EVALUATION OF DIGITAL TECHNOLOGY FROM THE STUDENTS` PERSPECTIVE IN THE CASE OF PROJECT WORK IN GEOGRAPHY

Sonja Trškan
Rudolf Maister Grammar and Secondary School Kamnik, Slovenia

Abstract

The aim of the research is to evaluate a project on the subject of reliefs, which included the use of modern digital technology from the perspective of secondary school students. Since the formative assessment of students also includes a critical self-evaluation of the final products, anonymous surveys were used to determine how the students evaluated the project work, and the use and usefulness of digital technology in geography lessons. Results of this research showed that digital technology encourages students to become more engaged and interested in learning, to reflect on their work and learning, to follow the evaluation criteria, and to achieve better learning outcomes.
Keywords: *digital technology, evaluation criteria, (self-) evaluation, project work, geography teaching*

Introduction

In secondary schools, geography teachers have access to various digital applications, tools and devices with which they can create learning material to be used in lessons. *"We must be aware that when preparing learning materials, we should stem from the contents, the learning objectives and the selected didactic approach, and adapt the choice of ICT accordingly."* (Drožđek et al., 2019, pp. 12). For this reason, a rather demanding learning content was selected for project work, which contains unknown terms on the topic of reliefs, whereby the students must be able to enumerate and explain different types of relief (glacial, fluvial, coastal, aeolian, karst), relief forms (river valley, glacial erratic, fjord, moraine, meander, etc.) and external land-forming processes (erosion, weathering, accumulation, denudation, etc.) (Baloh et al., 2016, pp. 26–47; Polšak et al., 2008, pp. 20 and 39).

In the case of formative assessment, teachers are to provide a thought-provoking, safe and relaxed work atmosphere during lessons (Holcar et al., 2016a, pp. 9). Therefore, this research focused on creating a learning environment, which would facilitate the students' learning of geography through digital technology by incorporating their experience in using smartphones, computers, Microsoft Office programs and the Mindmeister web application, and their knowledge of programming e-assignments or computer games.

The project work was planned in several phases (collecting material in the field; selecting the text and visuals for preparing a PowerPoint presentation, a mind map and a computer game on different types of relief, relief forms and external land forming processes in the Slovene, German and English languages; evaluating the project work by conducting a survey among students). It was implemented in a 1st year class of a grammar school (general secondary school) in the school year 2018/19.

https://doi.org/10.48127/gu-nse/21.18.36

Research Problem and Aim

Bearing in mind that in the case of formative assessment, the feedback on the learning process needs to be passed from the students to the teacher (Holcar et al., 2016a, pp. 10), the main purpose of the empirical research was to determine how the students evaluated the project work, and the use and usefulness of digital technology in geography lessons.

Research Questions and Hypotheses

On the one hand, this research focused on how involved the students were in each phase of the project work, how much they complied with the success criteria, and how many different skills they acquired through the project work. On the other hand, the aim of the research was to find out the students' opinions on the use and usefulness of modern electronic devices in geography lessons.

This research assumed that a project assignment supported by digital technology would encourage students to become more engaged and interested in the schoolwork or project work; that they would gain more knowledge and skills and thus achieve the learning objectives more easily; and that they would, above all, learn how to reflect on their own work and learning, contribute to the joint final product as a team, and define the success criteria for self-evaluation or for the evaluation of the project assignment. In addition, this research assumed that the students were aware of the benefits of using digital technology for school purposes.

Research Methodology

Instrument

An anonymous online survey was conducted by means of the 1KA application. An online questionnaire was prepared, which contained closed-ended questions and questions with different rating scales.

Participants

The questionnaire was filled out by students on 5 February 2020 during a geography class. Students used either smartphones or the school's tablet computers. The questionnaire was fully completed by the 23 students (aged from 15 to 16) who were attending class that day.

Data Analysis

The results (frequencies and percentages, and, in some cases, arithmetic means and standard deviations) were obtained from the 1KA web application. The percentages were rounded to the nearest whole unit, which is why the sum does not equal 100%. When analysing the results, the descriptive and explicative methods of empirical pedagogical research were applied (Cencič, 2002, p. 99).

Research Results

This research focused on how the students evaluated their contribution to each phase of the project work and in which phase they were most successful. The students rated their contribution the highest in the phase of the project work that required the making of a PowerPoint presentation with photographs, descriptions and reflection, and submitting it in the online classroom; they rated it the lowest in the phase that required them to translate the computer game (the text for photographs) into German and/or English, as shown in Table 1. 35% of the students answered that they were the most successful in the oral presentation using PowerPoint; 30% of the students said the same for their individual work in the field; 26% of the students answered that they were the most successful in making the PowerPoint presentation. 4% of the students answered that they were successful in the group work and another 4% said the same for translating the computer game.

Table 1
Students' Contribution to Each Phase of the Project Work

Students' contribution to each phase of the project work, N (%)							$\bar{x}$	σ
	Very small	Small	Moderate	Large	Very large	Total		
Individual work in the field (photographing two relief forms, and one landform shaped by the weather or water)	0 (0)	3 (13)	8 (35)	7 (30)	5 (22)	23 (100)	3.6	1.0
Making a PowerPoint presentation with photographs, descriptions and reflection, and submitting in the online classroom	0 (0)	2 (9)	10 (43)	4 (17)	7 (30)	23 (100)	3.7	1.0
Oral presentation using PowerPoint	2 (9)	2 (9)	8 (35)	5 (22)	6 (26)	23 (100)	3.5	1.2
In groups, selecting photographs and keywords for relief forms by relief types (5 groups: glacial, karst, fluvial, coastal and aeolian) and combining them into a common mind map with Mindmeister	1 (4)	2 (9)	10 (43)	4 (17)	6 (26)	23 (100)	3.5	1.1
Translation of the computer game (the text for photographs) into German and/or English	1 (4)	6 (26)	8 (35)	2 (9)	6 (26)	23 (100)	3.3	1.3

https://doi.org/10.48127/gu-nse/21.18.36

This research focused on how much the students complied with the success criteria they had defined together with their teacher for the oral presentation using PowerPoint, and how much that mattered to them. The students complied the most with the criteria "Selection of appropriate photographs" and "Proper naming and correct description of the relief type shown in the photograph", and the least with the criterion "Reflection on fieldwork". They also complied well with other success criteria, e.g., "Selection of appropriate maps for showing the location" and "Illustrative oral presentation using PowerPoint" (Table 2). 39% of the students found being able to define the success criteria together with their classmates and teacher very important; 30% found it important, 22% moderately important, 4% found it of very little importance and 4% of little importance.

The students answered the question of how many different skills they had gained through the project work and how they would evaluate their knowledge of reliefs. The survey answers have shown that the students rated two skills the highest, namely learning how to revise and consolidate the learning content in a different way and learning how to contemplate on their work and on their contribution to the project assignment. They rated these two skills with the average score of 3.9 (out of 5). The lowest rated skill (3.3 out of 5) was that of learning to use smartphones and computers for a creative school assignment and defining the success criteria for a proper PowerPoint, and oral presentation together with the teacher and classmates. They estimate that their knowledge of reliefs was poorer before doing the project assignment (average score of 3.8) than after completing the project assignment (average score of 4.3) (Table 3).

Table 2

Students' Compliance with Success Criteria for an Oral Presentation using PowerPoint

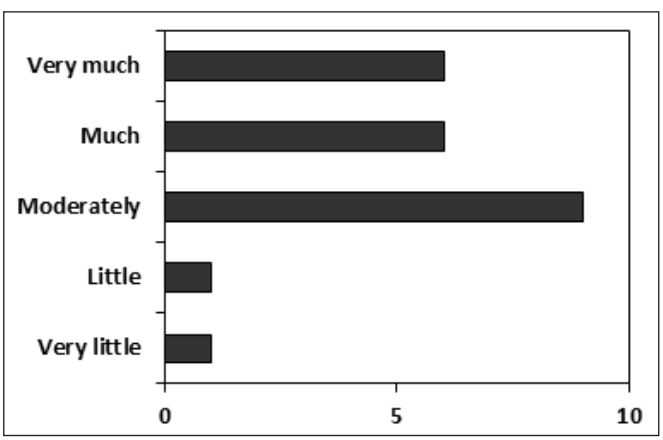
Students' compliance with success criteria for an oral presentation using PowerPoint, *N* (%)							$\bar{x}$	σ
	Very small	Small	Moderate	Large	Very large	Total		
Selection of appropriate photographs	0 (0)	0 (0)	4 (17)	11 (48)	8 (35)	23 (100)	4.2	0.7
Selection of appropriate maps for showing the location	2 (9)	1 (4)	6 (26)	7 (30)	7 (30)	23 (100)	3.7	1.2
Proper naming and correct description of the relief type shown in the photograph	0 (0)	0 (0)	7 (30)	6 (26)	10 (43)	23 (100)	4.1	0.9
Proper naming and correct description of the relief form shown in the photograph	0 (0)	1 (4)	8 (35)	5 (22)	9 (39)	23 (100)	4.0	1.0
Proper naming and correct description of the external land forming process shown in the photograph	0 (0)	1 (4)	6 (26)	10 (43)	6 (26)	23 (100)	3.9	0.8
Illustrative oral presentation using PowerPoint	1 (4)	3 (13)	6 (26)	5 (22)	8 (35)	23 (100)	3.7	1.2
Reflection on fieldwork	1 (4)	7 (30)	7 (30)	3 (13)	5 (22)	23 (100)	3.2	1.2

Table 3
Knowledge of Reliefs before and after Completing the Project Assignment according to the Students

Knowledge of reliefs before and after completing the project assignment according to the students, N (%)							σ
	Insufficient	Sufficient	Good	Very good	Excellent		
Knowledge of reliefs before the project assignment	0 (0)	2 (9)	7 (30)	7 (30)	7 (30)	23 (100)	3.8
Knowledge of reliefs after completing the project assignment	0 (0)	0 (0)	3 (13)	9 (39)	11 (48)	23 (100)	4.3

This research focused on the students' opinions regarding how much the use of a smartphone and other devices (e.g., a camera) contributed to the implementation of the project work, and how much their knowledge of using a computer and web applications contributed to the implementation of the project work. 39% of the students answered that using a smartphone and other devices (e.g., a camera) had contributed very much to the implementation of the project work; another 39% of the students answered that it had contributed much, while 22% of the students answered that it had contributed moderately. No one said that the contribution was small or very small. 26% of the students answered that their knowledge of using a computer and web applications had contributed very much to the implementation of the project work; another 26% of the students answered that it had contributed much. 39% of the students answered that it had contributed moderately. One student (4%) answered that it had contributed little, while another student (4%) answered that his knowledge of using a computer and web applications had contributed very little to the implementation of the project work (Figure 1).

Figure 1
Students' Opinions Regarding How Much Their Knowledge of Using a Computer and Web Applications Contributed to the Implementation of the Project Work



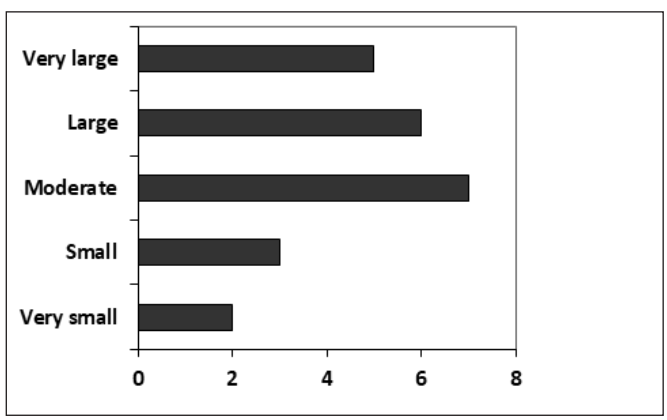
 https://doi.org/10.48127/gu-nse/21.18.36

The students rated the difficulty of the computer game or e-assignment on reliefs, which they had designed and then tested themselves; they also rated how important it was to them to co-create the learning process. Most students (65%) found the computer game or e-assignment on reliefs, which they had designed themselves, semi-difficult; 13% of the students found it easy; 9% of the students found it difficult; another 9% of the students found it very easy; 4% of the students found the e-assignment very difficult. 48% of the students found the e-assignment very useful; 26% of the students found it useful; another 26% of the students found it moderately useful for learning about reliefs in geography class. No one said it was of little use or useless. Most students (57%) answered that they found it moderately important to be the co-creators of teaching materials; 22% of the students found it very important; 13% found it less important and 9% quite important. No one said it was unimportant to them.

In the end, this research focused on determining the students' opinions on the appropriateness of using electronic devices, and how much the use of electronic devices (smartphone, tablet, computer) in geography lessons contributed to their activity and participation. Most students (30%) found that using personal electronic devices was very appropriate for geography lessons; 26% of the students found it moderately appropriate and 22% found it quite appropriate. 13% of the students found it less appropriate and 9% of the students found it hardly appropriate. Most students (30%) answered that using electronic devices in class had a moderate impact on their activity and participation during geography lessons; 26% of the students answered that it had a large impact, and 22% that it had a very large impact on their activity and participation. 13% of the students answered that it had a small impact and 9% of the students that it had a very small impact on their activity and participation during geography lessons (Figure 2).

Figure 2

Students' Opinions on the Impact of Using Electronic Devices on their Activity and Participation during Geography Lessons



Discussion

The students' survey answers show that they did their best to participate in all the phases of the project work and to successfully fulfil all the requirements. The Gaussian curve indicates that most students invest a medium amount of effort in their schoolwork. Moreover, the survey answers show that the students invested much more effort in their

independent work in the field and in making the PowerPoint presentation because they had to present their independent work to their classmates orally.

The students found it very or quite important to define the success criteria together with their classmates and teacher; in this project assignment, the success criteria were defined for an oral presentation using PowerPoint. They also properly complied with these criteria; they only had problems complying with the success criteria relating to the (self-) reflection on fieldwork. This can be confirmed, as the students spoke with difficulty or modestly (in front of the class) about the problems they had experienced during fieldwork and when preparing the oral presentation.

The students assessed that their knowledge of reliefs improved after completing the project assignment (by half a score), which is proved by their ratings of the skills they acquired. It is believed that the students are very knowledgeable in using smartphones and computers, as they had no need to perfect their knowledge during this assignment but only had to apply their prior knowledge.

They had greater difficulty defining the success criteria and translating the geographical text into the German and English languages, which represented a challenge; in the future, more attention should be devoted to cross-curricular integration and teaching students how to define concrete and understandable success criteria that will influence their learning process and their final products. Formative assessment also encourages teachers to involve students in co-defining the success criteria, helping them with various questions, guidelines and discussions (Holcar et al., 2016b, p. 5).

The students are aware that they could not have done the project work without using a smartphone, computer, and web applications. The students' answers showed that the use of digital devices influences the activity and participation during lessons in three-quarters of the students. For this reason, they consider their use appropriate for geography lessons. They assessed that they had designed a semi-difficult computer game, which they consider very useful for revising and consolidating the learning content on reliefs in the subject of geography. The students are partly aware of the importance of being co-creators of the learning materials used in lessons, which is why in the future the learning process will have to centre even more on the students, making them aware of their important role and their responsibility towards learning and learning outcomes; this has also been established by other geography teachers who are incorporating formative assessment into geography lessons (Kelbič Đajić, 2016; Matkovič, 2019; Žökš, 2017). Moreover, the research on the use of contemporary technologies in education in Slovenia has confirmed that integration of digital technologies in the classroom *"leads to better understanding and knowledge of the field, which the students will be able to apply in the future."* (Zemljak & Aberšek, 2020, p. 51). *"The process and method of integrating technology must be taken into account in order to create the optimal learning conditions."* (Drožđek et al., 2019, pp. 13).

Conclusions

This research assumed that secondary school students are aware of the benefits of using digital technology for school purposes, which was proved by the implementation of this project work. The students' survey answers showed that they have a positive perception of digital technology; it can therefore be confirmed that a project assignment supported by digital technology encourages students to become more engaged and interested in the schoolwork or project work, as all of them had to make an effort and be actively

 https://doi.org/10.48127/gu-nse/21.18.36

involved in all the phases of the project work in order to design the final e-assignment or computer game. This research proved that students have no problem using computers and smartphones, and that they are aware of the benefits of using their digital knowledge for school purposes.

This research assumed that the students would gain more knowledge and skills through the project work and thus achieve the learning objectives more easily, and that they would, above all, learn how to reflect on their own work and learning, contribute to the joint final product as a team, and define the success criteria for self-evaluation or for the evaluation of the project assignment. The survey answers corroborated these assumptions, however, it should be pointed out that the students had difficulty contemplating on their work and learning and defining the success criteria. In the future, more attention should be devoted to gradually accustoming students to reflect on their schoolwork and their outcomes.

The anonymous questionnaire contributed a great deal to the final evaluation of the entire project assignment and indicated the guidelines for the future use of digital technology and formative assessment in geography lessons.

This research proves that through computer-assisted activities, secondary school students can achieve the learning objectives relating to identifying or describing the types and forms of relief, but also gain the competencies for creating a useful electronic teaching aid as an educational and communication tool in several languages for the subject of geography.

References

Baloh, E., Petek, M., Repe, B. & Stankovič, M. (2016). *Geografija 1. Učbenik za geografijo v 1. letniku gimnazije in srednjih strokovnih šol* [Geography 1. Geography Textbook for the 1st Year of General and Secondary Technical Schools]. Mladinska knjiga Založba.

Cencič, M. (2002). *Pisanje in predstavljanje rezultatov raziskovalnega dela. Kako se napiše in predstavi diplomsko delo (nalogo) in druge vrste raziskovalnih poročil* [Writing and presenting research results. How to write and present a Diploma Thesis (Paper) and other types of research reports]. Pedagoška fakulteta Univerze v Ljubljani.

Drožđek, S., Luštek, A., & Rugelj, J. (2019). Večpredstavna učna gradiva za boljše usposabljanje učiteljev [Multimedia teaching materials for better teacher training]. In Rugelj, J., & Ferk Savec, V. (Eds.), *Inovativna didaktična uporaba informacijsko komunikacijske tehnologije v študijskem procesu* [Innovative Didactic Use of Information and Communication Technology in the Study Process] (pp. 11-31). Univerza v Ljubljani.

Holcar Brunauer, A., Bizjak, C., Borstner, M., Cotič Pajntar, J., Eržen, V., Kerin, M., Komljanc, N., Kregar, S., Margan, U., Novak, L., Rutar Ilc, Z., Zajc, S., & Zore, N. (2016a). *Formativno spremljanje v podporo učenju. Priročnik za učitelje in strokovne delavce. Zakaj formativno spremljati?* [Formative Assessment in Support of Learning. Handbook for Teachers and Professional Staff. Why Conduct Formative Assessment?]. Zavod Republike Slovenije za šolstvo.

Holcar Brunauer, A., Bizjak, C., Borstner, M., Cotič Pajntar, J., Eržen, V., Kerin, M., Komljanc, N., Kregar, S., Margan, U., Novak, L., Rutar Ilc, Z., Zajc, S., & Zore, N. (2016b). *Formativno spremljanje v podporo učenju. Priročnik za učitelje in strokovne delavce. Nameni učenja in kriteriji uspešnosti* [Formative Assessment in Support of Learning. Handbook for Teachers and Professional Staff. Learning Purposes and Success Criteria]. Zavod Republike Slovenije za šolstvo.

Kelbič Đajić, M. (2016). Uporabnost aplikacije Nearpod pri preverjanju in utrjevanju znanja. [Usefulness of the Nearpod application in knowledge assessment and consolidation]. *Geografija v šoli, 24*(1)*,* 78-80.

Matkovič, M. (2019). Spletna učilnica kot možnost izvajanja formativnega spremljanja pri pouku geografije. [Online classroom as an opportunity for conducting formative assessment in geography lessons]. *Geografija v šoli, 27*(2)*,* 56-59.

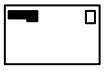
Polšak, A., Dragoš, A., Resnik Planinc, T., & Škof, U. (2008). *Učni načrt. Geografija. Elektronski vir. Gimnazija. Splošna, klasična, ekonomska gimnazija. Obvezni predmet (210 ur). Matura (105 ur).* [Curriculum. Geography. Electronic Source. "Gimnazija". General, Classical, Economic "Gimnazija". Compulsory Subject (210 Hours). "Matura" Examination (105 Hours)]. Ministrstvo za šolstvo in šport; Zavod Republike Slovenije za šolstvo. http://eportal.mss.edus.si/msswww/programi2019/programi/media/pdf/un_gimnazija/2013/SSL_UN_GEOGRAFIJA_gimn.pdf

Zemljak, D., & Aberšek, B. (2020). Integration and use of contemporary technologies in STEM education. *Gamtamokslinis ugdymas / Natural Science Education, 17*(1), 44-52. https://www.doi.org/10.48127/gu-nse/20.17.44

Žökš, M. (2017). Primer formativnega spremljanja in vrednotenja pri predmetu geografija v sedmem razredu. [Example of Formative Assessment and Evaluation in the Subject of Geography in the 7th Grade]. *Geografija v šoli, 25*(2)*,* 45-55.

Received 25 April 2021; Accepted 17 June 2021

Cite as: Trškan, S. (2021). Evaluation of digital technology from the students` perspective in the case of project work in geography. *Gamtamokslinis ugdymas / Natural Science Education, 18*(1), 36-44. https://doi.org/10.48127/gu-nse/21.18.36



Sonja Trškan
MSc, Geography Teacher, Gimnazija in srednja šola Rudolfa Maistra Kamnik [Rudolf Maister Grammar and Secondary School Kamnik], Novi trg 24A, SI-1241 Kamnik, Slovenia.
E-mail: sonja.trskan@guest.arnes.si