, not only for his or her own good, but also for the good of his or her students. The object of the study was the development of reflective abilities of future biology teachers in the teacher's university, as well as the identification of the state of reflective motivation in behavior of both practicing biology teachers and students.

Literature Review

The problem of reflection in the personal [11, 12] and professional development of a teacher [13, 14] constantly concentrates the attention of researchers and is currently relevant. For example, J. Piaget [15] notes that for a teacher to think reflectively means to correlate professional activity with the student, from the standpoint of assessing its effectiveness for the student's personal and intellectual development. By definition of V. Pliushch & S. Sorokun [16], reflection of both future and already established teacher includes the analysis of their actions through the eyes of the administration, students, their parents, etc.; the desire to understand and comprehend the information received. Awareness of their behavior and actions is one of the most effective and powerful mechanisms for personal and professional self-development. A teacher who possesses reflection, is capable of constant self-improvement, can help students discover the potential for self-development, awaken their personal activity [16-21]. One of the conditions for successful reflective control of the interaction with students is a high level of teacher's social abilities, which ensures adequate perception and understanding of students, and through them, the self-perception [22-25].

Let us consider the teacher's abilities, manifested in interaction with the child, namely, ability to listen to the interlocutor. F.A. Rodrigues & M.J. Mogarro [26] identify that from of all the skills that determine communication, the ability to listen is the most important, that is why it requires improvement to the greatest extent. It should be noted that of all the information and communication skills, in the training of a teacher, insufficient attention is paid to the ability to listen. Meanwhile, this professional skill is crucial, as it ensures the establishment of mutual understanding and trust.

The rapidity with which teaching situations change, their routine repetition, lead to the fact that teachers rarely make alternative decisions, often act stereotypically, resorting to automated patterns of behavior [27-30]. This

study suggests that a teacher's deep reflective analysis of his or her individuality would help avoid stereotypical reactions in certain teaching situations. Thus, the activity of a teacher in its practical sense consists of the following stages of solving specific pedagogical problems:

– design of educational content, technologies, forms of organization and teaching aids aimed at achieving the goal;

– practical implementation of the project through direct contact with students;

– control over achieved educational results, as well as pedagogical tools.

Each of these stages involves the performance of a certain role by a teacher [31]:

– a teacher as a designer of his or her activities for teaching children – an "expert in presenting information", carrying out constructive reflection;

– a teacher as an organizer of children's activities to solve an educational problem, carrying out interactive reflection ("communication expert");

– a teacher as an expert of professional reflection and the creator of his or her personal experience, carrying out observational reflection ("analyst-creator").

At each stage of the performance of professional roles in the course of solving a pedagogical problem, reflective processes of different quality and intensity are manifested. In a reflective position, the teacher – designer of teaching activities ("expert in presenting information") concentrates his or her attention on the content of the upcoming lesson. Therewith, the teacher makes a reflective assessment of his or her projective techniques, correlating them with the specific individual characteristics of students, the possibilities of their development [22].

At the beginning of the lesson, there is an immersion in educational interaction ("communication expert"). At this stage, the subject of reflection of the teacher is both the actions of students, their emotional reactions, attitudes, and teacher's professional activities. The teacher's reflection in such situations can be called "enabled"; it accompanies actions, coinciding with them in time. This requires the teacher to be flexible, critical and highly responsible [32-34]. The reflection of the "analyst-creator" is aimed both at analyzing, evaluating, generalizing personal experience, as well as comprehending the experience of colleagues, correlating with individual experience. The teacher's constant reflection on his or her personal theoretical knowledge and practical experience performs a regulating professional function, which gives rise to a qualitatively new education filled with personal meaning and leading ideas of a professional [31].

At the end of the review, the authors would like to quote the words of educators and scientists D. Boud *et al.* [35]: "The activity of reflection is so familiar that, as teachers or trainers, we often overlook it in formal learning settings, and make assumptions about the fact that not only is it occurring, but it is occurring effectively for everyone in the group. Perhaps if we can sharpen our consciousness of what reflection in learning can involve and how it can be influenced then we may be able to improve our own practice of learning and help those who learn with us". Currently, in the methodological training of undergraduate students in a teacher's university, more and more attention should be paid to the methods of organizing reflection [17]. Systematic use of reflection in the educational activities of students:

– firstly, it helps to put oneself in a subject position and, consequently, develop the ability to self-govern learning;

– secondly, it organizes a creative dialogue in the course of solving educational and professional tasks.

Materials and Methods

To solve the outlined problem, it is necessary to study the readiness of undergraduate students majoring in biology to reflect on teaching activity, as one of the components of the professional training of future teachers. For this purpose, the questionnaire method was applied using the Google Forms. In 2019-2020, 18 biology teachers of secondary schools in Kazakhstan and 63 third-year year students majoring in biology took part in the survey. A survey among biology teachers was conducted first, which was caused by the need to identify the level of reflection among teachers. The survey used open-ended questions. Teachers could choose an answer or express their opinion regarding the problems and contradictions associated with the organization of educational activity, where major part is played by reflection.

The following questions were prepared for the teachers:

1. Do you think that reflection plays an important role in the work of a biology teacher?
2. Do you think that after each lesson you should reflectively analyses it?
3. Do you easily change your professional opinion as a biology teacher under the influence of convincing arguments from experienced teachers?
4. Do you carefully consider each of your professional decisions in the course of teaching biology?
5. Analyzing your actions as a biology teacher, do you learn something new about yourself?

Having found certain shortcomings and problems of reflection of biology teachers, the authors organized a survey of third-year biology students. Students were asked to provide answers to several statements of the questionnaire. Students could apply the existing teaching experience or recall the experience of teaching practice at school. In the answer sheet, students had to tick (+ or v) near the number corresponding to the answer: 1 – Strongly disagree; 2 – Disagree; 3 – Rather disagree; 4 – Undecided; 5 – Rather agree; 6 – Agree; 7 – Strongly agree.

The questionnaire consisted of statements:

1. Every personal or professional mistake makes me think about it for a long time.
2. At the end of a conversation or discussion, it is always interesting to trace the train of thought and the starting point of the discussion.
3. At the beginning of a difficult task in educational methodology or biology, I do not concentrate on thoughts about the upcoming difficult work.
4. I often put myself in place of another, whether a student or colleague, etc.
5. My decision requires me to carefully think through the details and plan for its implementation.
6. I am convinced, that most educational and professional situations require a prompt solution, even if it may be hasty.

After forming a list of different answer options, they were grouped according to semantic proximity. The authors considered them as some characteristics of those surveyed and represented the answers by diagrams. In the course of the pedagogical experiment, third-year students majoring in 5B011300 Biology were surveyed (Table 1).

Table 1. Stimulus material

Statement	1	2	3	4	5	6	7
After reading an interesting book, I think about it for a long time, I try to find some company to discuss it							
When a teacher unexpectedly addresses me in class, I easily get lost and I can answer the first thing that comes to mind							
When preparing for a telephone conversation, I always think through everything I plan to say							
Every personal or professional mistake makes me think about it for a long time							
At the end of a conversation or discussion, it is always interesting to trace the train of thought and the starting point of the discussion							
At the beginning of a difficult task in educational methodology or biology, I do not concentrate on thoughts about the upcoming difficult work							
For me, the most important is the goal of my educational or professional teaching activity, intermediate tasks do not motivate me as much							
Sometimes it is difficult to understand discontent of a friend, colleague, or student							
I often put myself in place of another, whether a student or colleague							
The entire course of upcoming work must be well-thought-out and presented							
I cannot easily write a resume, an essay, or a letter if I do not draw up a preliminary plan							
I strive to be professionally fulfilled without getting stuck in the reflection of my pedagogical failures							
I easily decide on an expensive purchase							
The decision made requires me to carefully think over the details and plan for its implementation							
My professional future is important, I am worried about it							
I am convinced, that most educational and professional situations require a prompt solution, even if it may be hasty							
I can admit that sometimes I make rash decisions in educational or future professional activities							
Often the lesson I have conducted continues in my mind, I give arguments in support of the chosen method							
Conflict forces me to analyze my behavior first							
Any decision requires me to think carefully, analyse, weigh							
Professional problems and conflicts often stem from the fact that I cannot predict the expectations of my students about myself							
Scheduling a conversation with another person requires me to “replay” the discussion in my mind							
I do not consider it necessary to think about the impressions of other people about my actions and words							
In order to make a remark, I always try to choose the right words that would not offend a student							
When a difficult professional task arises, I always think about solving it, even when doing other things							
An argument with a friend, colleague, or student cannot make me believe I am guilty							
In a discussion, the result is important to me, but sometimes I regret my words							

Source: compiled by the authors based on [36]

Results and Discussion

The results of the survey of biology teachers established that schools do not provide ideal conditions for reflection and teachers have to learn to reflect independently. When asked whether the respondents believe that reflection plays an important role in the work of a biology teacher, the following answers were received: absolutely all respondents answered this question positively (Figure 1).

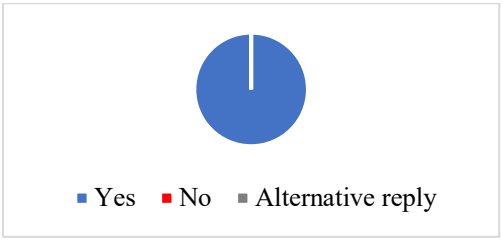

Figure 1. Distribution of answers about the role of reflection in the work of a biology teacher
Source: compiled by the authors

All teachers agreed on the importance of reflection in professional activity (100%). In the next question, it was found out whether the respondents think that reflective analysis should be performed after each lesson (Figure 2). Reflective analysis is aimed at clarifying the meaning of the new material, building a further training route (it is clear, it is not clear, it is necessary to learn more about this, it would be better to ask a question about this, and so on). To reflect on the lesson, the teacher usually needs to answer a series of questions. To begin with, it is important to outline the learning objectives for the lesson – it can be participation in dialogue and exchange of opinions, or maybe the student's analysis of the text he or she listened to and an attempt to retell it. There are several stages of a lesson and its analysis. The first is the challenge – that is, the actualisation of existing knowledge and an attempt to awaken the student's interest in new ones. Next comes comprehension, which includes obtaining new information and adjusting the student's learning goals. The last stage is just reflection – reasoning, the birth of new knowledge and the setting by the student of new learning goals.

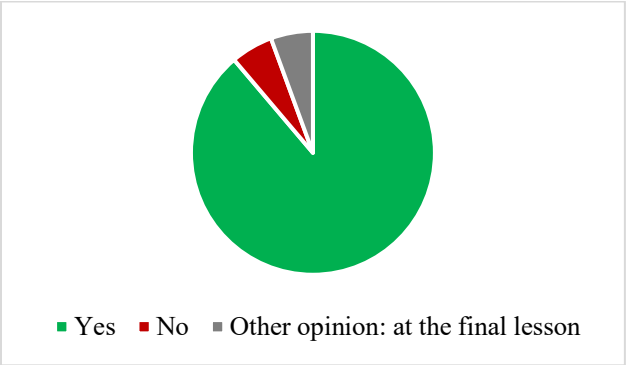

Figure 2. Distribution of answers about the need for reflective analysis after each lesson
Source: compiled by the authors

As a result, it was found that 88.9% of teachers perform reflective analysis after the lessons. This is a positive point. But it is alarming that 5.6% of teachers do not analyse their teaching activity, and 5.6% gave unequivocal answers about the lack of time for reflection. It should be noted that reflective analysis is a necessary part of the teacher's work. A more detailed analysis, provides for better presentation of material in the future, suggesting new ways of solving pedagogical problems. It is important to structure this procedure, draw up a clear analysis plan and stick to it on multiple occasions. Independent work is no less important than further exchange of the gained experience with colleagues. It is in the process of verbalisation that the chaos of thoughts in the process of independent comprehension is systematised, turning into new knowledge. Any questions or doubts that arise can be resolved. It is important to consider the opinions of young colleagues as well as those of older ones. However, the main aspect in qualitative reflective analysis is the ability to maintain critical thinking and independently choose important methods in the pedagogical process. The question about the suggestibility of the respondents and their susceptibility to the opinions of experienced colleagues gave the following distribution of answers (Figure 3).

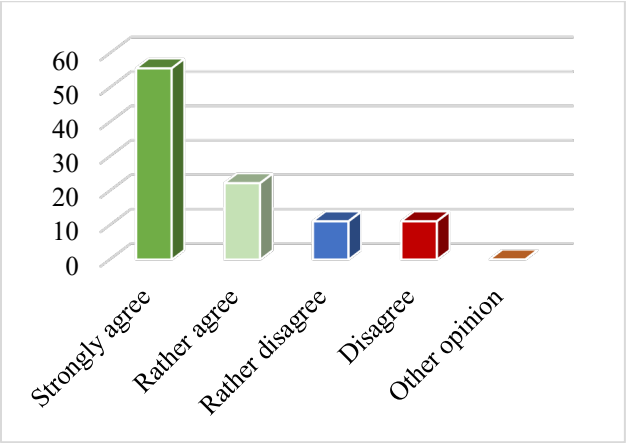

Figure 3. Distribution of answers about susceptibility to colleagues' opinions
Source: compiled by the authors

As can be seen from the results of the survey, 55.6% of teachers are influenced by their more experienced colleagues, notably, the respondents are young teachers. This suggests that lecturers in teacher's universities do not pay significant attention to the development of students' reflection. But in the process of exchanging opinions on what they have read or heard, students have the opportunity to realise that the same text can form different ideas that vary in form and content. Some arguments of other students can be perfectly accepted by other students as their own. Other arguments drive the need for a discussion. In any case, the stage of reflection actively contributes to the development of critical thinking skills. But the development of a student's critical thinking largely depends on the ability of his or her teacher to ask the right questions, analyse the information received, and reflect correctly. The quality of the teacher's reflection also has certain criteria by which it can be assessed. The poll demonstrated that only 22.2% of the teachers surveyed have their personal opinion and can think reflectively. The following answers were received to the question about the carefulness of thinking over their professional decisions (Figure 4).

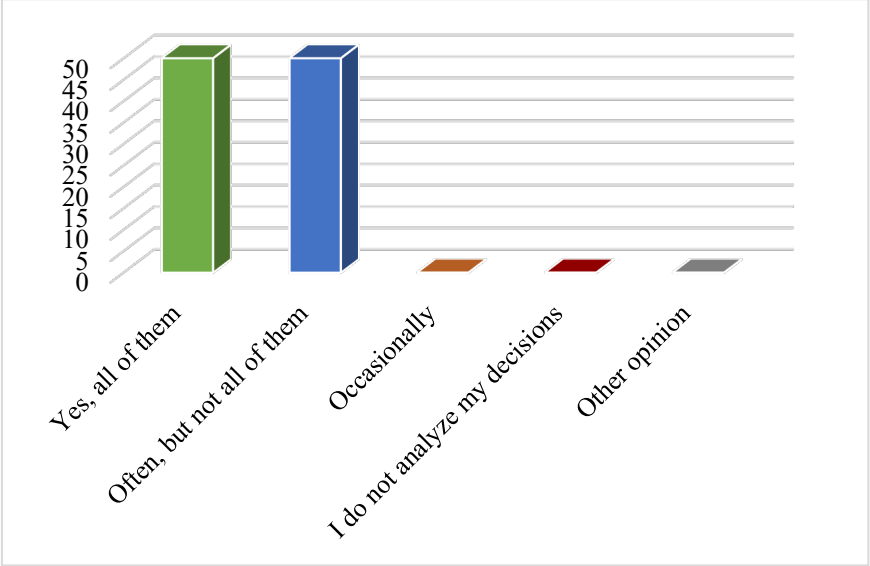

Figure 4. Distribution of answers about the careful consideration of professional decisions
Source: compiled by the authors

The answers suggest that 50% of teachers carefully consider their professional decisions, 50% do it often, but not all of them. By analysing their professional decisions, the teacher can correct shortcomings and mistakes. This gives rise to a kind of professional flexibility that is necessary for a specialist teaching other people. Flexibility and customisability occupy a central position in educational systems of universities. Despite the increasing importance of flexibility in the design of educational systems and the irresistible forces driving it forward, there is still no generally accepted concept of flexibility. However, as a general term, pedagogical flexibility can be described as a complex mental formation that combines dynamic characteristics that determine the teacher's ability to easily abandon certain behaviours, thinking patterns, and emotional responses inappropriate to the situation, and develop or apply new original approaches. This is a quality necessary for a teacher, which is also developed through constant analysis of work. This also suggests that not all teachers are ready and able to analyse their professional activities. To the question about the possibility of learning new things about oneself in the course of analysing own

actions as a biology teacher, the following answers were received (Figure 5).

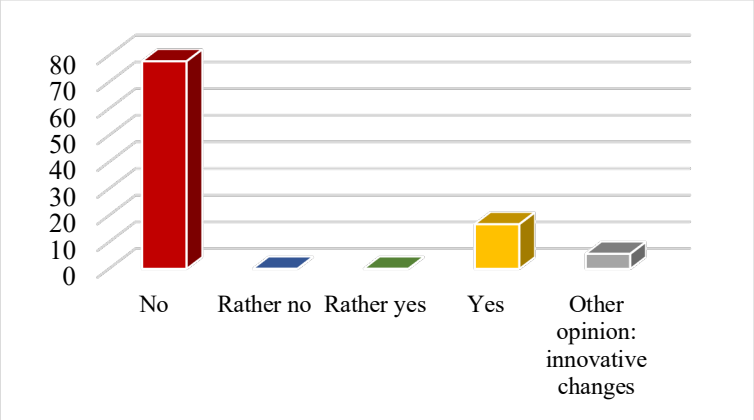

Figure 5. Distribution of answers about the effectiveness of reflection on professional behaviour to expand the ideas about self-image

Source: compiled by the authors

Returning to the question of qualitative reflection, the issue here concerns teaching this technique the teachers themselves. In the teacher's professional activity, reflective ability performs the following functions:

– forms professional identity and vocational adjustment of the future teacher in the course of mastering teaching activity;

– develops a conscious attitude towards the activity being performed;

– implements a systemic integral regulation of teaching activity;

– determines productive and innovative qualities of creative thinking;

– increases the productivity of teaching activities;

– increases the level of professionalism, teaching skills, professional competence, and the ability for continuous personal and professional improvement and personal growth based on the psychological mechanisms of self-esteem, introspection, and self-regulation;

– protects the teacher from professional deformation, and such negative phenomena as "pedagogical burnout", "pedagogical crises".

The development of the ability for pedagogical reflection is impossible without creating the right conditions, constant updating of methods and exchange of views with competent persons. The distribution of answers above, suggests superficial reflection of teachers, only 16.7% of the respondents gave a positive answer, as 77.8% – do not learn anything new about themselves during reflection, that is, they do not see their professional growth or vice versa their failures and mistakes. The answers of the respondents about the methodological preferences in the preparation and conduct of biology lessons are shown in the Figure 6.

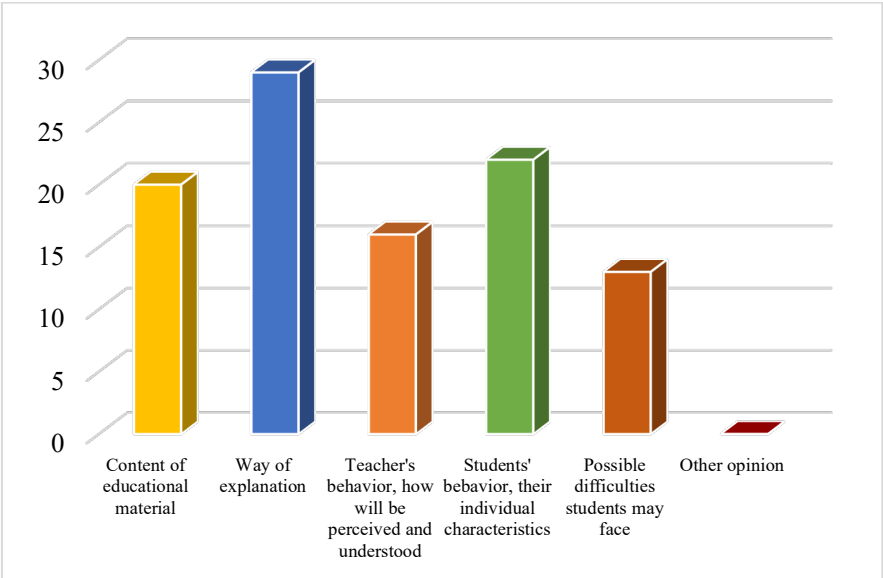

Figure 6. Distribution of answers about methodological preferences when preparing biology lessons

Source: compiled by the authors

Special attention was paid to this issue, since it reveals the value priorities of teachers. Only 16% of teachers pay attention to how students will perceive and understand them in class. Most teachers pay attention to the content of the teaching material and how to explain it. During the survey, it was of particular interest whether teachers

include the stage of students' reflection in a biology lesson. Therefore, the questionnaire included a question about the preferred frequency of organisation of students' reflection at the biology lessons (Figure 7).

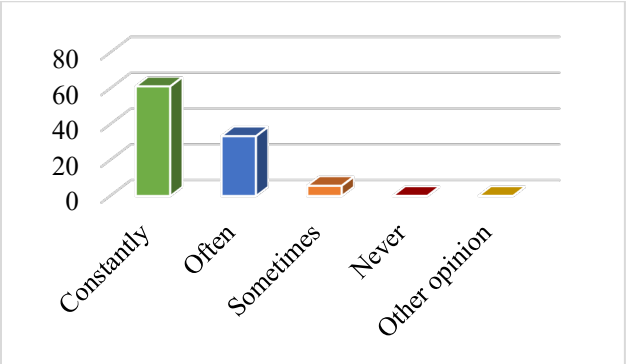

Figure 7. Distribution of answers about the organisation of reflection when teaching biology
Source: compiled by the authors

61.1% of the teachers surveyed believe that reflection in biology lessons should be carried out constantly. 33.3% – carry out reflection often. This is due to the fact that, in accordance with new pedagogical ideas and educational standards, at the end of the lesson it is recommended to organise the reflective activities of students. Therewith, it is considered necessary to create the right environment by the teacher, where students will perceive him or her as a competent person. The essence of teaching in the case of focusing on educational material is reduced to a dry presentation of the material. Here the psychological and social role that the teacher can and should play in preparing for the lesson is lost. The teacher's task is not only to present the material, but also to find an individual approach to the student as to an individual person, to create the right ground for assimilating the material, to form research skills and critical thinking in students. The teacher serves as a link between the information that exists in the educational environment and the student's knowledge, the latter's ability to use this information correctly. This process is impossible without the student's reflection after each lesson.

63 third-year students took part in the survey created by the authors. The scores of the questionnaires were calculated and analysed according to the proposed method (Table 2). All respondents' answers to the proposed questions were taken into account.

Table 2. Results of the survey of students

Test scores / Number of students	80 and lower	81-100	101-107	108-113	114-122	123-130	131-139	140-147	148-156	157-171	172 and higher
63 students	-	3	7	7	19	13	7	5	1	-	1

Source: compiled by the authors

Thus, it was revealed that the majority of students do not have a complete understanding of reflection, they have a superficial understanding of the possibilities of reflection in the establishment of a teacher as a person. Moreover, the answers to the question about the frequency of the use of reflection in the teaching process suggest that special attention was not paid to professional reflection during training. The results of the survey showed that students' knowledge of the methods of reflection is very mixed and rather mediocre. The results are presented in the diagram below (Figure 8).

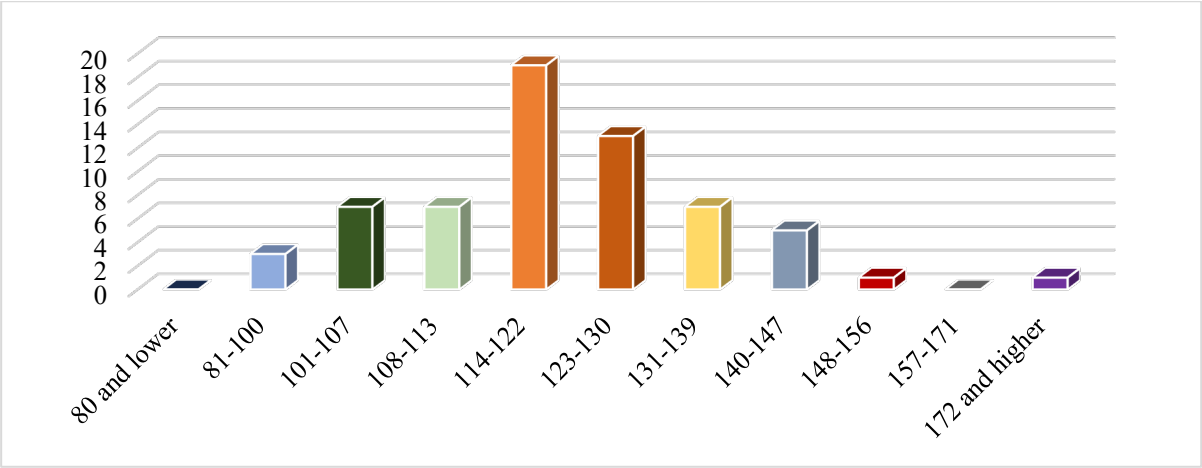

Figure 8. Results of the survey of students' reflective ability
Source: compiled by the authors

The results were differentiated into three main categories (Figure 9):

– from 140 to 172 or more points – evidence of highly developed reflective ability;

– from 114 to 139 points – evidence of an average level of reflective ability;

– less than 114 points – evidence of a low level of reflective ability.

Not enough attention is paid to the development of reflective ability among students in teachers' universities. The teacher's reflection is aimed at analysing, evaluating, generalising his or her experience, comprehending the experience of other teachers.

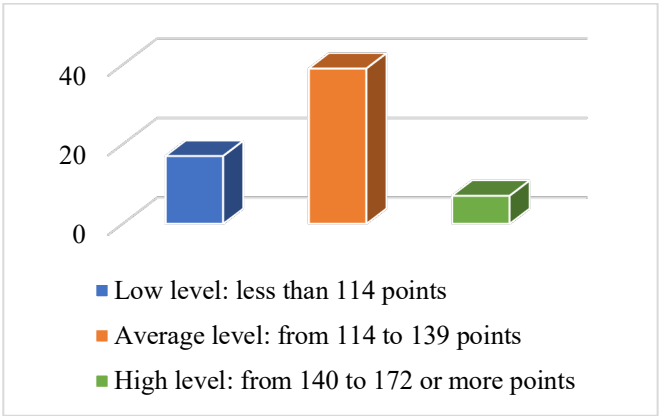

Figure 9. Determination of the level of development of students' reflective ability
Source: compiled by the authors

Thus, the need for a reflexive attitude of the teacher towards his or her activities is defined by the fact that the source of the teacher's professional growth lies in the constant comprehension of personal experience. However, it is impossible to perform it efficiently without correlating personal experience with the experience of other teachers [37].

Conclusions

The data of the survey of biology teachers and students of a teacher's university confirmed the insufficient levels of reflective activity in both groups. The data obtained in the course of the survey is oriented towards setting goals for the reinforcement tasks from the standpoint of the reflexive activity of the methodological training of future biology teachers: optimization of the educational environment, stimulating, first of all, the teachers themselves to think about the extent to which they participate in thinking about their practice and self-esteem as a means of professional development; forms of educational activities ("advanced" lectures, trainings, consultations of new style); the use of educational technologies that bring students and teachers to a new level of reflective practices; inclusion in the educational process of tasks and teaching situations of various types (to attach personal meaning, to affirm universal and professional values, to stimulate creativity and reflection, etc.).

The results of the survey allowed to determine the strategy for future study, in particular, to design and test the conditions for the implementation of methodological training based on reflective teaching. These conditions include: attracting students to an inclusive dialogue, discussions on teaching biology at school; the use of technological methods that would stimulate students – future teachers of biology for the search, evaluation, choice, and projection in search of solutions to pedagogical problems.

Thus, the developed professional reflection of the future biology teacher would allow, based on the developed introspection skills, to optimize the professional

response, to ensure the readiness for professional and creative growth. This would help prevent "pedagogical crises", "pedagogical burnout", overcome stereotypical professional reactions, and increase the productivity of pedagogical decisions.

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None.

Conflict of Interest
None.

References

[1] Bocheliuk VY, Spytska LV, Shaposhnykova IV, Turubarova AV, Panov MS. Five stages of professional personality development: Comparative analysis. *Polish Psychol Bull.* 2022;53(2):88-93. 10.24425/ppb.2022.141136
[2] Spytska L. Social-psychological peculiarities of youth with delinquent behavior. *Youth Voice J*. 2023;2:9-17.
[3] Jacobs M, Vakalisa NCG, Gawe N. *Teaching-learning dynamics.* Cape Town: Pearson South Africa; 2016. Available from: https://za.pearson.com/tvet-and-higher-education/higher-education/Trusted-content/local-titles/education-and-psychology/teaching-learning-dynamics.html.
[4] Akbari R. Reflection on reflection: A critical appraisal of reflective practice in L2 teacher education. *System*. 2007;35(2):192-207. DOI: 10.1016/j.system.2006.12.008.
[5] Moldazhanova AA, Amanova AA, Tashetov AA, Bissembaeva Assem K, Dzhumazhanova GK, Nurbekova MA. Future teacher-psychologists' professional position as a component of professional competence formation. *Int J Environ Sci Educ.* 2016;11(18):12317-12325.
[6] Bocheliuk VY, Spytska LV, Mamicheva OV, Panov MS, Kordonets VV. Psychological Features of Post-COVID Syndrome Course. *Int J Health Sci*. 2021;5(3):276-285.
[7] Tyliszczak B, Drabczyk A, Kudłacik-Kramarczyk S, Bialik-Wąs K, Sobczak-Kupiec A. In vitro cytotoxicity of hydrogels based on chitosan and modified with gold nanoparticles. *J Polym Res.* 2017;24(10):153.
[8] Danilenko I, Gorban O, da Costa Zaragoza de Oliveira Pedro PM, Viegas J, Shapovalova O, Akhkozov L, Konstantinova T, Lyubchyk S. Photocatalytic Composite Nanomaterial and Engineering Solution for Inactivation of Airborne Bacteria. *Top Catal.* 2021;64(13-16):772-779. DOI: 10.1007/s11244-020-01291-2
[9] Doroshkevich AS, Lyubchyk AI, Islamov AK, Turchenko VA, Glazunova VA, Yu Zelenyak T, Burkhovetskiy VV, Shylo AV, Balasoiu M, Saprykina AV, Ohmura S, Lygina OS, Lyubchyk SI, Konstantinova TE, Lakusta MV, Bodnarchuk VI, Lyubchyk SB, Bacherikov YY, Aliyeva Y, Kholmurodov KT. Nonequilibrium chemo-electronic conversion of water on the nanosized YSZ: Experiment and Molecular Dynamics modelling problem formulation. *J Physics: Conf Ser.* 2017;848(1):012021. DOI: 10.1088/1742-6596/848/1/012021
[10] Žibėnienė G, Barkauskaitė M. The reflection experience of future teachers as professional improvement tool. *Pedagog.* 2018;130(2):64-75. DOI: 10.15823/p.2018.22.
[11] Denha N. Means of formation of professional reflection of future elementary school teachers during the educational process at pedagogical college. *Sci J Transact Kremenchuk Mykhailo Ostrohradskyi Nat Univ.* 2018;2(109.2):21-7. Available from: https://visnikkrnu.kdu.edu.ua/statti/2018_2_21-27-2018-2-2.pdf.
[12] Gerum J, Loyens SMM, Rikers RMJP. Mind your mindset. An empirical study of mindset in secondary vocational education and training. *Educ Stud.* 2020;46(3):273-81. DOI: 10.1080/03055698.2019.1573658.
[13] Li Y, Walsh S. Technology-enhanced reflection and teacher development: A student teacher's journey. *RELC J.* 2023;54(2):356-75. DOI: 10.1177/00336882231161153.
[14] Kulida O. Pedagogical reflection in the modeling of the purposes of the professional preparation of the future specialists. Sci J Polonia Univ. 2020;38(1-1):159-65. DOI: 10.23856/3821.
[15] Piaget J. The psychology of intelligence. London: Routledge; 2001. DOI: 10.4324/9780203164730.
[16] Pliushch V, Sorokun S. Innovative pedagogical technologies in education system. *J Time Space Educ.* 2022;15(34):e16960. DOI: 10.20952/revtee.v15i34.16960.
[17] Bilyk V, Yashchuk S, Marchak T, Tkachenko S, Goncharova V. Organization of the educational process on natural science training in higher education institutions on the basis of innovation and heuristics. *Postmod Open.* 2021;12(2):78-108. DOI: 10.18662/po/12.2/298.
[18] Messina A, Fogliani AM. Valproate in conversion disorder: A case report. *Case Rep Med.* 2010;205702. DOI:10.1155/2010/205702
[19] Spytska L. Principles of delinquent behavior correction program creation for youth detention centers. *Hum Res Rehabilit.* 2023;13(2):188-199. DOI: 10.21554/hrr.092301
[20] Zhantlessova S, Savitskaya I, Kistaubayeva A, Ignatova L, Talipova A, Pogrebnjak A, Digel I. Advanced "Green" Prebiotic Composite of Bacterial Cellulose/Pullulan Based on Synthetic Biology-Powered Microbial Coculture Strategy. *Polym.* 2022;14(15):3224. DOI: 10.3390/polym14153224
[21] Shumka L, Peri L, Lato E. The needs for determining degradation risks from temperature and relative humidity of post-byzantine church indoor environment. *J Environ Manag Tourism.* 2020;11(3):601-605. DOI:10.14505/jemt.11.3(43).13
[22] Nocetti De La Barra A, Medina Moya JL. Teacher reflection and the conditions that trigger it in future teachers during their practicums. *Espacios*. 2018;39(15):2. Available from: https://www.revistaespacios.com/a18v39n15/18391502.html.

[23] Messina A, McCormick LM, Paradiso S. Wernicke-korsakoff syndrome and dementia. In: *Diet and nutrition in dementia and cognitive decline* (pp. 167-176). 2015. DOI:10.1016/B978-0-12-407824-6.00016-1
[24] Spytska L. Social and psychological features of affective disorders in people during crisis periods of life. *Soc Regist.* 2023;7(4):21-36.
[25] Shokatayeva D, Ignatova L, Savitskaya I, Kistaubaeva A, Talipova A, Asylbekova A, Abdulzhanova M, Mashzhan A. Bacterial cellulose and pullulan from simple and low cost production media. *Eur Chem-Technol J.* 2019;21(3):247-258. DOI: 10.18321/ectj866
[26] Rodrigues FA, Mogarro MJ. Professional identity images of future teachers. *Brazil J Educ.* 2020;25:e250004. DOI: 10.1590/S1413-24782019250004.
[27] Min M, Akerson V, Aydeniz F. Exploring preservice teachers' beliefs about effective science teaching through their collaborative oral reflections. *J Sci Teach Educ.* 2020;31(3):245-63. DOI: 10.1080/1046560X.2019.1690818.
[28] Spytska L. Symptoms and Main Differences between a Psychopath and a Sociopath. *J Nerv Ment Dis.* 2024;212(1):52-56.
[29] Spytska L. Forecasts regarding mental disorders in people in the post-war period. *Eur J Trauma Dissociation*. 2024;8(1):100378.
[30] Shumka S, Sulçe S, Brahushi F, Shumka L, Hyso H. Biomass energy for productive use in the olive oil and other agriculture sectors in Albania. *Proc Eng Sci*. 2021;3(1):103-110. GOI: 10.24874/PES03.01.010
[31] d'Alessio MA. The effect of microteaching on science teaching self-efficacy beliefs in preservice elementary teachers. *J Sci Teach Educ.* 2018;29(6):441-67. DOI: 10.1080/1046560X.2018.1456883.
[32] Spytska L. Conceptual basis for creating a program to overcome the current fears of modern youth. *Youth Voice J.* 2023;13.
[33] Sobczak-Kupiec A, Olender E, Malina D, Tyliszczak B. Effect of calcination parameters on behavior of bone hydroxyapatite in artificial saliva and its biosafety. *Mater Chem Phys.* 2018;206:158-165.
[34] Shukurlu YH. The effect of selenium on the supramolecular structure and thermal characteristics of fibroin bombyx mori L. *Period. Tche Quim.* 2020;17(34):591-598.
[35] Boud D, Keogh R, Walker D. *Reflection: Turning experience into learning.* London: Routledge; 1987. Available from: https://craftingjustice.files.wordpress.com/2017/04/david-boud-rosemary-keogh-david-walker-reflection_-turning-experience-into-learning-routledge-1985-pp-1-165.pdf.
[36] Pfeffer I, Strobach T. Predicting physical activity behavior by automatic and reflective self-regulatory processes. *Front Psychol.* 2021;12:714608. DOI: 10.3389/fpsyg.2021.714608.
[37] Němečková L, Pavlasová L. The individual watching of one's own video and its influence on future biology teachers' professional vision. *Tuning J High Educ.* 2019;7(1):93-113. DOI: 10.18543/tjhe-7(1)-2019pp93-113.

Розвиток рефлексії майбутніх учителів біології в освітньому процесі

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Анотація
Актуальність. Актуальність цього дослідження підкреслюється ключовою роллю вчителів у сприянні освітнім інноваціям та об'єднанню різних педагогічних традицій.

Мета. Метою цього дослідження є вивчення розвитку рефлексивних здібностей у майбутніх учителів біології під час їхньої університетської підготовки в Казахстані.

Методологія. Основною методологією дослідження було використання опитувань, що проводилися за допомогою Google Forms. В опитуванні взяли участь 18 вчителів біології середніх шкіл і 63 студенти третього курсу біологічних факультетів університетів Казахстану. Для вчителів були використані відкриті запитання, щоб оцінити їхні погляди на роль рефлексії у навчанні, тоді як студенти відповідали на твердження за допомогою структурованого опитувальника.

Результати. Результати опитування виявили недостатній рівень рефлексивної активності як серед учителів біології, так і серед учнів. Ці висновки підкреслюють необхідність цілеспрямованих втручань, спрямованих на посилення рефлексивних практик у програмах підготовки вчителів. Подальший аналіз спрямований на вдосконалення методичної підготовки за допомогою різних стратегій, включаючи оптимізацію освітнього середовища, впровадження інноваційних методик викладання та сприяння інклюзивному діалогу щодо педагогічних викликів.

Висновки. У висновках дослідження окреслено стратегічну дорожню карту для вдосконалення рефлексивних практик викладання серед майбутніх учителів біології. Розвиваючи навички самоаналізу та сприяючи інклюзивному діалогу, педагоги можуть оптимізувати професійні реакції, пом'якшити педагогічні кризи та підвищити ефективність прийняття педагогічних рішень.

Ключові слова: освітній процес педагогічного університету; компетентності; методика викладання біології; анкетування