IRSTI 14.25.07
DOI: https://doi.org/10.47344/m7mrmn54

Shakhrizat Agaidarova[1], Nursultan Japashov[2], Samat Maxutov[3]*
[1,3]SDU University, Kaskelen, Kazakhstan
[2]University at Albany, New York State University, Albany, NY, USA
[*]e-mail: samat.maxutov@sdu.edu.kz

DEVELOPING KAZAKHSTANI SCIENCE CAPITAL THROUGH CLIL IN THE CONTEXT OF INTERNATIONAL OLYMPIADS

Abstract. Science capital development is becoming a priority in Kazakhstan. The country endeavors to incorporate international best practices into its education system, yet insufficient research and preparation hinder effective implementation. However, bottom-up practice blends post-Soviet educational methodologies with modern approaches, resulting in a hybrid approach. One such initiative is teaching science through Content and Language Integrated Learning (CLIL) employing English. CLIL serves as a transformative strategy in multilingual educational contexts, bridging language and content for deeper comprehension. This study explores how students develop their science capital within CLIL settings through the lens of the Science Capital framework. We examined students' perspectives through interviews, observations, and analyzed official policy documents to support the findings. Our findings align with previous literature. However, this study introduces a novel perspective on languages used in science education. It was found that Russian remains one of the dominant languages in science education despite ongoing efforts to implement the Kazakhization policy. Moreover, field notes indicate that participants lack practical skills and experimental knowledge, hindering their ability to compete in high-stakes Olympiads and limiting the full development of their science capital. Correspondingly, to unlock Kazakhstan's holistic capital and foster an informed citizenry, it is crucial to integrate the local language(s) more effectively into science education policy and improve the curriculum to enhance theoretical and practical scientific competencies.

Keywords: science capital, CLIL, science Olympiads, STEM career interest, Kazakhstani education system

Introduction

With a wealth of natural resources and multilingual capital, can Kazakhstan leverage STEM education to unlock its full economic potential? STEM education promotes economic growth, innovation, technical advancement, national security, global competitiveness, and solves societal issues (Brown, 2012; Bybee, 2013). Sahin et al. (2015) highlight that nations succeed in the global marketplace when their citizens are STEM-literate and have informed awareness. Kazakhstan systematically undertakes initiatives to enhance STEM fields (Japashov et al., 2022). For instance, according to the State Program for the Development of Education and Science of Kazakhstan for 2020-2025, all schools should be equipped with classrooms designed explicitly for STEM. As part of the elective courses, public schools actively teach children the basics of programming, robotics, computer modeling, and design (MES, n.d). According to the trilingual education policy, English is a medium of instruction for high school students in science disciplines. The Science Committee of the Ministry of Education and Science provides Funding for STEM implementation projects (Zholumbayev et al., 2021).

Moreover, recent local studies show that grade level, gender, family socioeconomic status, school type, and end-of-term marks affect students' STEM career interests (Balta et al., 2023). Early exposure to STEM-related activities positively impacts students' interest in STEM (Bybee & Fuchs, 2006; DeJarnette, 2012). Furthermore, external and contextual factors, including the classroom microsystem, school mesosystem, and societal macrosystem, play a crucial role in shaping students' interest in STEM careers (Balta et al., 2023). Coming to the school mesosystem and societal macrosystem, science Olympiads are among the practices that promote STEM career interests from the academic side (Sahin et al., 2015; Smith et al., 2021). Sahin et al. (2015) found that participating in Science Olympiads strengthened students' intent to pursue STEM majors, though female students predominantly chose environment, whereas male students opted for engineering.

Science Olympiads offer students a valuable opportunity for personal and academic growth, fostering critical thinking, analytical skills, problem-solving abilities, twenty-first-century competencies, and facilitating networking (Sahin et al., 2015). On a national level, Science Olympiads contribute to workforce development, enhance international reputation, develop innovation and research, and positively impact the country's economic growth (Campbell & Walberg, 2011). Moreover, Archer et al. (2014) contend that scientific knowledge and qualifications possess both symbolic and exchange value nationally, as a scientifically educated populace is esteemed in the job market, facilitating the advancement of the knowledge economy.

This research has two major goals. First, it aimed to explore students' perceived benefits of participating in the International Junior Science Olympiad (IJSO), identifying factors influencing Kazakhstani students' STEM aspirations. Second, it aimed to explore students' views on learning Science through the CLIL approach. This study is among the first to examine the interconnectedness of these elements using a purely qualitative approach, uncovering previously unexplored insights. The findings offer a novel understanding of science teaching through CLIL in Kazakhstan, the development of science capital, and the challenges associated with participating in International Science Olympiads. These insights challenge existing perspectives of local education, contributing to ongoing discussions on educational challenges and opportunities within the Kazakhstani education system.

The rationale for incorporating these elements in this qualitative investigation stems from their interconnected roles in shaping students' academic and professional trajectories. Each component significantly contributes to students' cognitive, linguistic, and career development, making their combination meaningful (Dalton-Puffer, 2011; Maltese & Tai, 2009). Moreover, the majority of studies in this field are quantitative, focusing on statistics and different contexts (Chiang et al., 2024; Sahin et al., 2015; Smith et al., 2021); this study employs a qualitative approach to shed light on dispositions and lived experiences of the Kazakhstani participants to fill the research gap. Moreover, this study has a theoretical novelty, as it is among the first to employ the Science Capital framework (Archer et al., 2015) in the Kazakhstani context. Overall, this study makes significant contributions to the existing body of research in several ways. Firstly, previous studies investigated the correlation between participating in Science Olympiads and STEM motivation. This study contextualizes these phenomena locally, employing a qualitative approach that provides interesting insights. Secondly, the researchers integrated the Science Capital framework with CLIL, which offers a novel perspective on learning science in a multilingual setting.

Our main objective was to examine the findings through the lens of the Science Capital framework (Archer et al., 2014), which elucidates how students' science-related dispositions, behaviors, practices, and social capital form their science capital. First, we examine this framework, followed by a thorough review of the central themes. Next, a brief outline of the methodology and ethics that guided the study is provided. Then, the findings are presented and discussed through the theoretical lens. Finally, the paper concludes with recommendations for further research and acknowledgements of the limitations.

Theoretical approach

Archer et al. (2012) conducted a longitudinal mixed-method study, which laid the groundwork for conceptualizing Science Capital (Archer et al., 2015). Archer et al. (2012) employed Bourdieu's Theory of Practice (Grenfell & James, 2003), a comprehensive framework that illustrates how social disparities evolve through the interplay of fundamental concepts such as habitus, capital, and social contexts. Habitus refers to a set of deep-rooted dispositions that impact how individuals perceive and act in a social context; capitals are various forms of resources such as cultural, societal, symbolic, and economic; social context is an area where individuals cooperate, engage, and increase their capital

(Archer et al., 2014). The findings of Archer et al. (2012) are multidimensional, covering family habitus, social class, and cultural capital that shape children's science aspirations. Familial support plays a crucial role in defining a child's career path. For instance, middle-class families provide structured support for their children due to their economic, cultural, and social capital, making science a common career choice. It refers to family habitus. Archer et al. (2012) defined the family habitus as an interplay of family behavior patterns, values, and practices. Family habitus is the (un)conscious integration of Science into family life, influencing a child's learning and perceptions of science (Archer et al., 2012).

Archer et al. (2014) used Science Capital as a conceptual framework to examine how socioeconomic class influences a child's interest in science careers. However, science capital is not distinct from other capitals; it is a theoretical tool for connecting social, cultural, and economic capital (Archer et al., 2014). Archer et al. (2012) define science capital as an individual's scientific knowledge, qualifications, interests, and social connections. Possessing science capital is advantageous in employment since it signifies academic competence and indicates "informed citizenry" (Archer et al., 2014, p. 19). In their later work, Archer et al. (2015) expanded the theoretical concept of Science Capital and proposed ways to measure it. Their model included three key dimensions: Science-Related Cultural Capital, Science-Related Behaviors and Practices, and Science-Related Social Capital, each comprising distinct components (Archer et al., 2015).

Science Olympiads

The Science Olympiad is a collective and individual competition in which students from multiple levels, including regional, state, national, and international, engage in academic events (Sahin et al., 2015). For example, Smith et al. (2021) indicate that participation in STEM Olympiads contributes to developing career interests in STEM in the long term. Networking opportunities, global interaction, and cultural awareness are key advantages of Olympiad participation (Sahin et al., 2015). Moreover, Campbell and Tirri (2017) found that participating in STEM Olympiads provides opportunities to access elite universities and fosters students' academic growth and research skills. Similarly, Singaporean students who achieved gold medals in reputed olympiads enhanced admission chances to prestigious universities (Lim et al., 2014). Consequently, positive attitudes toward communication, collaboration, and adaptability contribute to developing 21st-century skills (Wirt, 2011).

IJSO is an annual competition that encompasses examinations in physics, chemistry, and biology (Park, 2024). IJSO stimulates students' curiosity in Science, fostering skills in problem-solving, critical analysis, and hands-on experimentation (IJSO, n.d.). Participants engage in individual assessments, including multiple-choice and theoretical exams, and collaborative, practical experiments where teamwork is essential to accomplish a shared objective (IJSO, n.d.). Several studies focused on IJSO from different perspectives, such as profile interest (Dierks et al., 2014; Höffler et al., 2019), social self-concepts (Höffler et al., 2017), students' social-emotional well-being (Nadhirah and Fauzia, 2019), and analysis of olympiad questions (Kim, 2024; Lee, 2024; Park, 2024).

Dierks et al. (2014) compared interest profiles between two groups: participants of IJSO and regular secondary school students, applying a mixed-method approach. The study results indicate different interest profiles between the two groups, highlighting the unique preferences of students engaged in science competitions. Similarly, Höffler et al. (2019) examined the science interest profiles of various groups. The quantitative study identified general disparities and specific interest profiles among Olympiad students. Another study by Höffler et al. (2017) compared the social self-concepts of the IJSO participants with non-participants and participants in sports competitions. It indicates that IJSO participants had higher social self-concepts than other groups (Höffler et al., 2017).

Factors shaping STEM career interests

Scientific Olympiads provide an out-of-school opportunity to develop students' STEM aspirations through practical experience and real-world scientific challenges (Sahin et al., 2015). Supportive learning environments and STEM role models significantly influence students' long-term career interests in STEM (Oliver, 2017). STEM competitions enhance students' academic performance and instill fundamental skills and knowledge required for sustainable development

(Baskaran, 2016). This aligns with national investment priorities, educational advancements, and technological innovation, essential for informed decision-making and addressing global challenges (Baskaran, 2016).

The literature review identifies individual, social, and environmental factors influencing students' STEM career interests. Regarding individual factors, a systematic review by Campbell and Tirri (2017) identified key personal characteristics that positively influence students' interest in STEM in different countries. For instance, Finnish Olympians' early exposure to math is a critical component. Moreover, Finnish students' self-assurance, self-reliance, intense curiosity, and persistent efforts are also critical. Similarly, German Olympians credit their success in STEM to traits such as drive, dedication, initiative, and curiosity. Chinese Olympians emphasize the importance of family engagement in early schooling, combined with psychological stability and personal dedication.

Furthermore, favorable traits such as attention, critical thinking, curiosity, independence, involvement in extracurricular activities, and efficient time management skills influence Taiwanese children's interest in STEM (Campbell & Tirri, 2017). Smith et al. (2021) investigated the impact of participating in Science Olympiads on former Olympians using a mixed-method approach. The findings indicate that personal characteristics such as curiosity, confidence, interest in STEM, motivation, early exposure to STEM, and independence in learning positively affected their career choices in STEM. Sahin et al. (2015) assert that personal interests vary by gender. Male students preferred engineering (41,6%) while female students viewed engineering as least favorable and opted for environmental studies (69%). Similarly, Top et al. (2015) found that girls were interested in environmental studies, whilst boys chose engineering. Moreover, new experiences, self-confidence, and academic contribution were identified as significant factors related to individual aspects by Top et al. (2015). Participants indicated that participation in the Science Olympiads afforded them worldwide experience, enabling immersion in various cultures (Top et al., 2015). Regarding academic contribution, Top et al. (2015) discovered that Science Olympiads served as extrinsic reinforcement to motivate students to get scholarships. Overall, this paragraph underscores the significant factors that positively shape students' interest in STEM from an individual perspective (Campbell & Tirri, 2017; Japashov et al., 2022; Smith et al., 2021; Top et al., 2015).

Family characteristics, including siblings, parents' occupations, and education, have been identified as key factors influencing students' interest in STEM careers (Archer et al., 2012; Xie et al., 2015). Japashov et al. (2022) suggest that students' interest in STEM varies depending on the number of siblings in their families. Interestingly, students' interests in STEM did not significantly differ based on their parents' occupations and education levels, as Japashov et al. (2022) indicated. However, Balta et al. (2023) found a positive association between the number of siblings and students' interest in mathematics careers. Additionally, familial support and the presence of family role models were significantly correlated with higher interest in STEM careers among students (Archer et al., 2012). It is noteworthy that Black et al. (2005) have reported a negative correlation between family size and children's education, while Japashov et al. (2022) and Ali et al. (2017) have found no significant difference in children's education based on family size. These findings underscore the complex interplay between family dynamics and students' career aspirations in STEM, highlighting the importance of familial support in shaping students' career trajectories in STEM (Archer et al., 2012).

CLIL

CLIL is a widely used educational approach for simultaneously teaching content in an additional foreign language (Cenoz et al., 2014). However, its definition and implementation process are questioned by the balance of teaching language and content, assessment issues, linguistic capacity, instructional objectives, and target language exposure (Cenoz et al., 2014). CLIL is an umbrella term with a dual focus on teaching content in a foreign language (Marsh, 2002). Moreover, English is a widely used foreign language in the context of CLIL (Dalton-Puffer, 2011). Within Kazakhstan, CLIL is also a highly researched notion from different viewpoints (Bedeker et al., 2023; Huertas-Abril & Shashken, 2021; Karabassova & San Isidro, 2023). For instance, Bedeker et al. (2023) explored science teachers’ pre-existing knowledge of CLIL practice by analyzing it through the third space theory. “Science teachers’ epistemic stance shows hybridity” (Bedeker et al., 2023; p. 128), meaning that they integrate their previous teaching practice with CLIL pedagogy, resulting in a new dynamic way of science teaching. Thus, in the scope of our study, the working definition of CLIL refers to teaching content such as biology, chemistry, and physics through English medium instruction with translanguaging practices into Kazakh and Russian languages (Karabassova & San Isidro, 2023).

Methodology

This inquiry employs a qualitative approach, including interviews, document analysis, and field notes from non-participant observations, to investigate the benefits of participating in IJSO and students' perspectives on studying through CLIL (Merriam & Tisdell, 2016; Patton, 2014). Using multiple data collection tools, including interviews, document analysis, and observations, resembles Miles and Huberman’s (1994) concept of triangulation, which supports researchers in making sense of valid and credible research data (Merriam & Tisdell, 2016; Patton, 2014). In this study, we sought to gain a deeper understanding of how students perceived the benefits of participating in IJSO and the factors that influenced students' career trajectories in science. The study employed a purposeful sampling strategy to recruit participants who had direct experience of participating in international Science Olympiads (Creswell, 2017). The rationale for the purposeful selection of participants is to gain a detailed understanding of the benefits and challenges that students perceive when participating in high-stakes Olympiads, as well as their experiences of studying science in English. Using a purposeful sampling technique allowed the researchers to get rich and meaningful data that aligns with the research aim.

The sample consisted of 10 students who participated in IJSO 2023 Thailand and IJSO 2024 Romania. There were eight male and two female students. However, gender was not treated as a research variable in this study. We report it for informative purposes. The small sample size is justified by prioritizing information rich participnats rather than statistical dominance in qualitative research (Creswell, 2017). Participants are recruited based on their experience in IJSO 2023 Thailand and 2024 Romania to explore their perspectives on participating in international Science Olympiads. Additionally, we observed data saturation with these ten participants. The sample provided in-depth and rich data on participation in international educational initiatives, challenges, factors, and learning science in other languages. Subsequently, the research seeks to answer the following research questions:

- How do Kazakhstani students perceive the benefits of participating in the International Science Olympiad, and what factors influence their STEM aspirations?
- What are students’ views on learning science through English in Kazakhstan?

Data collection

The data were collected through field notes, document analysis, and semi-structured interviews (Miles & Huberman, 1994). These procedures allowed us to develop an in-depth understanding of the study on the impact of participating in IJSO and learning science through English. Data collection took place from December 2023 to January 2025. It consisted primarily of interviews, complemented by field notes from the IJSO competitions in Thailand in 2023 and in Romania in 2024. One researcher served as team leader, tasked with supporting the Kazakhstani students. The researcher kept copious field notes during the trips to support the interview data. To minimize researcher bias, this researcher did not conduct the interviews but only took field notes. The interviews were conducted by another team member who had no contact with the participants.

Interviews

Semi-structured interviews were conducted with volunteers who participated in IJSO. First, we sent contact letters to all potential participants explaining the study's purpose and ethics, which ensured confidentiality. A parental consent form was prepared and distributed to volunteering participants to obtain permission from their parents. Only after getting parental consent, the researchers conduct interviews via phone calls. The interviews lasted for around 40 minutes. The interview questions were prepared in English and translated into Kazakh and Russian. The respondents chose the language of the interview. The interview questions were semi-structured and open-ended to allow participants to express their unique experiences about IJSO, studying through a foreign language, future careers, and skills development. All researchers are proficient in Russian, Kazakh, and English. Two researchers translated the transcript into English; all three proofread the translation for inaccuracies.

Document Analysis

The document analysis began by reviewing official documents about Kazakhstan's education system and participation in the Olympiad. We identified their relevance to the research and created a document summary form (Miles & Huberman, 1994). The document analysis explored the rationale behind language policy implementation and participation in international Olympiads. It provided the necessary information to recognize the importance of participating in international scientific olympiads and obtain formal guidance on using foreign languages in science education.

Research Context and Participants

One of the researchers served as the team leader of the Physics Olympiads and had the opportunity to travel and observe the IJSO competition process. According to observer notes, IJSO is a very selective tournament, with every country taking part allowed to send only six students. The competition comprises three distinct sections. First, individuals are tested on their theoretical understanding of biology, chemistry, and physics. Second, it involves solo problem-solving tasks across these three disciplines. Third, students are assessed on their experimental competencies, with participants working in three teams to conduct hands-on experiments. According to field notes, IJSO develops students' intercultural communicative competence, communication skills, and problem-solving skills. English was used as a *lingua franca* during the IJSO Olympiad in Thailand in 2023 and Romania in 2024. According to field notes, all participants have good English communication skills. We purposefully recruited the participants through the list of IJSO participants. The researcher sent each participant a contact letter, asking them to volunteer to participate in the study. Palinkas et al. (2015) claim that qualitative research frequently employs purposeful sampling to gather data-rich examples about the main phenomena. This inquiry included telephone interviews with 10 students who participated in IJSO 2023 Thailand and IJSO 2024 Romania. The participants consisted of eight male students and two female students.

Data Analysis

The data analysis focused on deriving meaning from participants' responses, field notes, and official documents. Qualitative methodology highlights that data collection and analysis are interconnected and collaboratively constructed work (Creswell, 2017; Merriam & Tisdell, 2016; Patton, 2014). Data collection and analysis are the two stages of the ongoing iterative process that constitutes qualitative data analysis (Miles & Huberman, 1994). The data were organized into emerging themes, and broader ideas were generated (Merriam & Tisdell, 2016). Each audiotape of the interview was carefully listened and detailed notes were taken. Then, the data were coded using a coding system that included labeling and categorizing (Patton, 2014).

As reported, we categorized and developed themes. The research questions were used as a guide during data analysis. Next, responses were grouped according to recurring themes, patterns, and concepts aligned with the study questions (Merriam & Tisdell, 2016). Several themes emerged from the data. But the researchers focused on the most relevant patterns that closely align with the research questions. Those include factors, perceived benefits, and the role of the languages.

To ensure transparency, the researchers followed the steps outlined by Clarke and Braun (2017) for the thematic analysis. The interview transcripts were read carefully multiple times, and codes were generated directly from those responses. Those codes were systematically refined and grouped into broader categories. Following this, overarching themes were identified that represent the key findings of the study. The data were analyzed using an inductive thematic analysis approach (Clarke & Braun, 2017), where we used the interview transcripts to identify patterns of meaning that emerged from the data.

Credibility and Trustworthiness

The purpose of this study is to explore the perceived benefits of participating in International Olympiads, investigate the factors influencing students' career interests, and their views on studying content in English. Data triangulation was used, including interviews, field notes, and document analysis (Patton, 2014). The face validity approach (Lather, 1986) was also employed, which means reviewing themes, adjusting and recycling them to ensure that the results appropriately reflect the participants' experiences. The data analysis was a continual process of returning to the data, reviewing, recycling, and modifying. Member checking was also employed, where a subsample was used to confirm that the data provided by respondents was accurately transcribed. Such validation is critical for accurately expressing participants' experiences and perspectives, and it determines the authenticity and credibility of the findings (Agbo et al., 2023). Furthermore, this inquiry provides a thick description of the research process, participants, and setting, making it more transferable to other contexts and enabling readers to assess the applicability of the findings (Ponterotto, 2006).

Ethical Considerations

Ethical considerations were the key to the current study's design (Creswell, 2017; Savin-Baden & Major, 2023). The current study received ethical approval from SDU University's Research Ethics Board in Kaskelen, Almaty, Kazakhstan. The participants were informed about the Ethics Procedures and Guidelines for Human Subject Research. We requested that parents sign consent papers before starting the interviews. Pseudonyms are used in the study's findings. Overall, this study underwent ethical review and approval by an institutional ethics committee to ensure that it meets ethical standards and guidelines for research involving human participants, particularly vulnerable populations such as students. The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest. All authors listed have contributed substantially to the work and approved it for publication.

Findings

Olimpiad benefits and future majors

Regarding the benefits of participating in the International Science Olympiads, participants believe they will receive or have already gained practical benefits from participating in IJSO. Among the ten interviewees, four claimed that IJSO helped them meet new friends. Here are some examples of students' assertions:

"IJSO has helped us make many new and interesting friends. It even happened that during the Olympiad we forgot that we were at the Olympiad, because of the daily excursions, different food, and communication with people. There was a case when I had breakfast, and saw crowds of people after breakfast going somewhere. When I asked "What excursion?", I was told this was the first tour. We still keep in touch with them. How are they doing? What are they doing? And sometimes it happens that one of them offers to do a group project."

In five responses, students claimed that IJSO helped them gain new knowledge. In one response, students said that they discovered new places with the help of IJSO. In another response, they mentioned that IJSO is also helpful in developing critical thinking and problem-solving skills. In two responses, students said that participating in IJSO was beneficial in getting scholarships from universities. Most respondents asserted that participation in IJSO improved their English language skills. Finally, in six responses, students said that the Olympiad helped them become motivated and raised their self-confidence:

"After communicating with foreigners and participating in well-organized events, I became motivated to study further. This is the most important opportunity.

The second question asked during the interview was what major they possibly wanted to study in college or university. All respondents claimed that they would choose STEM majors for their future studies. One of the female respondents said that:

"*I am most interested in the relationship between computer technology and chemistry, so I will most likely choose a field that connects spectroscopy, perhaps metallographic chemistry or biochemistry."*

Factors impacting STEM career interest

We asked respondents to name some factors that most affected their interest in a STEM career. There were 12 responses from the participants. In five responses, students claimed that family members, relatives, and friends impacted their interest in a STEM career the most.

“My second cousin, we have been very close since childhood. And when he was in 7th grade, I was in 4th grade. He showed me the Tesla Towers and how it works. Another factor is friends. During the Olympics, the guys who were with me were brilliant. I want to surround myself with people like this.”

Three responses asserted that school staff had the most effect on their interest in a STEM career.

“My teacher allowed me to participate in the Olympiad, and because of this, my interest in STEM awoke."

Three students said they feel confident in themselves in the STEM field and like being part of a STEM group. Only one student said that none of his relatives work in STEM-related fields. One student indicated that the media most affected his/her interest in a STEM career.

"There is a Ted Talks channel on YouTube. There, I saw many speakers talking about bioengineering. These speakers influenced me."

In response to the question 'How much do you believe that participation in IJSO influenced your career interest?' all respondents claimed that IJSO reinforced their decision.

“My knowledge of biology has expanded. Before this, I wanted to become a quantum computer engineer. I wanted to be completely in this area. And participation in this Olympiad, or rather the preparation, the study of biology, reinforced my understanding that this is necessary. That this will indeed be very helpful for the study of various biological processes. Biochemical processes. For example, how protein folds, how different vitamins pass through the body.”

In the interview, we asked students about the effect of IJSO on their daily lives. One student said that IJSO did not affect their daily life. Other students said that IJSO positively affected their daily routines.

"I have become more careful with time. Stopped playing football every day. Learned to find a balance between casual things and study."

Role of Language in Science Education

Regarding learning subjects in English, all respondents stated that subjects such as Biology, Chemistry, Physics, and Mathematics are taught in English. Moreover, all students perceive learning through English as an asset, enhancing both their subject knowledge and foreign language skills. One student mentioned experiencing linguistic difficulties at the beginning.

"At first, I had problems learning biology in English. But I improved my English after a while, and there were no more problems."

Some students highlighted the benefits of learning content in English, such as the ability to communicate with other Olympiad participants and explore new cultures. Most respondents also mentioned the availability of free online resources and experiments in English, which they found valuable. Additionally, they emphasized the opportunity to enroll in online courses.

“I watched online courses from leading universities worldwide, such as MIT's OpenCourseWare. I prepared for chemistry labs based on their courses."

"There are many advantages to studying in English. For example, Americans and Europeans share many materials online and share their experiments. Unfortunately, there is no normal equipment for research in the CIS countries."

Interestingly, one student mentioned that he uses the Russian language to communicate about Physics.

“I usually discuss scientific topics in the Russian language.”

Discussion and Conclusion

The dominant finding is that students are optimistic, believing that participation in IJSO and learning content in English will enhance their STEM career mobility. Students benefited from participating in scientific Olympiads, including making new friends, deepening their knowledge, and strengthening their critical thinking and problem-solving skills (Campbell & Tirri, 2017). Participants also stated that IJSO boosted their motivation, self-confidence, and English language skills while reinforcing their interest in STEM careers (Dierks et al., 2014; Höffler et al., 2019). These findings are consistent with previous literature, as they highlight multiple similar advantages (Lim et al., 2014; Smith et al., 2021; Sahin et al., 2015). Moreover, the document analysis revealed that participation in certain international high-stakes science Olympiads proved beneficial, particularly in securing financial awards and governmental scholarships (MES, 2022). This finding aligns with previous research on the scholarship benefits of participating in Science Olympiads (Lim et al., 2014). However, field notes indicate that most students awarded local government scholarships do not use them, opting instead for international education mobility to study abroad, leveraging their educational capital.

From a sociocultural perspective, engaging in science fairs is a form of social interaction where students, through scaffolding in learning, operate within their zone of proximal development by practicing tasks that require higher-order thinking (Vygotsky, 1978). Early exposure to and communication within social interactions, such as international Science Olympiads, would be valuable in students' future STEM careers and academic pursuits, enhancing their intercultural communicative competence (Byram, 1997; Smakova & Paulsrud, 2020). Additionally, collaborative efforts within social interactions accelerate problem-solving processes and critical thinking skills (Trilling & Fadel, 2009). These higher mental functions, essential in the STEM context, are developed through collaborative and communicative practices, with the scaffolding of knowledgeable others that enable progress within the ZPD (Glick, 2012).

Language is a powerful tool for transmitting knowledge, developing, and reflecting. Furthermore, language is crucial in facilitating mediated interaction and the exchange of cultural and cognitive practices (Daniels, 2002). Students reported that articulating their science-related ideas in English was significantly more straightforward, and they preferred engaging with science content in English (Dalton-Puffer, 2011). Proficiency in English was noted as critical for studying scientific content, as it can either facilitate or hinder cognitive processes. As documented in field notes, social interaction during the Olympiad was conducted in English, with English serving as the *lingua franca* in such international educational contexts (Seidlhofer, 2005). However, English was not the only language that helped facilitate Kazakhstan's science education. A key contribution of this study is the identification of the role of the Russian language; it also plays a pivotal role in mediated interaction, cultural exchange, and cognitive practices. Some participants highlighted that Physics-related materials were primarily available in Russian, and they found scientific discussions more effective in Russian. On the one hand, these findings suggest that the CLIL, with English as the medium of instruction, serves as an effective tool for learning science content (Dalton-Puffer, 2011). On the other hand, adopting mostly English may challenge the dominant cultural framework, in this case Kazakh, potentially fostering a deviant value system and shifting away from traditional cultural norms in the long term (Agbo et al., 2023).

When viewed through the Science Capital lens (Archer et al., 2012), students’ involvement in international science olympiads is seen as a means of increasing their science capital. Habitus, capital, and social contexts are the fundamental concepts of the comprehensive framework of Bourdieu's Theory of Practice (Grenfell & James, 2003), which operates as the foundation of Science Capital (Archer et al., 2012). Archer et al. (2012) define habitus as a set of dispositions that impact how individuals perceive and act in a social context. The findings suggest that students’ academic habitus has been formed by the dominance of English in science education, accelerating the perception that English is the predefined language of Science. This aligns with Archer et al.’s (2012) argument that habitus is a deeply ingrained set of attitudes and behaviors shaped by social interaction. The findings highlight previously unexamined relationships between science education, science capital, and participants’ cognitive development using Russian. The coexistence of the Russian language in Kazakhstani scientific discourse emphasizes different linguistic habitus among students. Some students connected strongly to English as a STEM education and scientific resource medium, while others internalized Russian as a preferred language for Physics and scientific discussion. This is similar to Bourdieu's (1991) concept of linguistic capital, in which language is a measure of social power, impacting students’ access to knowledge and academic achievement. Russian has a significant historical, political, and economic importance to Kazakhstan (Matuszkiewicz, 2010), serving as the *lingua franca* for the people of post-Soviet countries (Sabitova & Alishariyeva, 2015) and a tool of intercultural interaction (Dave, 2007).

The findings indicate that Russian still plays a significant role in Kazakhstan's educational and scientific contexts, contributing to students' cognitive development despite adopting the *Kazakhization* policy (Smagulova, 2008). As stated earlier, STEM education is designed to foster economic growth and encompass its associated aspects (Bybee, 2013). However, Wheeler (2017) claims that Kazakhs can establish a modern nation only by becoming proficient in the Kazakh language, even if they have mastered the two global languages of Russian and English. Wheeler's (2017) suggestion aligns with Byram's (1997) perspective, where the importance of the source language was emphasized to serve as a foundation for comparing, learning, and understanding the target language. It indicates that specific historical backgrounds and sociopolitical contexts mold science education in Kazakhstan, manipulating its development and implementation (Tolbert & Bazzul, 2017). Overall, the study findings revealed the use of multiple languages in science education. Further research is needed to examine how these language policy recommendations can be translated into effective classroom teaching strategies.

Additionally, Archer et al. (2015) highlight the intricate interplay of science-related cultural and social capitals, practices, and behaviors. Our findings support that scientific literacy goes beyond scientific knowledge and is more about utilizing such knowledge in a social context. Participants reported that involvement in science olympiads influenced their daily decision-making, allowing them to approach problems from multiple perspectives and engage in critical analysis (Archer et al., 2015). Regarding students' awareness of science career applicability in the future job market, participating in science-related learning contexts such as IJSO and science dispositions impact students' STEM career interests. In this study, science-related practices included watching TED Talks, participating in Science Olympiads, discussing Science, and interacting with other international Olympians, as indicated by participants. These behaviors improved students' motivation, enthusiasm, and self-esteem while also increasing students' scientific literacy and dispositions. Regarding pedagogical implications, teachers might consider incorporating project-based activities into their instruction to improve students' learning outcomes and interest in science. Finally, regarding social capital, family members and school instructors were essential role models within students' societal networks, promoting STEM career interests. However, this study did not cover all aspects of students' socioeconomic background, such as parental education, qualifications, cultural and social capital, and school types, which is a gap for further investigation.

The study has certain limitations. We did not aim to present this study's findings with the level of objectivity, quantifiability, and replicability required in research based on the positivistic paradigm (Agbo et al., 2023). Thus, employing a quantitative longitudinal study might provide more generalizable data. This approach enables examining changes in participants' dispositions, skills, and career trajectories over time, offering more profound insights into the long-term impact of Science Olympiad participation. Despite its exploratory nature, this study provides valuable insights into the dynamics of science education in Kazakhstan, highlighting the role of languages in action in strengthening science capital to build national identity. In terms of practical implications, extensive field notes revealed that Kazakhstani students lack practical experimental skills, which points to inadequate preparation for experiments, challenges faced by school teachers in delivering science experiment-related instruction, and the need for improved material and technical resources for conducting biology, chemistry, and physics experiments. This suggests that significant work is required with experimental tasks of the Science Olympiads.

Kazakhstan possesses the cultural, human, linguistic, and social capital necessary for economic development. While imitating international ideals may result in a failed educational system (Agbo et al., 2023; Fullan & Miles, 1992), the country's economy can benefit from 'knowledgeable citizenship' (Archer et al., 2014, p. 19), fostered through science capital. The findings indicate that English and Russian are considered the primary media of science education in Kazakhstan. Therefore, integrating Kazakh into science education could strengthen national identity through education. As Wheeler

(2017) stated, a nation can only achieve economic development when it attains proficiency in Kazakh. This perspective aligns with Byram's (1997) and Agbo et al. (2023) views. Science capital is essential for students' development and the economic growth of developing nations. Language, cultural, social, and human capital are key tools for fostering Kazakhstani capital, serving as a global competitiveness foundation. However, to what extent can we speak of our country's economic advancement if the source language and culture are not utilized in the education process? The researchers propose rethinking the role of the source language in science education to develop high-quality science capital that nurtures informed citizens.

Returning to the main research purpose, this study had two primary aims. First, this research explored students' perceived benefits of participating in international science initiatives and identified the key factors influencing their career interest. The researchers discussed the findings through the Science Capital Framework, which is a novel aspect, as scarce research has been conducted using this framework in the Kazakhstani context. Second, students' views on learning science through additional languages were studied, and it was found that, along with English, the Russian language also plays a role. Overall, this research achieved its aim and answered the research questions by providing detailed explanations of the key phenomena. Overall, this study contributes to the field of science education by employing the Science Capital Framework in the underexplored Kazakhstani context. Moreover, a major contribution relates to the exploration of the multilingual dimension of science learning and career interests.

References

Agbo, S. A., Pak, N., Abdrasheva, D., & Karimova, B. (2026). Modernizing Kazakhstan's Higher Education: Challenges of Policy Borrowing and Doctor of Philosophy Graduation Requirements. *International Journal of Educational Reform*, *35*(1), 229-255.

Ali, A., Ahsan, S., & Dziegielewski, S. F. (2017). Social and family capital and youth career intention: A case study in Pakistan. *Cogent Business & Management*, *4*(1), 1-16 https://doi.org/10.1080/23311975.2017.1362838

Archer, L., Dawson, E., DeWitt, J., Seakins, A., & Wong, B. (2015). "Science capital": A conceptual, methodological, and empirical argument for extending Bourdieusian notions of capital beyond the arts. *Journal of Research in Science Teaching*, *52*(7), 922–948. https://doi.org/10.1002/tea.21227

Archer, L., DeWitt, J., & Willis, B. (2014). Adolescent boys' science aspirations: Masculinity, capital, and power. *Journal of Research in Science Teaching*, *51*(1), 1–30. https://doi.org/10.1002/tea.21122

Archer, L., DeWitt, J., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2012). Science aspirations, capital, and family habitus: How families shape children's engagement and identification with science. *American Educational Research Journal*, *49*(5), 881–908. https://doi.org/10.3102/0002831211433290

Balta, N., Japashov, N., Karimova, A., Agaidarova, S., Abisheva, S., & Potvin, P. (2023). Middle and high school girls' attitude to science, technology, engineering, and mathematics career interest across grade levels and school types. F*rontiers in Education*, *8*, https://doi.org/10.3389/feduc.2023.1158041

Baskaran, A. (2016). UNESCO science report: Towards 2030. Institutions and Economies, 8(2) 125–127.

Bedeker, M., Ospanbek, A., Simons, M., Yessenbekova, A., & Zhalgaspayev, M. (2023). 'I can easily switch to the Kazakh language, also to the Russian language': Reimagining Kazakhstani CLIL implementation as a third space. *Language, Culture and Curriculum*, *37*(2), 121–138. https://doi.org/10.1080/07908318.2023.2245832

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2005). The more the merrier: The effect of family size and birth order on children's education. *The Quarterly Journal of Economics*, *120*(2), 669–700. https://doi.org/10.1093/qje/120.2.669

Bourdieu, P. (1991). *Language and symbolic power*. Harvard University Press.
Brown, J. (2012). The current status of STEM education research. Journal of STEM Education: Innovations and Research, 13(5).
Bybee, R. W. (2013). The case for STEM education: Challenges and opportunities.
Bybee, R. W., & Fuchs, B. (2006). Preparing the 21st-century workforce: A new reform in science and technology education. https://doi.org/10.1002/tea.20147
Byram, M. (1997). Teaching and assessing intercultural communicative competence. Clevedon, UK: Multilingual Matters
Campbell, J. R., & Walberg, H. J. (2011). Olympiad studies: Competitions provide alternatives to developing talents that serve national interests. *Roeper Review*, *33*(1), 17. https://doi.org/10.1080/02783193.2011.530202
Campbell, J., & Tirri, K. (2017). Mathematics and Science Olympiad studies: The outcomes of Olympiads and contributing factors to talent development of Olympians. *International Journal for Talent Development and Creativity*, *5*(1), 49–60.
Cenoz, J., Genesee, F., & Gorter, D. (2014). Critical analysis of CLIL: Taking stock and looking forward. *Applied Linguistics*, *35*(3), 243-262. https://doi.org/10.1093/applin/amt011
Chiang, F. K., Tang, Z., Zhu, D., & Bao, X. (2024). Gender disparity in STEM education: A survey research on girl participants in World Robot Olympiad. *International Journal of Technology and Design Education*, *34*(2), 629-646. https://doi.org/10.1007/s10798-023-09830-0
Clarke, V., & Braun, V. (2017). Thematic analysis. *The journal of positive psychology*, *12*(3), 297-298.
Creswell, J. W. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
Dalton-Puffer, C. (2011). Content-and-language integrated learning: From practice to principles? *Annual Review of Applied Linguistics*, *31*, 182-204. https://doi.org/10.1017/S0267190511000092
Daniels, H. (2002). *Vygotsky and pedagogy*. Routledge.
Dave, B. (2007). *Kazakhstan: Ethnicity, language and power*. Routledge.
DeJarnette, N. (2012). America's children: Providing early exposure to STEM (science, technology, engineering and math) initiatives. *Education*, *133*(1), 77-84.
Dierks, P. O., Höffler, T. N., & Parchmann, I. (2014). Profiling interest of students in science: Learning in school and beyond. *Research in Science & Technological Education*, *32*(2), 97-114. https://doi.org/10.1080/02635143.2014.895712
Fullan, M. G., & Miles, M. B. (1992). Getting reform right: What works and what doesn't. *Phi delta kappan*, *73*(10), 745-752.
Glick, J. (2012). *The collected works of LS Vygotsky: The history of the development of higher mental functions*. Springer Science & Business Media.
Grenfell, M., & James, D. (2003). *Bourdieu and education: Acts of practical theory*. Routledge.
Höffler, T. N., Köhler, C., & Parchmann, I. (2019). Scientists of the future: An analysis of talented students' interests. *International Journal of STEM Education*, *6*(29), 1-8. https://doi.org/10.1186/s40594-019-0184-1
Höffler, T. N., Bonin, V., & Parchmann, I. (2017). Science vs. sports: Motivation and self-concepts of participants in different school competitions. *International Journal of Science and Mathematics Education*, *15*, 817-836. https://doi.org/10.1007/s10763-016-9717-y
Huertas-Abril, C. A., & Shashken, A. (2021). Exploring the potential of CLIL in Kazakhstan: A qualitative study. *Revista complutense de educación*, *32*(2), 261. https://doi.org/10.5209/rced.68345

Japashov, N., Naushabekov, Z., Ongarbayev, S., Postiglione, A., & Balta, N. (2022). STEM career interest of Kazakhstani middle and high school students. *Education Sciences*, *12*(6), 397. https://doi.org/10.3390/educsci12060397

Karabassova, L., & San Isidro, X. (2023). Towards translanguaging in CLIL: A study on teachers' perceptions and practices in Kazakhstan. *International Journal of Multilingualism*, *20*(2), 556-575. https://doi.org/10.1080/14790718.2020.1828426

Kim, D. (2024). Analysis of Students' Problem Solving for The Physics MCQ and Theory Problems of The 20th International Junior Science Olympiad (IJSO). *Journal of the International Gifted in Science*, *8*(1), 1-22.

Lather, P. (1986). Issues of validity in openly ideological research: Between a rock and a soft place. *Interchange*, *17*(1), 63–84. https://doi.org/10.1007/BF01807017

Lee, Y. M. (2024). Analysis of the 2023 International Junior Science Olympiad (IJSO) biological field questions. *Journal of the International Gifted in Science*, *8*(1), 41–53.

Lim, S. S., Cheah, H. M., & Hor, T. A. (2014). Science Olympiads as vehicles for identifying talent in the sciences: The Singapore experience. In *Communicating science to the public: Opportunities and challenges for the Asia-Pacific region*(pp. 195–211). Springer Netherlands. https://doi.org/10.1007/978-94-017-9097-0_12

Maltese, A. V., & Tai, R. H. (2009). Eyeballs in the fridge: Sources of early interest in science. *International Journal of Science Education*, *32*(5), 669 685. https://doi.org/10.1080/09500690902792385

Marsh, D. (2002). *CLIL/EMILE—The European dimension: Actions, trends and foresight potential.* University of Jyväskylä.

Matuszkiewicz, R. (2010). The language issue in Kazakhstan: Institutionalizing new ethnic relations after independence. *Economic and Environmental Studies*, *10*(2), 211–227.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation.* John Wiley & Sons.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook.* SAGE Publications.

Ministry of Education and Science of the Republic of Kazakhstan. (2022). *Rules for one-time rewards for international Olympiad winners and their teachers, including reward amounts.* https://adilet.zan.kz/rus/docs/V2200029030

Ministry of Education and Science of the Republic of Kazakhstan. (2022). *List of international Olympiads and competitions, and criteria for awarding educational grants to winners and prize winners.* https://adilet.zan.kz/rus/docs/V2200028848

Ministry of Education and Science of the Republic of Kazakhstan. (n.d.). *State program for the development of education and science for 2020–2025.* Adilet Legal Information System. https://adilet.zan.kz/rus/docs/P1900000988

Nadhirah, N. N. A., & Fauzia, A. N. (2019, December). Profile of Emotional-Social Competence of Quarantine Participants of International Junior Science Olympiad (IJSO). In *5th International Conference on Education and Technology (ICET 2019)* (pp. 514-517). Atlantis Press. https://doi.org/10.2991/icet-19.2019.130

Oliver, M. C. (2017). Science olympiad students: A case study of aspiration, attitude, and achievement. In *Policy and Practice in Science Education for the Gifted* (pp. 147-157). Routledge.

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed-method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, *42*, 533–544. https://doi.org/10.1007/s10488-013-0528-y

Park, H. Y. (2024). International Secondary Science Olympiad (IJSO) participants' awareness of science learning and career. *Journal of the International Gifted in Science, 8*(1), 55–67.

Patton, M. Q. (2014). *Qualitative research and evaluation methods: Integrating theory and practice* (4th ed.). SAGE Publications.

Ponterotto, J. G. (2006). Brief note on the origins, evolution, and meaning of the qualitative research concept thick description. *The Qualitative Report, 11*(3), 538–549. Retrieved from http://www.citeseerx.ist.psu.edu

Sabitova, Z., & Alishariyeva, A. (2015). The Russian language in Kazakhstan: Status and functions. *Russian Journal of Communication, 7*(2), 213–217 https://doi.org/10.1080/19409419.2015.1044877

Sahin, A., Gulacar, O., & Stuessy, C. (2015). High school students' perceptions of the effects of international science Olympiad on their STEM career aspirations and twenty-first-century skill development. *Research in Science Education, 45,* 785–805. https://doi.org/10.1007/s11165-014-9439-5

Savin-Baden, M., & Major, C. (2023). *Qualitative research: The essential guide to theory and practice.* Routledge.

Seidlhofer, B. (2005). English as a lingua franca. *ELT Journal, 59*(4), 339–341.

Smagulova, J. (2008). Language policies of Kazakhization and their influence on language attitudes and use. *International Journal of Bilingual Education and Bilingualism, 11*(3–4), 440–475. https://doi.org/10.1080/13670050802148798

Smakova, K., & Paulsrud, B. (2020). Intercultural communicative competence in English language teaching in Kazakhstan. *Issues in Educational Research, 30*(2), 691-708.

Smith, K. N., Jaeger, A. J., & Thomas, D. (2021). "Science Olympiad is why I'm here": The influence of an early STEM program on college and major choice. *Research in Science Education, 51*(Suppl 1), 443–459. https://doi.org/10.1007/s11165-019-09897-7

Top, N., Sahin, A., & Almus, K. (2015). A stimulating experience: I-SWEEEP participants' perceptions on the benefits of science olympiad and gender differences in competition category. *SAGE Open, 5*(3). https://doi.org/10.1177/2158244015605355

Tolbert, S., & Bazzul, J. (2017). Toward the sociopolitical in science education. *Cultural Studies of Science Education, 12*, 321-330. https://doi.org/10.1007/s11422-016-9737-5

Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times. John Wiley & Sons.*

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Harvard University Press.

Wheeler, L. (2017). *A linguistic ethnographic perspective on Kazakhstan's trinity of languages: language ideologies and identities in a multilingual university community* (Doctoral dissertation, University of Birmingham).

Wirt, J. L. (2011). An analysis of Science Olympiad participants' perceptions regarding their experience with the science and engineering academic competition. Seton Hall University.

Xie, Y., Fang, M., & Shauman, K. (2015). STEM education. *Annual review of sociology, 41*(1), 331-357. https://doi.org/10.1146/annurev-soc-071312-145659

Zholumbayev, O. M., Abilmazhinov, Y. T., Shakerkhan, K. O., Ontagarova, D. R., Sadykova, R. A. (2021). Priority aspects of stem education implementation in Kazakhstan and abroad and comparative aspects in development trends. *Moscow University Bulletin. Series 20. Pedagogical Education. (4), 87-98*

*Шахризат Агайдарова[1], Нұрсұлтан Джапашов[2], Самат Максутов[3]**

[1,3]SDU University, Қаскелең, Қазақстан

[2]Олбани университеті, Нью-Йорк штаты университеті, Олбани, Нью-Йорк, АҚШ

[*]e-mail: samat.maxutov@sdu.edu.kz

ХАЛЫҚАРАЛЫҚ ОЛИМПИАДАЛАР КОНТЕКСТІНДЕ CLIL АРҚЫЛЫ ҚАЗАҚСТАНДАҒЫ ҒЫЛЫМИ КАПИТАЛДЫ ДАМЫТУ

Аңдатпа. Қазақстанда ғылыми капиталды дамыту басым бағыттардың біріне айналуда. Ел білім беру жүйесіне халықаралық озық тәжірибелерді енгізуге ұмтылуда, алайда зерттеулер мен дайындықтың жеткіліксіздігі олардың тиімді жүзеге асырылуына әсер етеді. Осындай заманауи әдістердің бірі жаратылыстану пәндерін ағылшын тілінде оқыту. Бұл әдіс Content and Language Integrated Learning (CLIL) тәсілі деп аталады. CLIL көптілді білім беру контекстінде тіл мен мазмұнды біріктіріп, терең түсінуді қамтамасыз ететін трансформациялық стратегия ретінде қарастырылады. Бұл зерттеу Ғылыми Капитал тұжырымдамасын қолдана отырып, CLIL оқыту әдісі арқылы оқушылардың ғылыми капиталдарын қалай қалыптастыратынын зерттейді. Сұхбаттар, бақылаулар, және ресми құжаттар негізгі зерттеу инструменттері болып табылады. Зерттеу нәтижелері басқа да ғылыми еңбектермен сәйкес келетіні анықталды. Дегенмен, бұл зерттеуде жаратылыстану пәндерін оқытудағы тілдердің рөліне қатысты жаңа көзқарас ұсынылады. Зерттеу нәтижесіне сүйенсек, жаратылыстану бағытында орыс тілінің орны айрықша болғаны анықталды. Сонымен қатар, зерттеу жазбалар қатысушылардың практикалық дағдылары мен эксперименттік білімдерінің жеткіліксіз екенін көрсетті. Оқушылардың жеткіліксіз практикалық және эксперименттік дағдылар жоғары деңгейдегі олимпиадаларда бәсекеге қабілетті болуына және ғылыми капиталдың толық дамуына кедергі келтіреді. Осыған сәйкес, оқушылардың ғылыми капиталын жетілдіру мақсатында жаратылыстану пәндерін оқытудағы тілдердің, практикалық дағдылары мен эксперименттік білімдерін бағыттап жетілдіру маңызды болып табылады.

Түйін сөздер: ғылыми капитал, CLIL технологиясы, жаратылыстану олимпиадалары, STEM саласындағы кәсіби қызығушылық, Қазақстандық білім беру жүйесі

*Шахризат Агайдарова[1], Нурсултан Джапашов[2], Самат Максутов[3]**

[1,3]SDU University, Каскелен, Казахстан

[2]Университет Олбани, Университет штата Нью-Йорк, Олбани, Нью-Йорк, США

*e-mail: samat.maxutov@sdu.edu.kz

РАЗВИТИЕ НАУЧНОГО КАПИТАЛА КАЗАХСТАНА ПОСРЕДСТВОМ CLIL В КОНТЕКСТЕ МЕЖДУНАРОДНЫХ ОЛИМПИАД

Аннотация. Развитие научного капитала становится одним из приоритетных направлений в Казахстане. Страна стремится интегрировать лучшие международные практики в систему образования. Одной из таких инициатив является преподавание естественнонаучных дисциплин на английском языке с использованием подхода Content and Language Integrated Learning (CLIL). CLIL выступает как трансформирующая стратегия в условиях многоязычного образования, объединяя язык и содержание для обеспечения более глубокого понимания. Данное исследование рассматривает, как учащиеся формируют свой научный капитал в условиях CLIL через призму концепции научный капитал. Взгляды студентов были изучены посредством интервью и наблюдений, а также дополнены анализом документов. Полученные результаты в целом согласуются с существующей научной литературой; вместе с тем, исследование предлагает новый взгляд на роль языков в естествознании. Было установлено, что русский язык остается одним из доминирующих языков преподавания естественнонаучных дисциплин. Кроме того, заметки показывают, что участникам часто не хватает практических навыков и экспериментальных знаний, что ограничивает их способность успешно участвовать в олимпиадах высокого уровня и сдерживает полноценное развитие их научного капитала. Полученные результаты свидетельствуют о том, что для раскрытия научного капитала Казахстана необходимо более эффективно интегрировать языки в образовательную систему, а также совершенствовать учебные программы с целью развития практических навыков и экспериментальных знаний.

Ключевые слова: научный капитал, CLIL технологии, научные олимпиады, интерес к карьере в STEM-сфере, система образования Казахстана

Received 27 February 2026