Article

Creation of a Collaborative "School–University" Environment to Support Research Activities in Schools

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Abstract: This study identifies the issue of insufficient scientific and methodological support for school research projects. To address this, the study proposes the creation of a collaborative "school–university" environment, enabling schoolteachers and students to receive necessary guidance and methodological assistance in preparing and implementing school research projects in the humanities. The study suggests leveraging the Digital Humanities field to incorporate modern digital tools for creating competitive research projects that meet not only the requirements of the Ministry of Education, but also global scientific and economic trends. The assessment of the current situation in the preparation and implementation of school projects involved a survey of more than 600 teachers from the southern region of Kazakhstan. The survey results reveal that over 80% of teachers require scientific and methodological support in preparing school research projects. Based on the survey findings and the expressed demand for methodological assistance, the development of a pilot digital platform is planned. This platform will facilitate collaborative work among schoolteachers, students, university professors, and gifted students to create research projects in Digital Humanities. Such collaborative efforts aim to address the lack of adequate preparation for school research projects.

Keywords: school–university collaboration; collaborative environment; research project; project-based learning; digital humanities

1. Introduction

According to the Concept for the Development of Higher Education and Science in the Republic of Kazakhstan for 2023–2029 (Ministry of Higher Education and Science of the Republic of Kazakhstan, 2023), the main goal of higher education is to train specialists of a new generation who possess a wide range of competencies, solid knowledge, and professional skills. The preparation of such specialists requires the renewal and improvement of methods and technologies used in education.

The Law of the Republic of Kazakhstan "On Education" states the following: "The primary task of the education system is to create the necessary conditions in the field of education aimed at forming and professionally developing an individual based on national and universal values, achievements of science and practice, the introduction of new teaching technologies, informatization of education, and integration into global international networks" (Law of the Republic of Kazakhstan "On Education", 2023). In this excerpt, we are particularly interested in the latter part—"the introduction of new technologies" and "informatization of education". Both of these directions are the subject

of discussion in this study, and define its relevance and scientific–practical significance. The subject of the study is the issue of the joint preparation and implementation of research projects using innovative educational technologies and methods, Digital Humanities tools, and pedagogical design resources.

Continuity in education implies adherence to the principle of succession at all levels (general, secondary, higher, and postgraduate), which would make education continuous according to the principle of lifelong learning.

In line with new realities, it is necessary to provide students at every level of education not only with basic knowledge and skills, but also with the ability to navigate the rapid flow of information, develop an active life position, and cultivate a desire to contribute to the development of science and the scientific potential of their country at all levels of the educational system, and further in their professional activities.

These qualities are formed under the condition of systematically involving students in independent cognitive activity, one form of which is research projects and digital humanities studies within the modern Digital Humanities framework. The goal of the study is to organize and methodologically substantiate a collaborative, digital, and open "school–university" environment as an effective platform for the implementation of research projects in the context of Digital Humanities.

The tasks within the framework of the research are presented as follows: the study involves examining the works of Kazakhstani and foreign scientists to define the concepts of "Digital Humanities", "research project", "corpus technologies", and "collaborative environment"; using pedagogical design tools to create educational content that motivates the development of professional competencies within the framework of project technology; selecting digital educational tools to create more effective and in-demand learning materials; implementing project-based technology in the educational process; and proving the effectiveness of the selected technologies and methods.

Familiarity with the basics of research activities, according to the authors of this study, should begin at school, with its gradual and systematic complication from level to level.

Unfortunately, the authors' annual experience as experts at regional school project competitions allows them to state certain problems related to the preparation and implementation of research work. These problems are particularly acute for regional, small, and remote schools far from regional centers.

To reflect on this problem, a pre-experimental study of the topics of research school projects by 10th- and 11th-grade students in the humanities was conducted, revealing several problems:

1. Difficulties in formulating the research topic and scientific framework;
2. Insufficient relevance of the research topic. Most works are related to outdated and irrelevant phenomena;
3. Lack of novelty. Scientific studies often aim to state already-known facts;
4. Absence of literary works dedicated to contemporary Kazakhstani authors. Instead, classical literature, which has already been extensively studied, is examined;
5. Lack of practical significance in research;
6. Lack of interdisciplinarity and weak empirical foundations;
7. Ignorance of modern trends in the field of Digital Humanities.

As a result, school research papers presented at scientific conferences at various levels often take the form of essays or studies that are more emotional than scientific in nature. This is especially evident in the humanities.

These problems require measures to improve the quality of research work at the initial stages of the educational trajectory.

In this regard, a promising approach is to create partnerships between general secondary and higher education institutions based on the principle of succession, within which systematic and fruitful work would be carried out to achieve the following:

- Engage school students in research activities;
- Share experiences in creating research projects between university faculty and schoolteachers;
- Build a collaborative scientific environment;
- Introduce modern trends in Digital Humanities into school research projects;
- Implement mentorship and tutoring by university faculty for students and their supervisors within the framework of project-based research activities.

The updated education program of the Republic of Kazakhstan places particular emphasis on the system–activity approach in teaching. One of the effective means of involving students in an activity-based environment is the method of scientific projects, which has become widespread in schools in Kazakhstan. However, as practice shows, schoolteachers do not fully possess the skills to organize and guide students' research activities.

The authors of the study propose developing a collaborative environment to facilitate the preparation and implementation of research projects in schools within the Digital Humanities framework, supported by scientists and tutors from universities. In the context of increasing digitalization, the transition of higher and secondary education to offline and online learning formats, and the need for collaborative and interdisciplinary learning, the relevance of the proposed concept is undeniable.

The collaborative environment will contribute to engaging students in science, developing research skills, and, as a result, fostering the development of national science, starting from the school level.

2. Literature Review

In preparation for this study, the issue of continuity between schools and universities in the field of research and project-based activities was analyzed based on the works of Kazakhstani and international scholars. As a foundation for the present study, an exhaustive search of the domestic and foreign literature was conducted in various databases, including Scopus, Web of Science, and Google Scholar. The following clusters of search terms were used in the databases with logical operators: "school–university partnership", "school–university-science", "school–university-project activities", "Digital Humanities", "project activities of schools and universities", and "projects in the field of Digital Humanities", among others.

Digital Humanities (DH) is a trend in modern science that develops at the intersection of the humanities and digital knowledge in research and education. Our analysis of a large dataset from Springer, one of the largest European publishers, revealed significant interest in the global scientific community in the development of ideas in Digital Humanities (over 98,000 published materials on this topic). Particularly relevant are studies aimed at implementing project activities within the framework of Digital Humanities. Annual conferences on this topic are held worldwide.

The terminological apparatus of the new Digital Humanities (DH) field has remained open for discussion since its inception. There are more than 800 definitions of this discipline, leading to debates about its boundaries, tools, and methodology. However, all these definitions converge on the application of digital tools to humanities research.

The founder of Digital Humanities and its conceptual framework is recognized as Lev Manovich, who, back in the 1990s, introduced the concept of "cultural software". From the etymology of this term, its interdisciplinary nature becomes clear.

The formulation of Digital Humanities (DH) itself belongs to British practitioners and researchers Berry and Fagerjord (2017), who proposed the structure of the Digital Humanities field (Figure 1).
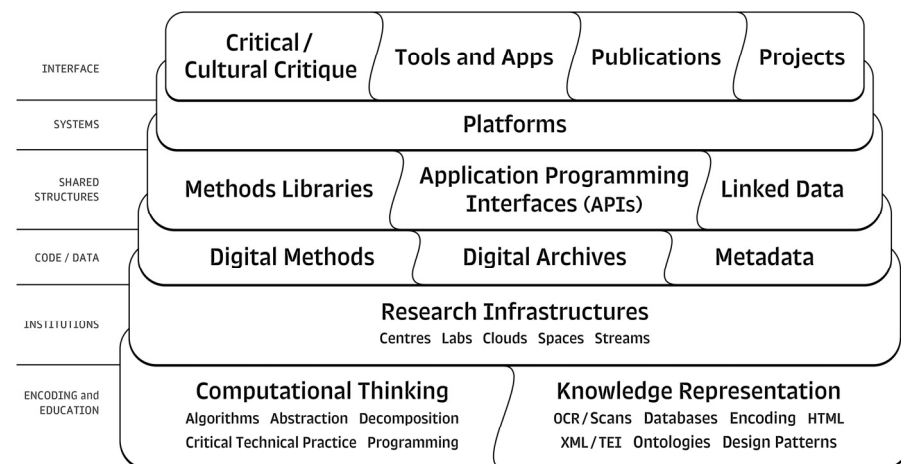

Figure 1. Structure of Digital Humanities by Berry D.M. and A. Fagerjord.

The structure highlights the following elements:

- Interface (cultural criticism, tools and applications, publications, projects);
- System, including digital platforms;
- General structure (method libraries, application programming interfaces, linked data);
- Code/data (digital methods, digital archives, metadata);
- Instructions (research guides);
- Coding and education (computational thinking, knowledge representation).

At the foundation of the structure lie the basic tools of Digital Humanities—computational thinking and knowledge representation. As one moves upward in the structure, interdisciplinarity and the connection between humanities knowledge and digital tools increase. This study focuses on the third level of the system—digital methods, digital archives, and metadata—and the sixth level, which involves project-based activities.

Several areas of activity in DH projects are identified as follows:

1. Working with electronic texts using corpus technologies;
2. Working with maps, spatial analysis, and data visualization;
3. Network analysis of humanities data;
4. Digital Art and cultural studies (Nurmikko-Fuller, 2023).

Corpus technologies are well-researched digital tools used for quantitative and qualitative text analysis. Projects using corpus technologies involve the study of various functional text styles, including video and audio texts, through automatic annotation. The most authoritative corpus of the Russian language is the National Corpus of the Russian Language (NCRL), which contains over 2 billion word usages. In Kazakhstan, efforts to create a national corpus of the Kazakh language have been ongoing for several decades. Today, this corpus includes over 40 million word usages.

The advantages of corpus technologies for implementing project activities in schools lie in the fact that the texts presented in the corpus have multiple levels of annotation (linguistic, semantic, syntactic, etc.), which automatically allows for the discovery of the desired linguistic facts and phenomena within the given texts.

Working with maps, spatial analysis, and data visualization represents another possible area for implementing project activities in Digital Humanities. GIS, or geographic information systems, is a database that processes "queries and statistical analysis, with the

benefits of full visualization and spatial analysis provided by maps" (Batalov & Radchenko, 2020). Combining work with maps, data visualization, the ability to build graphs, and integrated informative hyperlinks makes this approach interesting, relevant, and modern.

The network analysis of humanities data is most effective and popular when analyzing linguistic data. The advantage of such analysis lies in obtaining precise and mathematically verified data related to specific linguistic facts. Furthermore, network analysis is actively used to study and interpret the idiosyncratic stylistic features of individual authors, as well as in authorship attribution when needed or disputed.

Digital Art and cultural studies focus on applying digital methodologies and tools in the arts. The term "Digital Art" has evolved into "Media Art" today. Within this field, digital museums, exhibitions, and even digital exhibits are created.

Thus, the Digital Humanities field offers broad prospects for implementing project activities at all levels of the educational process—from schools to doctoral programs.

In Kazakhstan, the development of DH began with the March 2023 roundtable "Digital Humanities in Central Asia". At this event, representatives of scientific communities from Central Asian countries discussed issues of "digital transformation in humanities research and education at universities in Central Asia, the relevance of such studies and projects, and the formation of a community to develop Digital Humanities in the region".

This study aligns with the interests of the global community in the development of DH. The authors view Digital Humanities as an ideal platform for achieving the goal and objectives of the study—the creation of a collaborative environment where schools and universities unite for joint research activities in the framework of Digital Humanities.

A content analysis of domestic publications on the given issue did not reveal scientific studies on the interaction between schools and universities in preparing and implementing research activities. Kazakhstani scholars' attention is mainly focused on the interaction between schools and universities in terms of continuity in creating educational programs. Amanzholov (2017) attempted to develop a "new, scientific-educational language" between teachers and scholars in his study (Amanzholov, 2017). The researcher discussed the "Scientific Laboratory of Fine Arts" at the Palace of Schoolchildren in Astana, which implements the "creation of a unique educational environment with open-ended questions, where students' independent cognitive activity is initiated, and a space for interaction among children, teachers, and scholars is created" (Malysheva, 2009).

In the scientific-methodological discourse of the CIS, the issue of school–university interaction in research activities is presented more broadly. An analysis of scientific studies identified work on implementing the school–university continuity being undertaken in two directions:

- Continuity between schools and universities in implementing research activities (Malysheva, 2009; Kachanova, 2019; Semenova, 2017; Rumbeshta & Voitsekhovskaya, 2019; Abramova, 2016; Zakharova et al., 2022; Dikova et al., 2019);
- Preparing future teachers for implementing research project activities in schools (Sukhorukova, 2019; Kochetkova, 2010; Lazarev & Nosova, 2017).

Both directions correlate with the problem of the present study, so the experience of international colleagues was analyzed and documented for further reflection.

The study also examines the issue of school–university collaboration in international discourse. Bakioglu and Kirisci-Sarikaya (2024) proposed five potential avenues for such collaboration, as follows: "collaboration, mutual contribution, professional learning and development, workload, and social responsibility" (Bakioglu & Kirisci-Sarikaya, 2024). However, these researchers note the limited progress made in advancing these interactions.

Jakhelln and Postholm (2022), in their study, emphasized the positive impacts of collaborative environments on the motivation and engagement of teachers and university

educators. They assert that fostering interactions between school teachers and university faculty "lays the foundation for cooperation between teacher education and schools, promoting co-construction of knowledge, as well as shared learning and development" (Jakhelln & Postholm, 2022).

Nash et al. (2024) conducted a comprehensive study, and developed a model for school–university partnerships. Their experiment demonstrated that collaboration between teachers and university faculty enriches the professional experience of future teachers, and supports practicing teachers. The researchers identified areas for synergy between schools and universities, extending beyond professional development to include joint academic projects—"Findings from this case study demonstrate that a key motivation for involvement in this collaborative partnership was the co-construction of knowledge to authentically inform the practice of academic researchers and classroom practitioners" (Nash et al., 2024).

In international practice, the need for school–university collaboration is reflected in the Common European Principles for Teacher Competences and Qualifications, as follows: "The OECD advocates for partnerships to play a central role in developing innovative teaching and learning communities, bridging theory and practice, as well as connecting practitioners with academic researchers" (Farrell, 2023).

This initiative elevates the relationship between schools and universities to the highest level. In international practice, the interaction between schools and universities is defined by a unique concept—a "third space" (Zeichner, 2010). This collaborative environment fosters interaction between secondary and higher education institutions in various areas, including the joint development and implementation of research projects.

Creating a "third space", a collaborative environment for quality research activities, is the primary goal of the project described in this article.

3. Materials and Methods

The main hypothesis of the conducted survey was that schoolteachers face significant difficulties in preparing and implementing school projects at all stages—formulating the research topic and scientific framework, the lack of novelty and relevance in the research, the absence of interdisciplinary components, the lack of methodological support and guidance from the administration, and the absence of partnerships with university faculty in the preparation and implementation of joint research projects.

On the other hand, the organization of a collaborative environment for the implementation of students' research projects in the context of Digital Humanities will contribute to improving the quality and effectiveness of research projects in secondary schools and beyond, at all stages of education. Digital data analysis technologies will optimize work with large factual datasets and adapt them for a broader audience. These factors will increase students' interest in scientific work, help develop new forms of thinking, and, following the principle of continuity, become a foundation for further research in universities.

The study included a content analysis of the domestic and international literature on the development of the Digital Humanities scientific field, and summarized the scientific and practical experience of the global scientific community. Through data analysis and synthesis, the main directions of applying Digital Humanities tools in pedagogical education were identified. A model for integrating Digital Humanities into the educational process and independent research activities of secondary and higher school students was presented.

Since the introduction of Digital Humanities tools for preparing research projects is planned to begin with school education, the authors conducted a survey among more than 600 secondary school teachers in the southern region of Kazakhstan. The study included

teachers from Almaty and the Almaty Region, Shymkent and the Turkestan Region, Taraz and the Zhambyl Region, and Kyzylorda and the Kyzylorda Region (Figure 2).
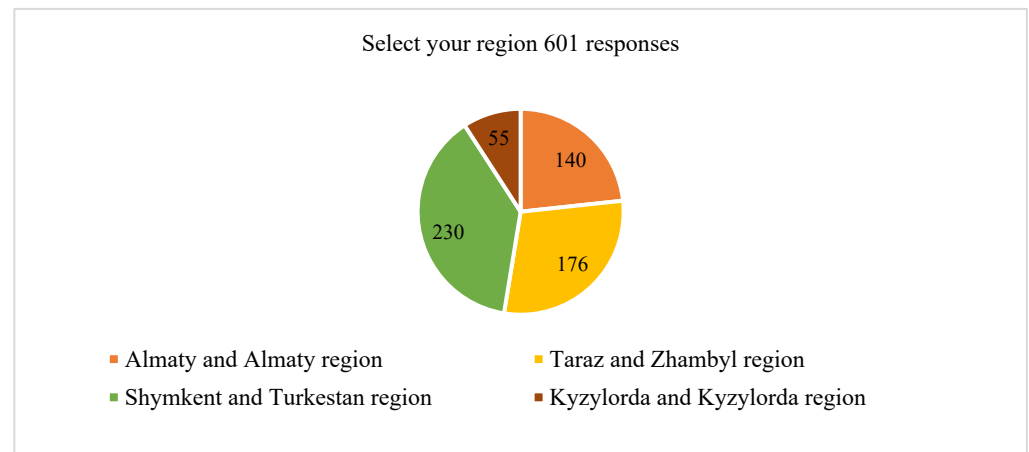

Figure 2. Number of respondents surveyed.

The study's geographical scope is explained by the fact that the authors work in educational institutions in the southern region of Kazakhstan and have access to schools in this area. However, the survey can also be applied in other regions of Kazakhstan and beyond. In the future, the study's geography is planned to be expanded.

The purpose of the survey was to identify the problems and prospects of organizing project activities in schools. The survey aimed to determine the range of problems modern schoolteachers face when preparing and implementing school research projects at all stages—from formulating the topic to defending the project.

The target sample of respondents corresponds to the purpose and hypothesis of the study, namely, to understand the difficulties schoolteachers face, how these difficulties can be resolved, and to determine the psychological readiness of schoolteachers for joint research activities with universities. Special attention was paid to regional and district schools, as the remote location of regional schools complicates access to broadband internet, making the use of digital tools for preparing school research projects problematic.

The survey instrument consisted of several questions aimed at identifying problems in the above-mentioned aspects. The survey included the following questions:

1. Have you ever been a scientific advisor for student research projects?
2. What difficulties did you encounter while preparing students for participation in scientific project competitions? (with the option to select multiple answers)
3. Are you willing to participate in seminars, courses, and master classes for advisors of student research projects?
4. Is there an established connection between your school and higher educational institutions regarding the preparation and implementation of student research projects?
5. Do you need scientific and methodological assistance in creating and managing student research projects?
6. Do you think there is a need to create a common electronic platform for collaboration between schools and universities to provide scientific and methodological support for school projects?
7. What suggestions would you make to improve the quality of student research projects? (provide your option).

4. Results and Discussion

The survey results reveal that teachers face numerous difficulties when working on school projects. These include problems with formulating the research topic (26.5% of respondents), the lack of explanatory materials, training seminars, workshops, manuals, and methodological recommendations for organizing students' research activities (25.8% of respondents), and issues with developing the scientific framework, such as defining goals, formulating tasks, hypotheses, novelty, and practical significance (24.1% of respondents), among others (Figure 3).
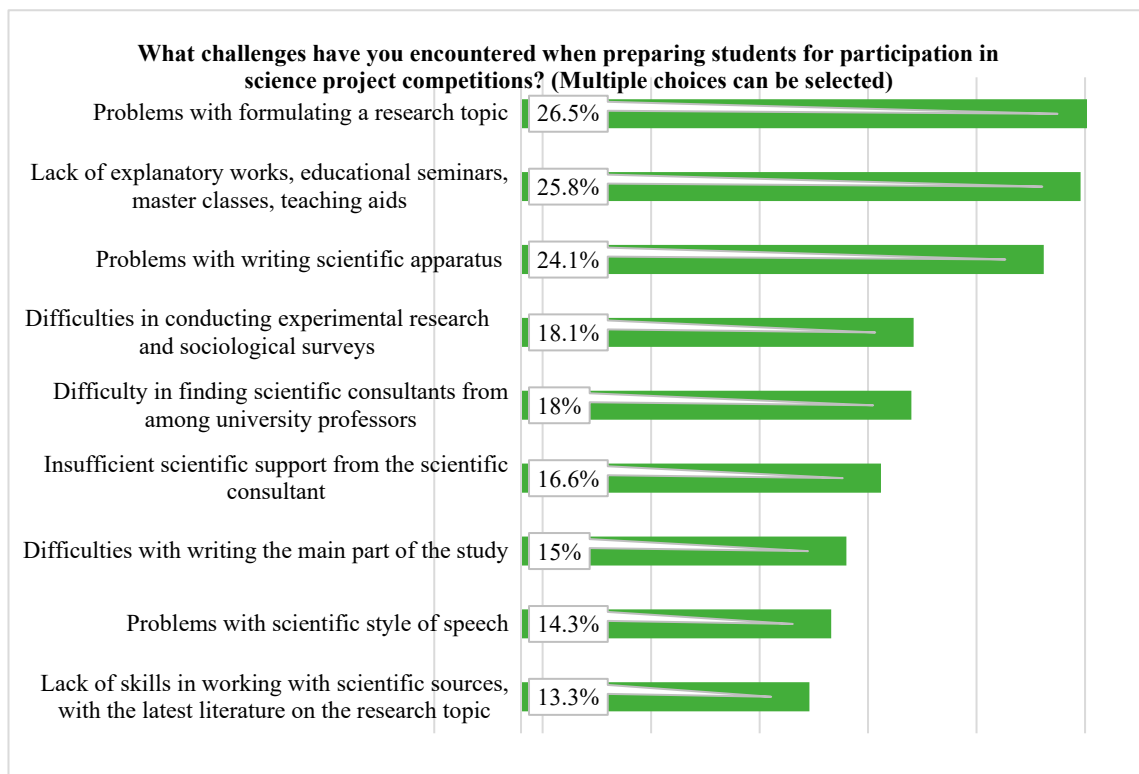
What challenges have you encountered when preparing students for participation in science project competitions? (Multiple choices can be selected)

Problems with formulating a research topic	26.5%
Lack of explanatory works, educational seminars, master classes, teaching aids	25.8%
Problems with writing scientific apparatus	24.1%
Difficulties in conducting experimental research and sociological surveys	18.1%
Difficulty in finding scientific consultants from among university professors	18%
Insufficient scientific support from the scientific consultant	16.6%
Difficulties with writing the main part of the study	15%
Problems with scientific style of speech	14.3%
Lack of skills in working with scientific sources, with the latest literature on the research topic	13.3%

Figure 3. Difficulties faced by teachers in preparing school projects.

According to the data presented in the figure, the most pressing issue is formulating the research topic. It is well known that the topic consolidates the main questions of the study. This stage of preparing a research project is crucial as it determines the further structure of the study. As noted earlier, the analysis of research projects revealed a large number of irrelevant topics, which often resulted in descriptive or emotional works rather than genuine research.

Another significant issue noted by most respondents is the lack of explanatory materials, training seminars, workshops, manuals, and methodological recommendations for organizing students' research and project activities. This problem is expected to be addressed through the creation of a digital platform for coordinating project activities, providing access to DH tools, and reflecting all participants, project stages, and results.

Regarding teachers' readiness to participate in seminars, courses, and workshops for supervising student research projects, more than 75% of respondents answered positively, and an additional 14.9% expressed willingness to consider receiving methodological support for preparing and implementing school projects (Figure 4).
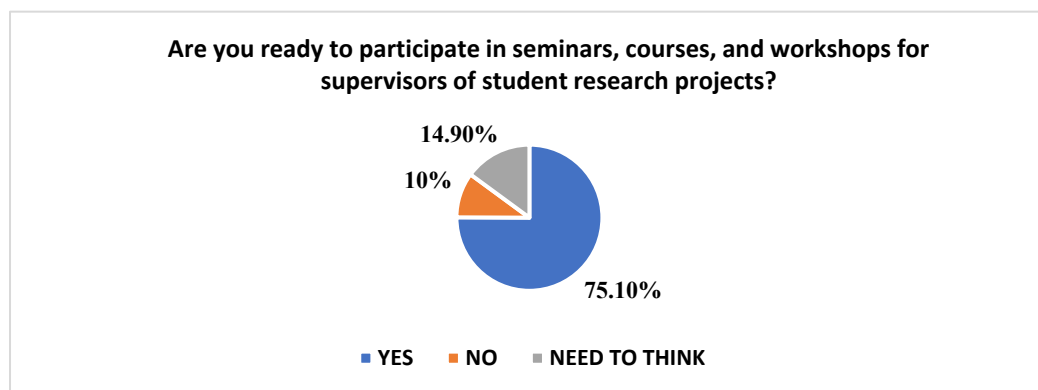
Are you ready to participate in seminars, courses, and workshops for supervisors of student research projects?

14.90%

10%

75.10%

■ YES   ■ NO   ■ NEED TO THINK

Figure 4. Teachers' readiness for methodological support.

Nearly 80% of respondents reported that they need professional support, mentorship, and tutoring in preparing students for participation in research projects. The lack of methodological assistance, specialized literature, and other issues mentioned above highlight the necessity of establishing a stable support system for schoolteachers in implementing school-level scientific activities. More than 400 respondents (443, 79.1%) indicated a need for methodological support, which is currently inaccessible for various reasons (Figure 5).
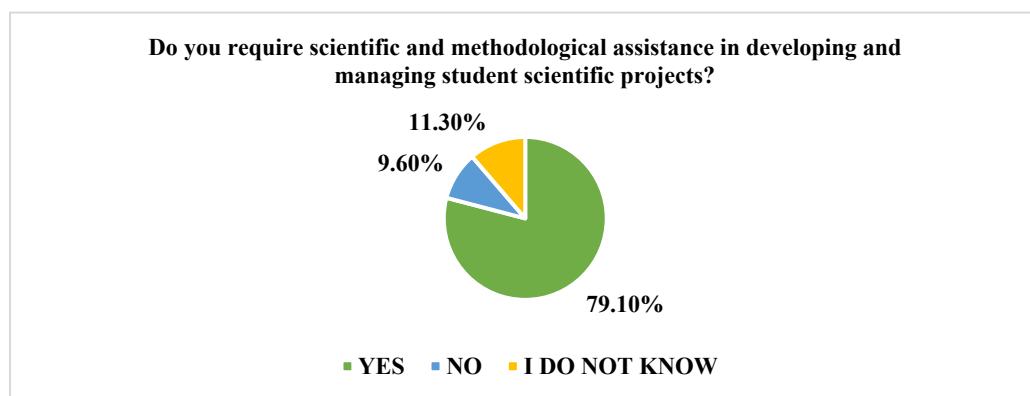
Do you require scientific and methodological assistance in developing and managing student scientific projects?

11.30%

9.60%

79.10%

■ YES   ■ NO   ■ I DO NOT KNOW

Figure 5. Percentage of respondents needing methodological support in school projects.

Thus, the survey results demonstrate the need to create a collaborative environment between schools and universities, which, based on the principle of continuity, would facilitate productive partnership work in advancing science in Kazakhstan, starting at the school level.

The necessity of creating such a platform is also confirmed by the survey results, wherein more than 95% of respondents agreed on the need for a unified electronic platform for collaboration between schools and universities, so as to provide scientific and methodological support for school projects (Figure 6).

This platform will aim to provide students and teachers with the necessary informational and methodological support for preparing and implementing research projects.

As part of collaborative work with schoolteachers, a series of seminars will be conducted to introduce them to the basics of organizing and managing project activities. In subsequent stages of the research, teachers will independently apply the acquired knowledge in their practice of guiding students' research work. Together with students, tutors, and scientific advisors, they will go through all the key stages of conducting a research project: collecting and systematizing theoretical data on the studied problem; exploring the

potential of Digital Humanities; analyzing key methods and tools; defining the topic and planning project stages; and conducting research on the chosen problem.
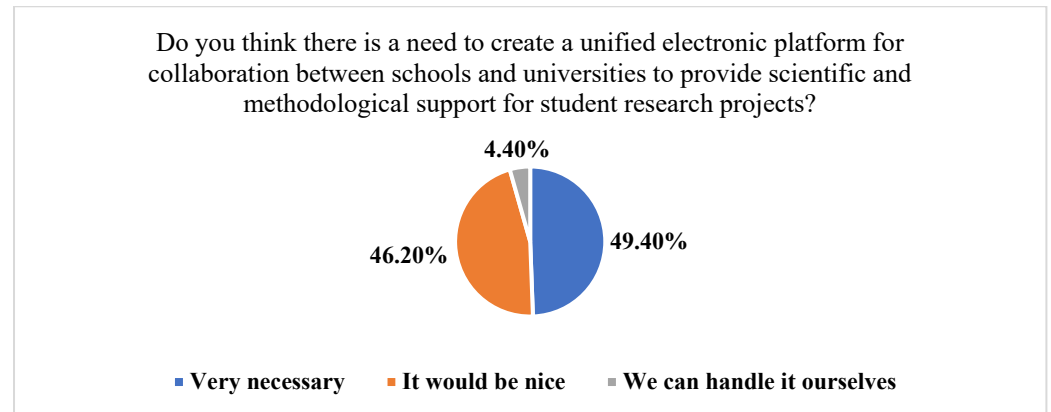

Figure 6. Respondents' readiness for a unified electronic platform for school–university collaboration.

Formative training sessions will be conducted among schoolteachers to assess the dynamics of their professional competencies in organizing and managing research projects within the framework of DH. Similar training will also be conducted among students to evaluate the development of their research skills and their mastery of digital tools for analyzing and synthesizing scientific data within DH.

The collaborative environment will consist of schoolteachers, students, tutors, reviewers, and others (Figure 7).
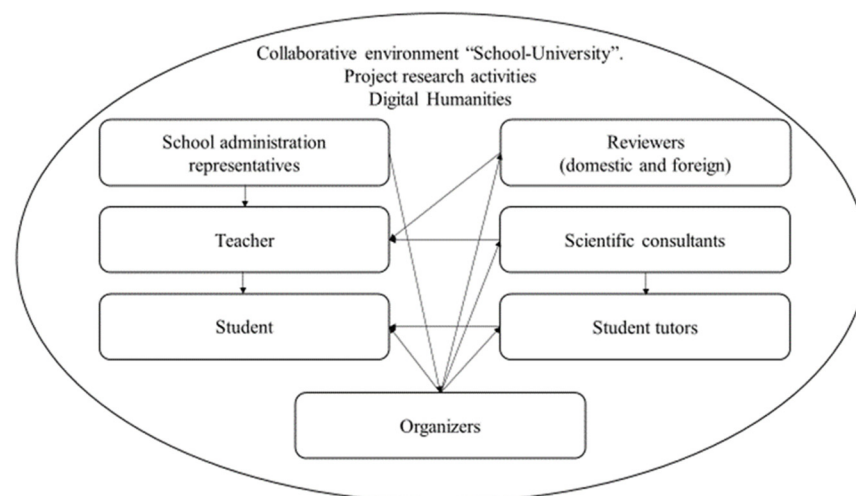

Figure 7. Composition of the "school–university" collaborative environment.

5. Conclusions and Recommendations

The conducted study, addressing multiple facets of the issue of preparing and implementing school projects by teachers and students, led to the following conclusions:

The field of Digital Humanities is currently a relevant and innovative interdisciplinary domain wherein the interaction of humanities and digital systems occurs. There are several key areas for Digital Humanities projects—working with electronic texts using corpus technologies; working with maps, spatial analysis, and data visualization; the network analysis of humanities data; Digital Art and cultural studies. This broad range of Digital Humanities tools provides opportunities to create engaging, relevant, and practicality-oriented research projects.

However, the theoretical foundation of Digital Humanities today sparks numerous debates regarding its boundaries and terminology. A content analysis of international studies revealed over 800 definitions of this interdisciplinary field. Despite this diversity, a common denominator underlies all these definitions: the use of digital tools and capabilities in humanities research. In Kazakhstan, there are currently no studies or projects dedicated to Digital Humanities, further emphasizing the relevance and novelty of this research.

According to the survey conducted among secondary school teachers in the southern region of Kazakhstan, significant challenges exist in implementing and managing project activities in schools. These include difficulties in formulating research topics and scientific frameworks, challenges in conducting experimental parts of studies and processing results, the lack of explanatory resources, the absence of methodological and scientific literature on project work, and a lack of workshops and professional development courses in this area. All these issues highlight the need for the creation of a unified space between schools and universities based on the principle of continuity. Approximately 80% of respondents indicated that they require methodological support and mentorship from universities to implement research project activities in schools.

In the future, this study envisions the creation of a collaborative, digital, and open "school–university" environment as an effective platform for implementing research projects within the framework of Digital Humanities.

Author Contributions: Conceptualization, S.B.; data processing, S.B., E.S. and A.Z.; formal analysis, A.Z.; investigation, E.S. and A.Z.; methodology, E.S.; project administration, E.S. and A.Z.; resources, A.Z.; supervision, S.B.; verification, S.B.; writing—original draft, E.S.; writing—review and editing, S.B. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement: Al-Farabi Kazakh National University IRBRB00010790, Approved on 29 November 2024.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in this study are included in the article. Further inquiries can be directed to the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

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