Application of Project-Based Learning and QR Codes in Geography Teaching: The Project "Geo QR – Scan and Learn"

Ljupka Milenković, Geography Teacher and Teacher Mentor
"Vojdan Chernodrinski" Primary School, Skopje, North Macedonia

DOI: 10.64370/UFLP4272

Abstract

The aim of this paper is to present the application of project-based learning in geography teaching through the integration of traditional hand-drawn geographical maps and the contemporary use of QR codes, as an approach to encouraging active, inquiry-based and interactive learning among students. The paper presents the project "Geo QR – Scan and Learn", implemented at OOU "Vojdan Chernodrinski" Primary School in Skopje, North Macedonia, with students from grades 7, 8 and 9 during the 2025/2026 school year. The project was organized as a series of interconnected activities that included research into geographical content, team-based creation of maps of different continents and regions, and the development of QR codes through which the students' work was enriched with digital educational content. The selection of continents and regions was aligned with the geography curriculum, with students from different grades working on content studied within regular instruction. The QR codes provided access to photographs, facts, explanations and other educational resources, thus linking printed teaching materials with digital content. Based on the observation of students' work, the analysis of the produced materials and the feedback received during the project, the findings indicated that students perceived the project as motivating, engaging and supportive of their active participation in the learning process. The activities provided opportunities for students to develop geographical knowledge, digital literacy, creativity, communication skills and critical thinking. Additionally, a post-project anonymous questionnaire was completed by 165 students. The results indicated a highly positive perception of the applied approach in terms of students' interest in learning, understanding of geographical content, and willingness to participate in similar project activities again. The findings indicate that the use of QR codes in geography teaching can contribute to the modernization of instruction, better connection between traditional and digital teaching resources, and the creation of a more interactive learning environment. The project represents a practical example of the integration of digital tools through project-based learning and active student participation.

Keywords: geography; QR codes; project-based learning; digital literacy; interactive learning

1. Introduction

Contemporary educational processes increasingly emphasise teaching approaches in which students play an active role in acquiring knowledge. Rather than being based exclusively on the transmission of information, teaching now places growing importance on inquiry, practical work, collaboration, problem-solving, and the independent creation of student products. In this context, project-based learning represents a valuable approach through which students can connect curriculum content with concrete activities and practical experience (Bell, 2010; Kokotsaki, Menzies and Wiggins, 2016).

Project-based learning enables students to investigate a particular topic, collect and analyse information, collaborate in groups, and transform their findings into a concrete product or presentation. Research in geography education indicates that project-oriented teaching approaches can contribute to the development of geographical literacy and research skills, as well as to a more active role for students in the learning process (Grobelski, Versluis and McClelland, 2023).

This approach is particularly relevant to geography teaching. As a school subject, geography allows theoretical content to be directly connected with space, natural and social phenomena and processes, cartographic representation, and diverse sources of geographical information. Maps have traditionally been among the fundamental teaching resources in geography; however, the development of digital technologies has created opportunities to enhance them through new forms of visualisation and access to information (Metz, 1990; Köbben and van den Brink, 2024).

QR codes are an easily accessible technology that can connect physical teaching materials with digital content. By scanning a code with a mobile device, students can gain immediate access to additional information, photographs, videos, maps, and other educational resources. In this way, a QR code functions as a link between physical and digital learning spaces. The literature describes various educational applications of QR codes, including their use in geography teaching, where they can support interactive activities and provide access to additional geographical content (Sağıt, Uçak and Savran Gencer, 2024).

Nevertheless, the use of digital technology does not in itself guarantee higher-quality learning. Its educational value depends on how it is integrated into the teaching process and on the activities that students undertake with its support. Digital tools should therefore not be used merely to display information, but as part of activities in which students investigate, select and organise information, create content, collaborate, and present their findings (Vuorikari, Kluzer and Punie, 2022).

The ‘Geo QR – Scan and Learn’ project, implemented at ‘Vojdan Chernodrinski’ Primary School in Skopje during the 2025/2026 school year, was based on this idea. The project was designed to combine the traditional handcrafting of geographical maps, inquiry and teamwork, and the contemporary use of QR codes. Students from grades 7, 8 and 9 participated in the activities, and the selected geographical content was aligned with the curricula followed in their regular classes.

A distinctive feature of the project was the connection between traditional cartographic expression and digital content. Rather than simply receiving ready-made materials, students actively participated in researching, selecting and organising information, creating the maps, and enhancing them with QR codes. The physical products created by the students were thus enriched with photographs, facts, explanations, and other educational materials accessible by scanning the embedded codes. Similar studies indicate that QR codes can be successfully integrated into geography education resources and can increase their interactivity (Sağıt, Uçak and Savran Gencer, 2024).

The project provided a shared thematic framework encompassing content related to all continents. Grade 7 students worked on topics concerning Europe and Asia; grade 8 students worked on European content in accordance with the curriculum they followed; and grade 9 students worked on Africa, North and South America, Australia, and the polar regions. The project was therefore not an activity separate from regular teaching, but a practical extension of the content studied by the students.

The aim of this paper is to analyse the application of project-based learning in geography teaching through the integration of hand-drawn geographical maps and QR codes, and to examine students' experiences and views of the approach. Particular attention is given to their interest in this mode of learning, the help they perceived in understanding geographical content, their willingness to participate again, and the aspects of the project they considered most significant.

In accordance with this aim, the paper addresses the following research questions: (1) How do students assess their interest in, and the perceived support provided by, project-based geography learning that combines hand-drawn maps and QR codes? (2) To what extent are students willing to participate again in a similar project activity? (3) Which aspects of the project do students identify as the most significant and engaging?

In addition to presenting the project's implementation, the paper analyses the findings and the practical educational value of the approach. The project is therefore examined as a case study of teaching practice, rather than merely as a description of a completed school activity.

2. Literature Review

2.1. Project-Based Learning as an Approach in Contemporary Teaching

Project-based learning is a student-centred teaching approach in which knowledge and skills are acquired and applied through inquiry, the completion of specific tasks, collaboration, and the creation of final products. Unlike instruction in which students primarily receive ready-made information, this approach enables active participation in locating and processing information, making decisions, and presenting results. In this process, the teacher acts as an organiser, facilitator, and supporter of student work (Bell, 2010; Kokotsaki, Menzies and Wiggins, 2016).

The principal features of project-based learning include a clearly defined objective, an inquiry process, student autonomy, collaboration, and the creation of a tangible product. Its educational value derives not only from the final product, but also from the process through which students formulate questions, select sources, connect new insights with prior knowledge, and share responsibility for a common task (Kokotsaki, Menzies and Wiggins, 2016).

Project-based learning has particular value in geography teaching because the nature of the subject enables students to investigate space, analyse natural and social phenomena, use diverse sources of geographical information, and create their own geographical products. Grobelski, Versluis and McClelland (2023) view this approach as an opportunity for students to discover geography by engaging in geographical practice. Geography is thus not reduced to learning facts about individual regions, but is presented as a dynamic field in which information is investigated, analysed, and spatially connected.

Project-based learning is closely associated with active learning because students participate in locating, selecting, processing, and presenting information. The knowledge

acquired can be transformed into a map, presentation, poster, digital resource, or another student product. In such a process, subject knowledge is connected with investigative, communicative, creative, and digital activities (Bell, 2010; Kokotsaki, Menzies and Wiggins, 2016).

2.2. Traditional Cartographic Expression and Hand-Drawn Mapmaking

The map is one of the principal means of representing and understanding geographical space. Despite the development of digital cartography and the widespread availability of interactive maps, hand-drawn mapmaking continues to have didactic value in geography teaching. When creating their own map, students are not merely users of a ready-made cartographic representation; they select, organise, and visually represent spatial information (Metz, 1990; Köbben and van den Brink, 2024). Metz (1990) describes sketch maps as a means through which students can organise spatial information and demonstrate the extent of their knowledge of the location of geographical features. Such activities encourage students to think about location, spatial relationships, and the organisation of geographical elements rather than merely observing a completed map.

More recent approaches to geography education likewise highlight the importance of students creating maps independently. Köbben and van den Brink (2024) note that sketch maps can be used to structure geographical information and distinguish primary from secondary elements. Their educational value is particularly evident when students create the maps themselves, as this requires them to select, simplify, and spatially organise information. Consequently, hand-drawn mapmaking and the use of contemporary technology need not be regarded as opposing teaching approaches. Hand drawing enables direct engagement with the cartographic representation of space, while digital technology can extend the physical product with additional information and multimedia content. This integration is one of the central ideas of the ‘Geo QR – Scan and Learn’ project.

2.3. QR Codes as an Educational Tool

QR codes enable physical materials to be connected rapidly with digital content. By scanning a code with a mobile device, users can gain immediate access to text, photographs, videos, websites, or other digital resources. In an educational context, this functionality allows printed and physical teaching materials to be supplemented with content that does not have to appear directly on the material itself (Sağıt, Uçak and Savran Gencer, 2024).

The systematic review by Sağıt, Uçak and Savran Gencer (2024), which covers studies of the pedagogical use of QR codes published between 2014 and 2023, demonstrates that this technology is used in diverse educational contexts and in combination with a range of mobile and digital resources. Its practical advantage lies in straightforward scanning and immediate access to selected digital information. Nevertheless, the educational value of a QR code does not derive from the code itself, but from the quality of the content to which it leads and the teaching activity in which it is integrated. Its use has greater educational significance when students are not merely users of ready-made links, but participate in researching, selecting, and organising digital content (Sağıt, Uçak and Savran Gencer, 2024).

In geography teaching, QR codes can provide access to photographs, facts, supplementary explanations, videos, and other digital sources related to the space represented on a map. The physical map thereby ceases to be only a static visual representation and becomes a starting point for further inquiry. For successful implementation, the content linked through the codes should be accurate, relevant, comprehensible, technically accessible, and age-appropriate.

2.4. Digital Literacy, Critical Thinking, and Active Inquiry

The integration of digital technologies into teaching should not be reduced to the technical ability to use a mobile phone, computer, or particular application. Digital and information literacy also encompass the ability to locate, select, understand, evaluate, and appropriately use information from diverse digital sources (UNESCO, 2011; Vuorikari, Kluzer and Punie, 2022).

This is particularly important in geography teaching, where students use maps, photographs, statistical data, texts, videos, and other representations of space. The digital environment provides access to a vast quantity of information, but simultaneously creates a need for students to evaluate critically the authorship, accuracy, relevance, and purpose of available content (UNESCO, 2011). Through the MiDENTITY project, Hintermann, Bergmeister and Kessel (2020) emphasise the importance of critical geographic media literacy. Geography education can therefore help students analyse more consciously how space, places, and social phenomena are represented in different media.

Project work can create conditions for developing these abilities when students search for information, decide which content is relevant to a particular geographical topic, organise it, and connect it with their own product. To have critical educational value, this process should also include checking the source, authorship, date, accuracy, and copyright status of the content used. The digital tool then becomes a means of inquiry and creation rather than merely a means of passively receiving information (Vuorikari, Kluzer and Punie, 2022).

2.5. Integrating Traditional and Digital Approaches and the Rationale for the Study

The development of digital technologies does not imply abandoning traditional teaching resources. Their purposeful integration has particular potential in geography teaching. A hand-drawn map enables active cartographic representation and the organisation of spatial information, while a QR code can connect the same physical product with supplementary digital content.

This integration brings together two complementary forms of work. In the physical component, students investigate, draw, label, organise, and visually represent geographical information. In the digital component, they search for, select, verify, and connect supplementary content with the product they have created. Project-based learning unites these activities in a process with a specific objective, distributed tasks, and a visible final outcome.

The literature reviewed addresses project-based learning in geography (Grobelski, Versluis and McClelland, 2023), the educational use of hand-drawn and sketch maps (Metz, 1990; Köbben and van den Brink, 2024), the pedagogical use of QR codes (Sağıt, Uçak and Savran Gencer, 2024), and digital and critical media literacy in geography education (Hintermann, Bergmeister and Kessel, 2020). These findings provide a theoretical basis for integrating these elements into a shared teaching practice.

The sources considered in this paper less frequently examine practices in which students independently create traditional geographical maps during regular geography lessons and subsequently enhance them with QR codes leading to selected digital educational content. An analysis of the ‘Geo QR – Scan and Learn’ project can therefore offer concrete insight into the organisation, applicability, and student experience of such an integrated approach. The study does not seek to demonstrate a general effect of QR codes on achievement, but to examine how traditional and digital activities can be connected in an authentic school context.

The project's distinctive feature lies in the participation of students from several grades, who worked on different regional-geographical topics while physical and digital activities were combined within a common process. The study thus analyses the educational value of connecting these activities with cartographic work, project-based learning, and regular curriculum content.

3. Research Methodology

The research was designed as a descriptive case study of teaching practice, intended to analyse the application of project-based learning and QR codes in geography teaching through the implementation of the 'Geo QR – Scan and Learn' project. The project was implemented at 'Vojdan Chernodrinski' Primary School in Skopje during the 2025/2026 school year as part of the school's Annual Work Programme and its geography teaching and project activities. A mixed-methods approach was employed, combining qualitative monitoring of the work process and analysis of student products with quantitative data obtained through an anonymous post-project questionnaire completed by 165 students. The data sources comprised direct observation of students' work, analysis of the geographical maps and accompanying digital content they produced, student feedback, the results of the post-project questionnaire, and photographic and video documentation from different stages of the project.

3.1. Participants and Educational Context

The project involved a total of 165 students from seven classes in grades 7, 8 and 9: three grade 7 classes, two grade 8 classes, and two grade 9 classes. The inclusion of several grades enabled the project to cover different regional-geographical topics studied by the students in their regular lessons. All 165 students involved in the project participated in the anonymous post-project questionnaire. The number of valid responses varied across the individual questions because some students did not answer every question.

The selection of topics was directly related to the curricula for the respective grades. Through this distribution, the shared project activity encompassed all continents, while the project work served as an extension of the content studied during regular instruction.

Students worked in teams on activities that included researching assigned geographical topics; selecting and organising relevant information; drawing, colouring, and graphically designing geographical maps on large sheets of poster paper; and enhancing the maps with QR codes linked to digital educational content. Students therefore participated in the entire process of creating the final product—from research and cartographic representation to its visual and digital enrichment.

3.2. Time Frame and Organisation

The project began in October 2025 and was implemented in several stages over the course of the school year. Activities took place alongside the teaching of the corresponding curriculum content, allowing students to apply knowledge acquired in regular lessons while researching and completing the project tasks.

The process included selecting and assigning topics, researching geographical content, teamwork, drawing, colouring and graphically designing the maps, selecting and preparing supplementary digital materials, and linking them through QR codes.

The QR codes were tested before being placed on the geographical maps. Each code was scanned with a mobile device to verify its readability, the functionality of the link, and the accessibility of the digital content to which it led. Codes with identified technical problems were corrected and retested before the final presentation of the students' work.

As the final stage of the project, the students' work was presented at an exhibition organised to mark the school's Patron Day. Products from the different grades were displayed, and visitors were able to view the maps and access supplementary digital content through the embedded QR codes.

The implementation process and the individual stages of the project are described in greater detail in the following section of the paper, thereby avoiding repetition of the activities in the methodology section.

3.3. Methods and Data Sources

Several data sources were used to monitor and analyse the project in order to obtain a broader insight into the work process and the outcomes achieved.

Students were observed throughout the project activities, with attention focused on their engagement, participation in teamwork, interest in the assigned tasks, independence in conducting research, and use of traditional and digital resources.

The analysis of student products included an examination of the hand-drawn and coloured geographical maps, the representation and organisation of geographical content, the connection between cartographic elements and QR codes, and the functionality of the supplementary digital content. The technical functionality of the embedded QR codes was also checked, including whether they could be scanned successfully and whether the linked digital content could be accessed. The final products were thus examined not merely as exhibition pieces, but as outcomes of a process involving inquiry, collaboration, and the application of acquired knowledge.

Student feedback collected during the activities was used as an additional source for understanding their interest, their experience of teamwork, and their attitudes towards combining hand-drawn cartographic work with digital content. Following completion of the project, an anonymous questionnaire was administered to 165 students. It consisted of four questions designed to explore students' experiences and views of the project, including their interest in this form of learning, their perceptions of improved understanding of geographical content, and their willingness to participate again in similar project activities. The final, open-ended question allowed students to describe in their own words what they had liked most about the project.

Photographic and video documentation made it possible to record the student products and their final presentation at the exhibition organised for the school's Patron Day. Photographs of the completed maps and the exhibition were used as visual documentation of the project's implementation. Some activities and student products were also published on the school's official Facebook page, thereby presenting the project to the wider school community.

3.4. Data Analysis

Depending on the type of data, descriptive, qualitative, and simple quantitative analyses were applied. The observations were considered in relation to students' active participation, collaboration, interest and motivation, independence in conducting research, and use of digital tools.

Student products were analysed in terms of their connection with the assigned geographical content, the mode of cartographic representation, the integration and technical functionality of the QR codes, and the connection between the physical products and supplementary digital resources. Student feedback and project documentation were used to support the interpretation of the observed processes and outcomes. Responses to the closed-ended questions in the post-project questionnaire were processed using response frequencies and percentages, whereas responses to the open-ended question were grouped according to the most frequently occurring themes.

Combining several data sources enabled the project to be examined from multiple perspectives and provided a more comprehensive picture of its implementation and educational value. The charts are presented in their original form, as generated by Google Forms, and therefore retain the Macedonian-language labels used in the questionnaire administered to the students.

3.5. Questionnaire and Data Processing

Following completion of the project, a short anonymous online questionnaire was administered through Google Forms. Its purpose was to explore how students had experienced this mode of learning and which parts of the project they considered most significant. The questionnaire contained three closed-ended questions and one open-ended question. Students assessed how interesting they had found the project, how much it had helped them to understand geographical content, whether they would participate again in a similar project, and what they had liked most.

The anonymous post-project questionnaire was completed by all 165 students involved in the project. The first and second questions each received 165 valid responses, the third question received 163, and the open-ended question received 147 responses. Responses to the closed-ended questions were processed using frequencies and percentages calculated according to the number of valid responses to each question. Responses to the open-ended question were analysed through a simple thematic analysis. All responses were read and grouped according to recurring, substantively similar ideas. The principal themes identified were teamwork and social interaction; hand drawing and mapmaking; the use of QR codes; research and the acquisition of new knowledge; and the exhibition and presentation of student work. Four responses that did not contain information relevant to the question were excluded from the thematic analysis; consequently, 143 substantively usable responses were analysed. As a single response could contain several distinct ideas, it could be assigned to more than one thematic category. The themes were therefore not treated as mutually exclusive statistical categories.

The analysis is descriptive in nature. The questionnaire presents students' views and personal assessments following completion of the project. It is not a test of knowledge and cannot be used to claim that the project directly caused higher achievement. The results are used to examine students' interest, perceived usefulness, and willingness to participate again in an activity of this kind.

3.6. Ethical Considerations and Privacy Protection

The 'Geo QR – Scan and Learn' project was implemented at school level as part of the school's Annual Work Programme. At the beginning of the school year, parents or guardians signed consent forms permitting students to be photographed, their work to be presented publicly, and photographs of school activities to be published through the school's official channels, including its Facebook page.

The questionnaire was anonymous and the results are reported in aggregate form. Participation was voluntary, and all 165 students involved in the project agreed to complete the questionnaire, although some did not answer every question. Students were informed that their responses would be used exclusively for an aggregate analysis of the completed project. No names or other information capable of identifying individual students were collected. The photographs selected to illustrate the paper focus on the work process and student products and do not permit the identification of minors. Given the journal's open-access status, the principle of data minimisation was applied when selecting the visual documentation.

4. Results

4.1. Interest in the Project-Based Mode of Learning

When asked how interesting they had found this mode of learning geography, 126 of the 165 students (76.4%) responded 'very interesting', while 35 students (21.2%) responded 'interesting'. Two students (1.2%) rated it as 'slightly interesting', and two (1.2%) stated that it was 'not interesting at all'. A total of 161 students, or 97.6% of respondents, gave a positive assessment. This finding indicates that project-based learning was positively received by a large majority of respondents. Nevertheless, the four less positive responses should not be disregarded. They serve as a reminder that no teaching approach is equally engaging for every student and that future implementation should provide varied roles and modes of participation.

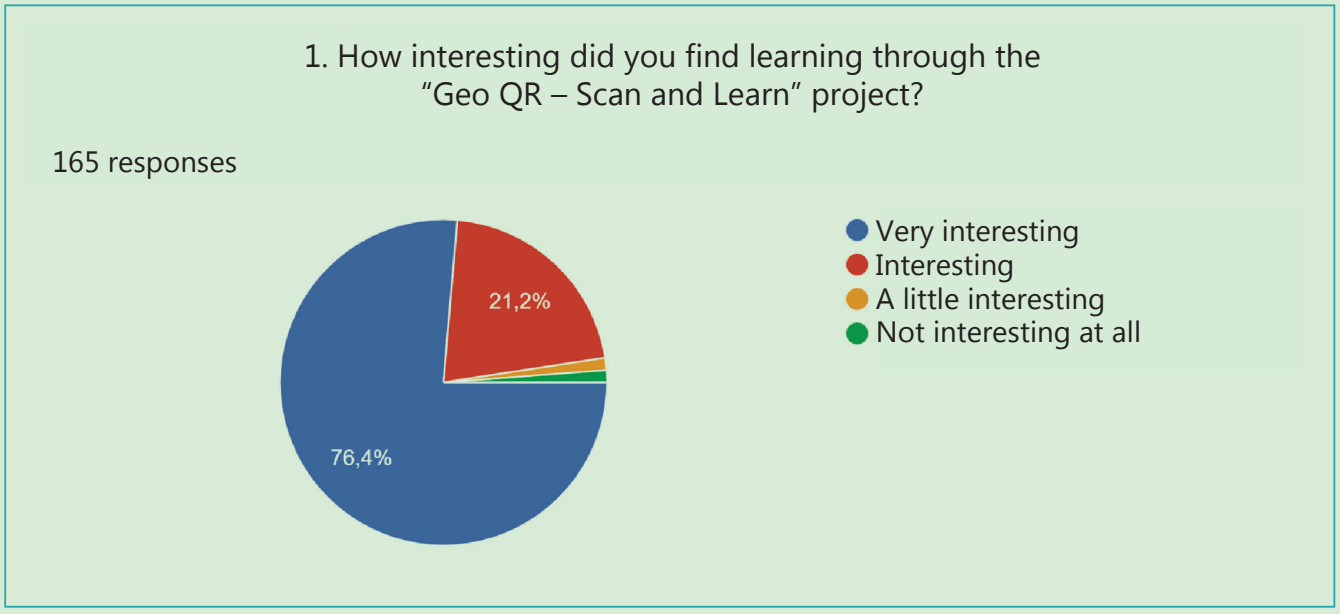


Figure 1. Students' interest in the project-based mode of learning (n = 165)
Source: Google Forms – author's questionnaire survey, 2026.

4.2. Perceived Support for Understanding Geographical Content

In response to the second question, 130 of the 165 students (78.8%) stated that the project had helped them greatly to understand geographical content, while 32 students (19.4%) stated that it had helped them to some extent. Two students (1.2%) responded that the project had helped them only a little, and one student (0.6%) that it had not helped at all. Thus, 162 of the 165 respondents, or 98.2%, felt that the project had helped them greatly or to some extent in understanding the content.

This finding is significant because it indicates that students did not experience the activity merely as drawing, colouring, or decorating. Most students felt that the project had helped them understand geographical content. Nevertheless, this reflects personal perception rather than an objectively measured change in knowledge. Such a conclusion would require pre- and post-project testing or another form of comparison.

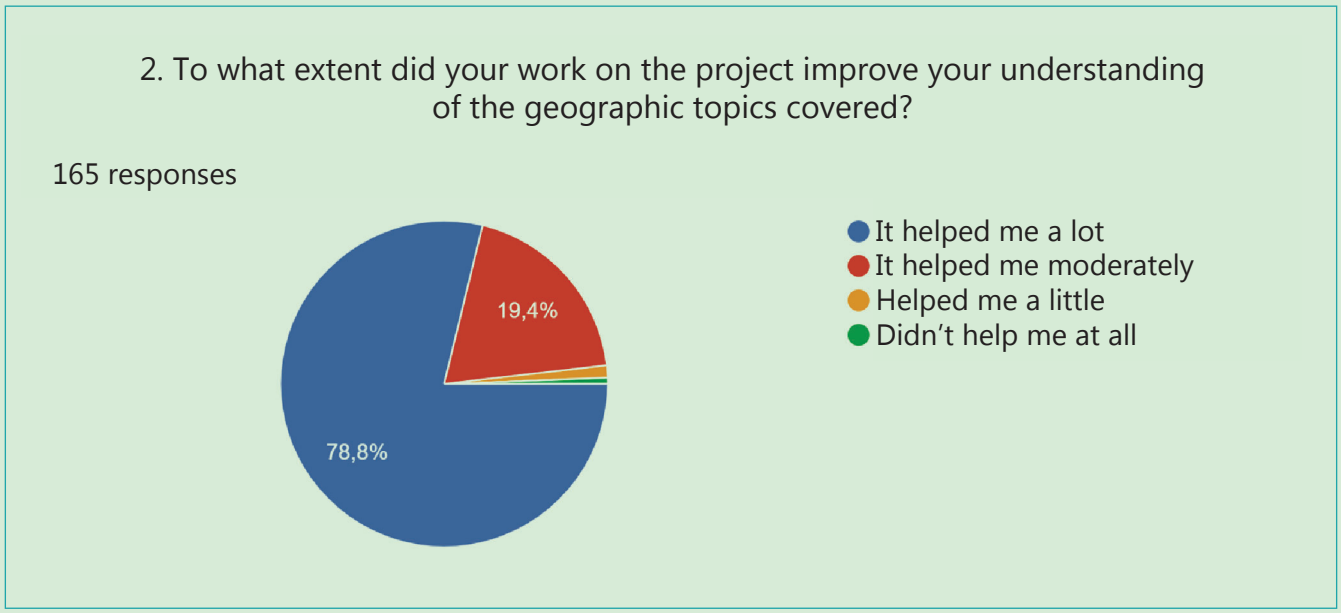


Figure 2. Perceived support for understanding geographical content (n = 165)
Source: Google Forms – author's questionnaire survey, 2026.

4.3. Willingness to Participate Again

When asked whether they would participate again in a geography project combining hand-drawn maps and QR codes, 144 of the 163 students who provided valid responses (88.3%) answered 'yes', 17 students (10.4%) answered 'maybe', and two (1.2%) answered 'no'. The high proportion of affirmative responses is consistent with the expressed interest in the project.

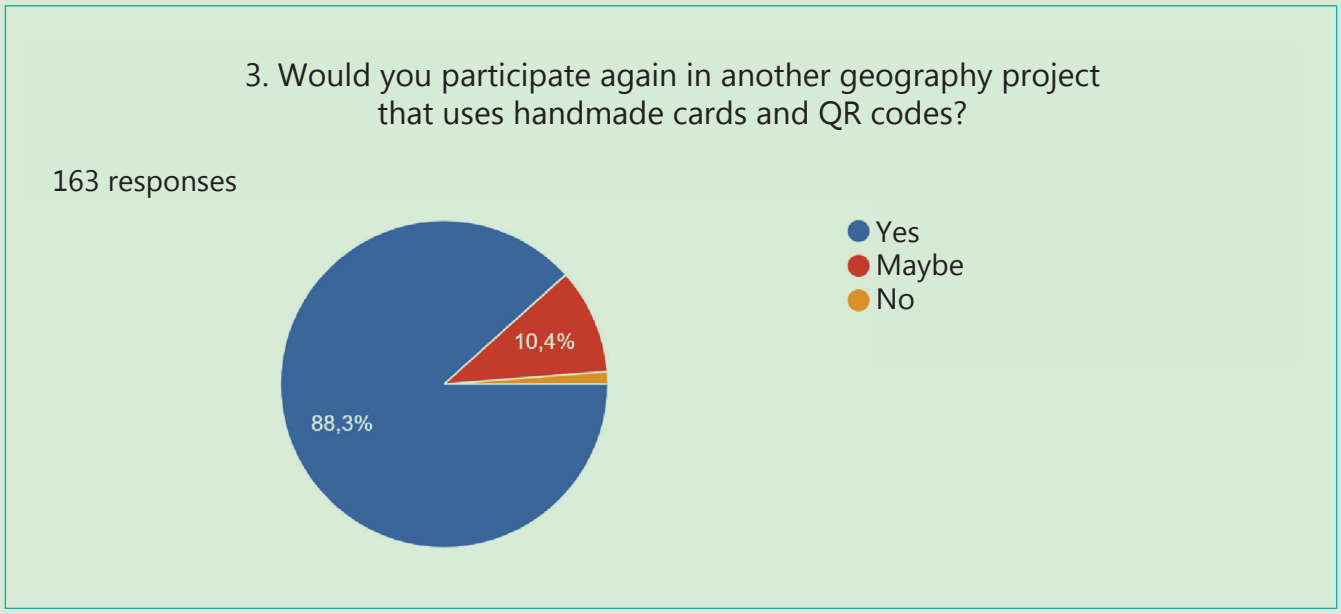


Figure 3. Willingness to participate again in a similar project (n = 163)
Source: Google Forms – author's questionnaire survey, 2026.

4.4. What Students Liked Most

The open-ended question, 'What did you like most about the "Geo QR – Scan and Learn" project?', received 147 responses. After four responses that contained no information relevant to the question had been excluded, 143 substantively usable responses were analysed thematically. Several themes emerged. Teamwork and group work, collaboration, social interaction, and the pleasant atmosphere during the activities were frequently mentioned. Students also highlighted hand drawing and colouring, working on large sheets of poster paper, labelling geographical features, and creating the maps.

QR codes constituted another prominent theme. Students highlighted creating, embedding, and scanning the codes, as well as the opportunity to use them to obtain supplementary information. Some students stated that they had not previously used this way of enriching a project. Responses also emphasised learning through inquiry, discovering new facts, gaining a better understanding of the subject matter, and connecting geographical content with the map. Some students mentioned the exhibition and presentation, while others positively evaluated the entire experience. A small number of neutral or negative views were also recorded.

The responses indicate that the technological element was not the sole source of interest. Different aspects of the project were positively distinguished: practical and creative work, inquiry and the acquisition of new knowledge, collaboration and social interaction, digital activity, and public presentation. Since a single student response could contain several elements, the themes were not treated as mutually exclusive categories, and precise percentages were not derived from them.

4.5. Student Products and the Exhibition

The final products represented the continents and polar regions through a variety of visual solutions. The maps included geographical names, borders, colours, flags, drawings, short texts, and QR codes. Although they differed in cartographic accuracy and the quantity of information presented, they demonstrated the students' ability to transform researched material into a shared visual product. During production, students selected which information would be displayed directly on the map and which would be made accessible through the QR codes. The exhibition enabled their work to be presented to the wider school community and gave the project work a clear purpose.

Before the student products were exhibited, the functionality of the embedded QR codes was confirmed through test scans. Once the necessary corrections had been made, the codes provided access to the intended digital content.

Visitors first viewed the physical maps and then accessed supplementary digital content by scanning the codes. This made the connection between traditional and digital teaching materials visible.

5. Discussion and Conclusions

5.1. Connecting Project-Based Learning, Maps, and QR Codes

The findings indicate that the project's educational value was associated not only with the use of QR codes, but also with the integration of multiple activities. Students researched curriculum content, selected information, created maps, prepared digital materials, and presented them to an audience. This corresponds to the definition of project-based learning as an approach involving inquiry, collaboration, autonomy, and a tangible final product (Kokotsaki, Menzies and Wiggins, 2016).

The large maps provided a shared workspace. Creating them required students to agree on the distribution of tasks, colours, symbols, names, and placement of information. The QR codes enabled the physical product to be supplemented with digital content without displaying that content directly on the map itself. The codes were therefore not decorative additions, but links to information that could not be presented in full on the poster paper.

The project also supported geography learning through practical geographical expression. Although the students were not producing professional maps, they made decisions concerning spatial organisation, location, boundaries, names, and visual representation. This process is connected with the educational value of student-generated maps described by Metz (1990) and Köbben and van den Brink (2024), as well as with Grobelski, Versluis and McClelland's (2023) concept of 'learning geography through doing geography'.

5.2. Engagement and Perceived Learning

The questionnaire produced highly positive assessments: 97.6% of respondents rated the approach as very interesting or interesting; 98.2% felt that the project had helped them greatly or to some extent in understanding the content; and 88.3% of the students who answered the third question stated that they would participate again. These results are consistent with literature associating project-based learning with engagement, autonomy, and collaboration (Bell, 2010; Kokotsaki, Menzies and Wiggins, 2016).

Nevertheless, the results do not demonstrate that the project objectively improved achievement. A positive experience may support learning, but interest and a personal assessment of understanding are not equivalent to a test result. The most precise conclusion is that the majority of respondents experienced the method as interesting, useful, and worth repeating.

The open-ended responses complement this finding. Different students found value in different elements: visual and manual work, technology, social interaction, inquiry, or geographical discovery. A project of this kind can offer multiple avenues for participation, but the teacher must ensure that every role remains connected with the shared learning objectives.

5.3. Digital Literacy and the Critical Use of Information

Preparing content linked to QR codes gave students a reason to search for, select, and organise digital information. This corresponds to the DigComp areas concerning information literacy, collaboration, and digital content creation (Vuorikari, Kluzer and Punie, 2022). At the same time, it created opportunities to discuss whether a source was comprehensible, relevant, accurate, and appropriate for student-produced material.

Based on the implementation experience, future activities would benefit from a more systematic approach to verifying and citing sources. Such activities also require attention to authorship, date, accuracy, and the copyright status of the digital content used. It would be useful for each group to maintain a list of the digital sources consulted. This would create a stronger connection between the project and media and information literacy (UNESCO, 2011), as well as critical geographic media literacy (Hintermann, Bergmeister and Kessel, 2020).

5.4. Practical Implications

The project can be adapted for use in other schools without specialised equipment. It requires large sheets of poster paper, basic working materials, internet access, and devices capable of scanning QR codes. Successful implementation nevertheless demands clear planning. The topics should be closely aligned with the curriculum. In this project, the geographical and digital criteria were defined in advance, and each group knew what it was expected to research, produce, and present. Before the final presentation, all QR codes were test-scanned and any technical problems identified were corrected. Such testing should be a mandatory stage in future implementations. Privacy, copyright, and source credibility should also be discussed. Assessment should take account of the process, participation, and geographical accuracy, rather than only the appearance of the final product.

5.5. Conclusion

The 'Geo QR – Scan and Learn' project represents a practical means of connecting traditional mapmaking with digital resources in primary geography education. Students from seven classes investigated regional-geographical content, worked in teams to create large maps, and used QR codes to expand and enhance them with supplementary information. All 165 students involved in the project completed the anonymous questionnaire, which produced highly positive assessments of interest, perceived support for understanding, and willingness to participate again.

The study's principal contribution is not evidence that QR codes automatically improve learning. Rather, it demonstrates how a simple technology can acquire educational meaning when embedded in a structured project involving geographical inquiry, mapmaking, collaboration, content creation, and presentation. Traditional and digital learning are not opposites; within the project, they supported different components of the same activity.

6. Limitations and Directions for Future Research

The study has several limitations. It was conducted in a single school and reflects the conditions of a particular teaching practice; the findings therefore cannot be directly generalised to other educational contexts. Although all 165 students involved in the project completed the questionnaire, the number of valid responses varied across individual questions: 163 students answered the third question and 147 answered the open-ended question. The results are consequently interpreted according to the number of valid responses to each question.

The questionnaire was administered only after the project and was based on personal assessments. There was no pre-project measurement, comparison group, or standardised test.

Students already possessed some prior knowledge, and the project activities took place alongside the teaching of regular curriculum content. When interpreting the findings, it must therefore be recognised that students acquired knowledge through regular instruction as well as through project activities. Observation was not conducted using a standardised rubric and was based on direct monitoring by the teacher, who was simultaneously responsible for implementing the project.

The open-ended question was optional, and responses varied in length and detail. The thematic analysis presents recurring ideas but does not constitute a precise measurement of their prevalence. The questionnaire did not collect information about students' grades, making comparisons between age groups, or between students in different grades, impossible.

Future research could employ a structured observation rubric and student focus groups to examine in greater detail students' experiences, engagement, and perceptions of the connection between traditional and digital activities. The long-term functionality of QR codes could also be monitored, particularly because, during project preparation, students explored various free and paid solutions and their time limitations. Future studies could additionally analyse in greater depth how students assess the credibility of online geographical information.

References

1. Bell, S. (2010) 'Project-based learning for the 21st century: Skills for the future', *The Clearing House*, 83(2), pp. 39–43. Available at: https://doi.org/10.1080/00098650903505415
2. Grobelski, T., Versluis, A. and McClelland, J. (2023) 'Discovering geography through doing geography: Project-based learning in an introductory undergraduate world geography course', *Journal of Geography*, 122(2), pp. 31–42. Available at: https://doi.org/10.1080/00221341.2023.2189743
3. Hintermann, C., Bergmeister, F.M. and Kessel, V.A. (2020) 'Critical geographic media literacy in geography education: Findings from the MiDENTITY project in Austria', *Journal of Geography*, 119(4), pp. 115–126. Available at: https://doi.org/10.1080/00221341.2020.1761430
4. Köbben, B. and van den Brink, M. (2024) 'A sketch map tool for geography education', *Abstracts of the International Cartographic Association*, 7, Article 76. Available at: https://doi.org/10.5194/ica-abs-7-76-2024
5. Kokotsaki, D., Menzies, V. and Wiggins, A. (2016) 'Project-based learning: A review of the literature', *Improving Schools*, 19(3), pp. 267–277. Available at: https://doi.org/10.1177/1365480216659733
6. Metz, H.M. (1990) 'Sketch maps: Helping students get the big picture', *Journal of Geography*, 89(3), pp. 114–118. Available at: https://doi.org/10.1080/00221349008979610
7. Ministry of Education and Science of the Republic of North Macedonia (2021) *Concept for Primary Education*. Skopje: Ministry of Education and Science.
8. Sağıt, P., Uçak, E. and Savran Gencer, A. (2024) 'A systematic review on the pedagogical use of QR codes', *Journal of STEM Teacher Institutes*, 4(2), pp. 106–126.
9. UNESCO (2011) *Media and Information Literacy Curriculum for Teachers*. Paris: UNESCO.
10. Vuorikari, R., Kluzer, S. and Punie, Y. (2022) *DigComp 2.2: The Digital Competence Framework for Citizens: With New Examples of Knowledge, Skills and Attitudes*. Luxembourg: Publications Office of the European Union. Available at: https://doi.org/10.2760/115376

Appendices

APPENDIX 1.
Student Questionnaire Administered after Completion of the Project

1. How interesting did you find this way of learning geography through the 'Geo QR – Scan and Learn' project?

- Very interesting
- Interesting
- Slightly interesting
- Not interesting at all

2. How much did working on the project help you to understand geographical content better?

- It helped me greatly
- It helped me to some extent
- It helped me a little
- It did not help me at all

3. Would you like to participate again in a geography project combining hand-drawn maps and QR codes?

- Yes
- Maybe
- No

4. What did you like most about the 'Geo QR – Scan and Learn' project? *(Open-ended question – students enter their responses independently.)*

APPENDIX 2.
Photographic Documentation of the Project Activities and Exhibition



Figure 4. Students work in teams to create a geographical map of Europe enhanced with QR codes
Source: Author's project documentation, 2026.



Figure 5. Completed geographical maps prepared for the school exhibition
Source: Author's project documentation, 2026.



Figure 6. The final exhibition of the 'Geo QR – Scan and Learn' project, organised to mark the school's Patron Day

Source: Author's project documentation, 2026.



Figure 7. Visitors view geographical maps enhanced with QR codes during the final exhibition

Source: Author's project documentation, 2026.

About the Author

Ljupka Milenković is a geography teacher and teacher mentor at "Vojdan Chernodrinski" Primary School in Skopje. Her educational work is grounded in contemporary, innovative, student-centred teaching practices designed to foster active learning, project work, digital literacy, and critical thinking among students. She actively participates in national and international educational projects, conferences, and training programmes spanning various areas of education and professional development. She is the author of several professional and scholarly papers published in international academic journals and has implemented numerous activities in the fields of education, environmental education, sustainable development, and the application of contemporary digital tools in teaching. In addition to her teaching duties, she is actively involved in mentoring trainee teachers and in organising and implementing competitions, student projects, and other extracurricular activities. In recognition of her professional contribution to education, she has received the 'Best Teacher in the Region' award, the anniversary charter 'Iskra Regiona' from the Association of the Best Teachers and Leaders from the Former Yugoslavia (ANN EX YU), and a Gold Plaque from the 'Prof. Dr Ljube Milenkovski' Association of Geography Teachers in Skopje.