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The use of cooperative learning in the formation of emotional intelligence based on project activity and social skills

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Abstract. One of the essential areas in teaching biology is the development of students social-emotional skills through project activities. These activities help students connect emotional intelligence with the subject, especially in group work, where they learn to recognize and respond to emotions, demonstrate leadership, manage interpersonal dynamics, and communicate effectively.

The article outlines the goals of project activities and presents scientific findings on skill development in this process. It highlights that diagnosing students interests and tracking the growth of their abilities in project-research work is a pressing issue. Monitoring results show a positive trend in students cognitive activity, confirming the effectiveness of the research.

The experiment on forming social-emotional skills included several stages. Data were processed using mathematical and statistical methods, such as calculating the arithmetic mean, conducting repeated-measures ANOVA, and performing variance and comparative analyses of students skills before and after the project.

The study demonstrates that project activities play a key role in training future biologists. In today's competitive environment, society demands graduates who think critically, have a strong personal stance, and are capable of conducting scientific research. A specialist with these competencies gains a significant advantage in professional and academic competition.

Keywords: emotional intelligence, science, learner, project activity, social-emotional skills, learning, Soft skills, cooperative learning.

Introduction

In the era of the Fourth Industrial Revolution, the role of emotional intelligence (EI) in education has become increasingly central. Modern learners are not only expected to acquire academic knowledge but also to develop self-awareness, self-regulation, empathy, and social competence. As science and technology evolve rapidly, so too must the personal and emotional capacities of students. Whether in school or university, learners undergo significant cognitive, emotional, and social changes that shape their identity and future success.

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The main challenge in fostering student motivation is guiding them toward research-oriented learning. One promising approach to meet this challenge is conceptual education, which involves the comprehensive study of phenomena through methods such as project-based learning and cooperative learning. These learner-centered pedagogies are now widely recognized in many countries as effective means of promoting critical thinking, creativity, and deeper engagement with science subjects like Biology.

The use of diverse teaching methods and strategies, particularly research-driven project activities, supports not only academic mastery but also the holistic development of learners. When teaching moves beyond information transmission toward active facilitation, it fosters stronger learning outcomes. In this process, the cooperative dynamic between teacher and learner becomes a key factor in shaping personal development and self-determination. Educators play the role of guides who facilitate knowledge discovery, and students, through active participation and reflection, internalize values essential for lifelong learning.

The integration of social-emotional learning into biology education requires a deeper understanding of what constitutes social and emotional skills. Pratama and Corebima (2016), in their study of Indonesian high school students, demonstrated that incorporating EI into biology instruction through project-based learning enhances both cognitive outcomes and emotional maturity. They also emphasized the importance of parental involvement in supporting students emotional growth.

According to Nelson D. (2012), project-based learning plays a significant role in higher education. Universities use various methods to prepare students as individuals who think critically, communicate effectively, and are capable of independent learning. Mayer, Caruso, and Salovey (2011) further argue that embedding project activities within the curriculum can improve students academic performance, social behavior, and emotional competencies.

What is the relationship between emotional intelligence and biology? In project-based biology activities, students work in groups where they learn to recognize and manage each other's emotions. They also develop leadership skills, resolve challenges positively, communicate effectively, show empathy, overcome difficulties, and reduce conflicts. What are social and emotional skills, and how are they connected to project-based learning? These are the key questions that guide our research. According to American scholars, a skill is defined as an ability, competence, behavior pattern, or form of expertise developed through experience. In 2012, researchers Colman and Pulford emphasized that the concept of «skill» encompasses a range of attributes that fall under the category of social-emotional skills (Colman & Pulford, 2012).

From a theoretical perspective, two key frameworks are relevant. The soft skills theory emphasizes success-oriented professional competencies, while the emotional intelligence theory (J. Mayer, D. Caruso, P. Salovey) explores the interaction between personal behavior and external social environments (Dorokhina, Smirnova, Davydov). These models lay the foundation for educational strategies that integrate emotional and social development with academic goals. Furthermore, Kazakhstani scholars have made significant contributions to this field. Researchers such as Z.A. Kairova, K.B. Zharikbayev, Z.Y. Namazbayeva, and M.S. Iskakova have explored the development of social-emotional learning in school environments. Drawing on international frameworks, Lechner, Anger, and Rammstedt (2019) categorized research into three areas:

1. The impact of developing social-emotional skills through project-based activities on educational outcomes;

2. The role of project activities in developing social-emotional skills as an educational factor;

3. The long-term influence of social-emotional skills developed during project work on learners' success in adult life.

Although long-term studies are fewer due to the complexity of measuring outcomes over decades, there is strong evidence that project-based learning significantly contributes to non-cognitive skill development, especially in the first two categories.

Table 1. Established theories about the concept of social-emotional skills

Name of theories	Content of theories	Scientists who studied
Theory of soft skills or soft skills	Professional skills or success skills. Self-management skills, communication skills, ability to achieve goals, self-confidence, and critical thinking skills.	E. Dall'Amico, A. Yarkova, S. Verona, E.V. Tikhonova, L.K. Salnaya
The theory of EQ or emotional intelligence	The theory of emotional intelligence – (J. Meyer, D. Caruso, P. Solovey) the behavior of learners and external environmental factors. (V.T. Dorohina, E.O. Smirnova, V.V. Davydov)	J. Meyer, D. Caruso, P. Solovei, V.T. Dorohina, E.O. Smirnova, V.V. Davydov

The formation of conceptual understanding of the subject «Biology» requires the active participation of both students and teachers in structured project activities, both in and beyond the classroom. Institutions like the National Research University «Higher School of Economics» emphasize that social-emotional learning enables learners to develop empathy, emotional regulation, social relationships, and conflict-resolution skills, i.e. what they define as enabling skills.

Another model of emotional intelligence was proposed by clinical psychologist and physiologist Reuven Bar-On (Bar-On, Parker). This model offers a broad understanding of emotional intelligence within the framework of collaborative learning based on project-based activities and social-emotional skills. In the context of such project activities, five key areas of individual competence are identified, each defined by specific components of emotional intelligence. Each area, in turn, consists of several subcomponents:

1. Intrapersonal (self-awareness): self-control, emotional self-awareness, assertiveness, self-affirmation, independence, self-esteem, and self-awareness;

2. Interpersonal (interpersonal communication skills): empathy, social responsibility, and interpersonal relations;

3. Stress management: resistance to stress and control of impulsivity;

4. Adaptability: communication with reality, flexibility, and problem solving;

5. Main mood: optimism and happiness.

In Russian science, several models of emotional intelligence based on project-based learning and social-emotional skills have been proposed. Notably, the models developed by A.I. Savenkov and D.V. Lucin are among the most recognized. A.I. Savenkov views emotional intelligence as a component of social intelligence within collaborative learning that incorporates project

activities and social-emotional development; he identifies three groups of criteria within its structure. Whereas D.V. Lucin, in his model, distinguishes between the intrapersonal and interpersonal domains of emotional intelligence. According to his framework, the intrapersonal domain involves recognizing one's own emotions and feelings, understanding their underlying causes, and developing the ability to identify and regulate them. The interpersonal domain, on the other hand, includes understanding the emotions and feelings of others, the ability to elicit «desirable» emotional responses in others, and the capacity to manage or reduce «unwanted» emotions (Federal Institute for Education Quality Assessment).

According to the official website of the Ministry of Education Quality Assessment, socio-emotional competencies are partially embedded in the standards of state education, with communicative competence viewed as a key outcome of socio-emotional development. Scholars including D.M. Ryzhov, E.S. Shamukhametova, V.V. Panteleeva, I.I. Baranetskyi, and E.I. Izotova underscore the importance of implementing socio-emotional competence for school-aged children. Many researchers are involved in developing and implementing such programs. However, as noted by Apresyan (2019), these programs face significant challenges in empirical validation due to the lack of standardized assessment tools.

In Kazakhstan, similar research is emerging. For example, Adelbayeva, Mussina, and Kazhimova (2022) used PISA-2018 data to assess the emotional well-being of students and found that social belonging plays a critical role in educational engagement. Dyussenova and Mandykayeva (2025) demonstrated the effectiveness of AI-assisted interventions in improving social intelligence among repatriate (Oralman) students. Sailinova et al. (2024) linked the development of social intelligence to cognitive skills like reflection and planning, while Tuyakova, Orynbekova, and Aiekeshova (2025) documented significant increases in students emotional intelligence after targeted training in higher education institutions.

Finally, both international and Kazakhstani studies support the claim that cooperative learning and project-based activities are highly effective frameworks for developing students emotional and social competencies. Their adaptability across cultural, disciplinary, and institutional contexts provides a strong foundation for the development of a Kazakhstani model of social-emotional learning – one that is particularly well-suited to the conceptual and collaborative nature of biology education.

All of this has a deep impact on learning, since when students lack emotional engagement, they tend to remain within the framework of traditional teaching. This offers them a comfort zone and creates the illusion of learning, but in reality, it affects them negatively. It also makes it harder to incorporate new knowledge, as they are unable to integrate or process it efficiently. As a result, the processes of deepening and assimilation are interrupted, preventing the student from making meaningful use of what they have learned. This limits their ability to make decisions, reduces their creativity, and slows their adaptability to the changes occurring in society (M.M. Erazo-Moreno, M.E. Colichon-Chiscul, J. Nina-Cuchillo and N. Cubas-Irigoin, 2023).

Methods

The criteria for evaluating the effectiveness of this experience is the degree of students self-realization through project-based activities incorporating socio-emotional skills. This is assessed using the following indicators:

Educational level of students

During the project activities, students cognitive interests were surveyed using V.S. Yurkevich's methodology. The aim of this method is to determine the level of motivation among learners engaged in project work.

– Students responses were scored based on their expressed attitude toward project activities and their preference for educational conditions: 1) Neutral answer – 3 points; 2) Expression of negative attitude – 1 point; 3) Confidently giving a positive answer – 5 points. Based on the results, students were categorized into groups with high, medium, and low motivation.

Increasing interest in studying biology

To assess learners' motivation in studying biology, we also applied N. Luskanov's methodology.

Emotional Intelligence

Emotional intelligence was assessed using Cattell's 16 Personality Factor (16PF) methodology.

Ability for project-research activities

Students capacity for engaging in project-research activities (as a result of increased enthusiasm for the subject) was determined through a combination of Guilford's creativity test and Ginsburg's motivation assessment method.

The positive dynamics of the experience were confirmed by the results of monitoring the level of cognitive activity of learners using diagnostic tools. The application of these methods provided the following data.

Results and Discussion

The creation of a Kazakhstan-specific model for engaging students in scientific research through project-based activities is the result of extensive work. To achieve this goal, we developed a three-year plan for our scientific research.

In the first stage of the dissertation study, the following key research areas were identified:

1. Investigation of the development of students skills through project-based activities;
2. Analysis of students motivation for participating in project activities using research methodologies;
3. Study of the management of students cognitive activity;
4. Comparative analysis of student engagement.

The experimental part of the dissertation was carried out in three main phases, in accordance with the research plan: the diagnostic experiment (was conducted between 1.10.2022 – 1.03.2023 and the results were published), the formative experiment (2024), the control experiment (2025), and the final experiment (2025). A total of 57 students participated in the study, including 31 students in the experimental group and 26 in the control group.

As part of the educational process, the formative experiment on the development of socio-emotional skills through project-based activities was conducted in two stages. Phase 1 took place from September 2023 to January 2024. The average age of the participants was 18 years. Psychologists from the educational institution were involved in the project and administered a socio-emotional training program to the experimental group (31 students). The second group (26 students) served as the control group. Following the training, topics related to socio-emotional learning were integrated into the independent coursework of the bachelor's program for the experimental group through project-based learning. Students responses were analyzed

using the content analysis method. Further statistical processing of the results included the use of mathematical and statistical methods, such as the calculation of the arithmetic mean ANOVA. A variance analysis was also conducted.

The following results were obtained during the control period of the empirical study of the experimental and control groups conducted after the introduction of the socio-emotional training program.

The participants were 1st-year students of the 6B01505 – Biology teacher training educational program. As part of their professional training, they studied biological objects and scientifically planned and carried out research projects within the core subject modules of «Botany» and «Zoology». According to V.S. Yurkevich's method of evaluating «Cognitive Interests», students were assigned scores based on their survey responses.

Table 2. The results of the survey of students on «Cognitive interests»

Cognitive interests	Students who participated in the survey %					
	High level		Intermediate level		Lower level	
	2023	2024	2023	2024	2023	2024
How long do students spend on intellectual work?	25	35	52	55	23	10
How do students answer when given questions aimed at knowledge and research?	15	33	25	45	60	22
Do students read a lot of secondary literature in the subject of biology?	20	45	57	50	23	5
Do students perform tasks related to project work with interest?	25	33	25	47	50	20
Do students often ask complex, logic-based questions based on their interests?	15	40	25	55	60	5
Can learners exercise self-control, emotional self-awareness, assertiveness, self-affirmation, independence, and self-esteem?	25	33	25	47	50	20
The ability to adapt to new things during project activities: communication with reality, flexibility, problem solving; prevailing mood: is there any optimism?	20	45	57	50	23	5
Are the skills that accumulate personal qualities, such as self-control, communication, ability to achieve a set goal, confidence, critical thinking, etc., visible in project work?	25	33	25	47	50	20

Analyzing the results of the implementation of project-research activities, it should be noted that the academic progress rate in the experimental group reached 100%, with 85% of students receiving grades of «B» or «A-». This indicates that the development of positive motivation leads

students to achieve educational outcomes aligned with both their personal social values and broader collective or societal values. The following results were obtained based on the diagnosis of the motivational-volitional sphere of 1st-year students using N. Luskanov's methodology. A total of 31 first-year students participated in the assessment of their interest in project-based activities according to this method. The methodology involves a test that identifies the level of interest among students across three levels.

1. Do you like research work in «Botany», «Zoology» subjects? a) doesn't like it very much; b) likes; c) doesn't like it.

2. How will you feel if the teacher gives assignments related to research work in «Botany» and «Zoology» subjects? a) I don't do it; b) in different situations; c) I will do it with joy.

3. If the teacher gives you assignments related to project work to do at home, how would you feel about doing them without coming to the university? a) I don't know; b) I do it at home; c) no, I will go to university.

4. How do you feel if you don't have lessons in «Botany» and «Zoology» subjects? a) likes; b) different situations; c) doesn't like it.

5. How do you feel about not doing homework in «Botany», «Zoology» subjects for project work? a) I will do it; b) I don't do it; c) I didn't know.

6. How would you like to keep the project running? a) I don't know; b) I am against it; c) always.

7. How do you feel about the help of other friends in the project work? a) I don't mind; b) sometimes; c) I don't ask my friends for help.

8. How would you feel if you were involved in a project against your will? a) I don't know; b) I participate; c) I will not participate.

9. Do you think that personal qualities such as self-control, ability to communicate, ability to achieve a set goal, confidence, critical thinking develop in project work? a) yes; b) no; c) I can't say.

10. Do you like doing project work through teamwork? a) likes; b) not so much; c) doesn't like it.

Interpretation and processing of results

Table 3. A special key for the processing result

Levels of interest match the key	Questions №									
	1	2	3	4	5	6	7	8	9	10
High - 2 points	Б	В	В	А	Б	Б	А	Б	Б	А
Medium - 1 point	А	Б	А	Б	В	А	Б	А	А	Б
The lowest is 0 points	В	А	Б	В	А	В	В	В	В	В

The levels of students motivation for project work are determined by the following score ranges:

14-20 points – a high level of engagement in project work. Students with this score demonstrate strong cognitive motivation and a desire to meet all academic requirements of the university.

7-13 points – medium level, indicating a generally positive attitude toward project work. This is considered a normative result and was observed in the majority of students. These students are characterized by cognitive motives prevailing over social ones.

1-6 points – low level, reflecting a negative attitude toward project work. This result is typical for students with low motivational, psychological, or physiological readiness.

After the practical component of the project work was completed, a follow-up assessment was conducted to evaluate students attitudes toward project-based learning, particularly in the subjects «Botany» and «Zoology», within the program 6B01505 – Biology Teacher Training. The data revealed that 77.6% of students showed sustained motivation to study biology. The remaining students demonstrated high motivation toward other subjects, which is linked to their process of professional self-determination. The clearer a student's personal attitude toward independent cognitive activity, the greater their readiness to engage in it.

When formulating survey questions, it is important to consider the challenges students face during the implementation of their projects. The projects implemented in «Botany» and «Zoology» were extracurricular in nature: part of the work was conducted in class (initial project launch and final presentations), while the majority required students to invest their own time, effort, and resources outside of class. These additional costs – time, effort, and materials – are difficult to quantify. Teachers identified student challenges while providing consultation support during project implementation, and these challenges often served as a basis for reflective analysis

Table 4. Grouping by types of activities that are formed as social-emotional skills through project activity

№	Project activities	Specific social-emotional skills to be formed
1.	Thinking activities	professional skills or success skills
		to be able to manage oneself, to be able to communicate, to be able to achieve one's goals,
		skills that accumulate personal qualities, such as goal setting and formulation of tasks, confidence, critical thinking.
		presenting ideas, hypotheses through brainstorming
		questioning (seeking a hypothesis)
		formulating a prediction
		method-based selection
		plan your activities
		self-analysis and reflection.
2.	Presentational	creating an oral report (message) about the work done
		selection of methods and forms of visual presentation of service results (product).
		preparation of items for visual presentation of service results (product).

		preparation of visual materials
		preparation of a written report on the work done
3.	Communicative	achieving goals (being able to work to achieve set goals); Building positive relationships, teamwork and effective conflict resolution
		expressing oneself working with others (the ability to build productive relationships with other people) showing understanding and compassion for others
		compromise emotion management (being able to control and understand both the expression of one's own emotions and the emotional states of other people)
		able to make responsible decisions. interaction within the group
4.	Search	able to manage emotions and values, behavior in group work to achieve their goals, find information about catalogs
		contextual search
		in hypertext, on the Internet, wording of keywords
5.	Informational	structuring information
		to separate the main thing
		receiving and transmitting information
		presentation in various forms

Conclusion

One of the important methods of organizing the educational process is the project-based learning method. This approach involves a set of educational and cognitive activities centered around students independent research on a specific problem. The integration of cooperative learning, project-based activities, and the development of social skills serves as a means for students to engage in scientific inquiry. In this process, students actively create and shape their own learning environment.

Moreover, cooperative learning through project-based activities and social skill development fosters independent and creative personal growth. The core idea of the project method is that students educational and cognitive activity is directed toward achieving a result by solving a problem of practical or theoretical significance.

Before and after completing the project, students conduct a comparative analysis of the results of their project skill assessments. This allows for:

– evaluating the dynamics of project skill development (whether positive or negative) through cooperative, socially engaged learning;

– planning for the targeted development of specific project skills, including the creation of lesson plans focused on cultivating those skills in future projects.

Cooperative learning and focused, project-based instruction help build project skills at varying levels. A questionnaire was designed to monitor the development of project skills

according to defined levels, allowing for adjustments in the set of skills being evaluated. Based on a comprehensive assessment approach, the outcomes of cooperative learning in project-based and socially integrated activities were evaluated. This framework enabled more effective organization of students project activities moving forward.

Contribution of the authors

Atysheva B.B. – Development of the research concept, definition of the aim and objectives, along with an analysis of educational goals and global competence indicators.

Amanbayeva M.B. – Primary contribution included providing guidance throughout the writing process, assisting in data interpretation, and contributing to the drafting of the Discussion section.

Gul A. – The primary contribution involved designing the research methodology and taking responsibility for writing the Methods section.

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Жобалық іс-әрекет пен әлеуметтік дағдыларға негізделген бірлескен оқытуды эмоционалды интеллект қалыптастыруда қолдану

Аңдатпа. «Биология» пәнін оқытуда білім алушылардың жобалық іс-әрекет арқылы әлеуметтік-эмоционалды дағдыларын дамыту маңызды бағыттардың бірі. Эмоционалды интеллект пен биология пәнінің байланысы жобалау іс-әрекетінде топтық жұмыс барысында білім алушылардың бір-бірінің эмоцияларын түсінуі, басқару қабілеті, кез келген жағдайды жеңілдетудің оң тәсілдері, тиімді қарым-қатынас жасауы кезінде көрініс табады. Ғылыми мақалада биолог мамандарды даярлауда жобалық іс-әрекет пен әлеуметтік дағдыларды дамыту арқылы эмоционалды интеллекттің қалыптастыру нәтижелері көрсетілген. Мақалада жобалау іс-әрекеттің теориясы мен практикасында қайшылықтармен бетпе-бет келіп, оларды шешу мәселесі қарастырылған. Бірлескен оқытуда эмоционалды интеллект қалыптастыруда тақырыбы қозғалған.

Мақалада білім алушыларға арналған жобалық іс-шаралардың мақсаты анықталып, жобалау қызметі процесінде дағдыларын дамыту бойынша ғылыми зерттеулердің нәтижелері келтірілген. Жобалық-зерттеу іс-әрекеті процесінде білім алушылардың дағдыларын дамыту мен қызығушылығын диагностикалау – бүгінгі күннің өзекті мәселесі. Зерттеу бойынша күтілетін нәтиже тәжірибенің оң динамикасы білім алушылардың танымдық белсенділігі деңгейін мониторингтеу нәтижелерімен расталады. Жобалық іс-әрекет кезінде әлеуметтік-эмоциялық дағдыларды қалыптастыру бойынша эксперимент бірнеше кезеңнен тұрды. Нәтижелерін өңдеуде математикалық-статистикалық әдістер (ANOVA) қолданылды. Дисперсиялық талдау жасалды. Жоба аяқталғанға дейін және одан кейін білім алушылар жобалық дағдыларын бағалау нәтижелерін салыстырмалы талдау жасалынды. Жобалық іс-әрекет пен әлеуметтік дағдыларға негізделген бірлескен оқыту бүгінгі таңда керекті дағдылардың даму динамикасы (оң немесе теріс) туралы қорытынды жасауға болады.

Түйін сөздер: эмоционалды интеллект, ғылым, білімгер, жобалық іс-әрекет, әлеуметтік-эмоциялық дағдылар, оқыту, Soft skills, бірлескен оқыту.

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Использование совместного обучения в формировании эмоционального интеллекта основанного на проектной деятельности и социальных навыках

Аннотация. Важным направлением в преподавании предмета «Биологии» является развитие социально-эмоциональных навыков обучающихся через проектную деятельность. Связь между эмоциональным интеллектом и биологией проявляется в проектной деятельности в процессе командной работы, когда обучающиеся понимают эмоции друг друга, обладают управленческими способностями, позитивными способами облегчения любой ситуации, и эффективно общаются между собой. В научной статье отражены результаты формирования эмоционального интеллекта через развитие проектной деятельности и социальных навыков в подготовке будущих биологов. В статье рассматривается проблема разрешения противоречий в теории и практике проектной деятельности при проведении исследования. Также затронута тема формирования эмоционального интеллекта в совместном обучении.

В статье определена цель проектных мероприятий для обучающихся и приведены результаты научных исследований по развитию навыков в процессе проектной деятельности. Диагностика интереса и развития навыков обучающихся в процессе проектно-исследовательской деятельности является актуальной проблемой сегодняшнего дня. Ожидаемый результат по исследованию подтверждается результатами мониторинга уровня познавательной активности эксперимент по формированию социально-эмоциональных навыков при проектной деятельности состоял из нескольких этапов: при обработке результатов применялись математико-статистические методы (нахождение среднеарифметического значения и дисперсионный анализ (ANOVA)); также был проведен сравнительный анализ результатов оценки проектных навыков обучающихся до и после завершения проекта. Совместное обучение, основанное на проектной деятельности и социальных навыках, позволяет сделать вывод о динамике развития необходимых на сегодняшний день навыков.

Ключевые слова: эмоциональный интеллект, наука, обучающийся, проектная деятельность, социально-эмоциональные навыки, обучение, Soft skills, совместное обучение.

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