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Infrastructure of Secondary Schools in The Context of Using New Technologies in Education*

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Abstract

The paper concerns the assessment of the infrastructure of secondary schools in the context of distance learning and students' attitude to undertaking remote work in the future. The aim of the paper is to discuss the results of empirical research conducted among secondary school students from Poland. The presented results refer to the research questions posed: RQ1: Are Polish secondary schools well equipped in digital technology such as computers or Wi-Fi?; RQ2: Is the situation of digital technology used in technical secondary schools worse than in general secondary schools?

Keywords: Education, New technologies, Infrastructure, Secondary school

Introduction

Social, organizational and technological changes in the conditions of digitization and globalization are an inherent element of modern education and the education system at every level. Experience from the Covid-19 pandemic has shown that adapting the education system to distance learning is a problem, even in conditions of advanced technological development. Remote learning is a challenge both for school principals and teachers, but above all for students. These challenges concern, inter alia, school equipment, information technology tools and technologies, and digital competences.

In the context of challenges for education with the use of information technologies, there is still a research gap that may result from the dynamic technological development and changing organizational conditions. Scopus, as one of the largest scientific databases in the world, showed only 148 documents as a search result for "remote education" and "challenges". It should be emphasized that the vast majority of these documents were published in 2020 and 2021, which means that it was only the Covid-19 pandemic that sparked considerable interest in the subject of challenges in remote education.

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According to the literature research, there are numerous studies concentrated on experiences and challenges of distance learning due to Covid-19. A large part of the published papers in the context of Covid-19 concern the challenges facing higher education. For instance, Tulaskar and Turunen (2021) investigated what makes traditional distance, online and virtual learning different from the new Emergency Remote Learning approach for university-level education. From a different point of view, the researchers also set out to investigate how post-graduate studies were carried out in the wake of the Covid-19 pandemic. Using the UK example, opportunities for blended learning and learning were explored taking into account the experiences and perceptions of students (Peimani and Kamalipour, 2022). In addition, research articles also refer to distance learning from a psychological point of view. For example, a secondary analysis of the World Vision Asia Pacific Region's response-assessment data to COVID-19 was performed and determined whether adolescent studies, physical and recreational activities, psychosocial status and sources of information about COVID-19 differed by gender (Wang et al., 2021).

The topic of remote education and advanced technologies in education process is very important in practice, which is confirmed by numerous financial and substantive support programs organized, for example, by education ministers or local governments. In this paper, the authors focus primarily on the organizational aspect, and more specifically on the infrastructure of secondary schools used for teaching with the use of advanced technology. The main aim of the article is to present the results of empirical research conducted among Polish secondary school students on school infrastructure in the context of advanced technologies and distance learning. With this study, the authors aim to answer three main research questions:

- RQ1: Are Polish secondary schools well equipped in digital technology such as computers or Wi-Fi?
- RQ2: Is the situation of digital infrastructure used in technical secondary schools worse than in general secondary schools?

The remainder of this paper is organized as follows. In the next section, the literature review is presented in the context of secondary schools infrastructure. In the section entitled methods and results the research procedure and analysis of students survey responses are presented. Then, the authors reflect on these findings and conclude with conclusion and recommendations for further research studies.

Literature Review

The analysis of the literature on the evaluation of the digital infrastructure of secondary schools shows that there is still a lot to be researched in this area. With the Scopus command: (TITLE-ABS-KEY ("secondary school") AND TITLE-ABS-KEY ("digital infrastructure")) only 4 results were obtained. An in-depth analysis of scientific articles was carried out to summarize the current observations of scientists and systematize practical and research implications.

Table 1: Literature Review Results

Authors	Main findings	Implications
Schneider, R., Sachse, K.A., Schipolowski, S., Enke, F. (2021)	Children from better-off families are spending 30% more time on home learning than are those from poorer families and have more resources for home learning. Many parents report problems supporting home learning. School closings will almost certainly increase educational inequalities.	**Practical**: Decision-making bodies should ensure: equalization of students' home-learning experience; bringing students back to school at different times; and offering students additional resources and additional support to catch up when they return to school.

Molina-Pérez, J., Pulido-Montes, C. (2021)	There is usually an imbalance or crisis of identity components professional. Therefore, teachers often feel that their professional effectiveness is being questioned by: conditions and skills related to the use of ICT.	**Practical:** Hybrid teaching-learning models, a reduction in class groups, alternating student attendance days, and hygiene and health measures are proposed. **Research:** It is necessary to: develop research that maps teachers' narratives and identifies the ambivalences, uncertainties and fractures that have occurred in remote education.
Blikstad-Balas, M., Klette, K. (2020)	Implementation of digital technology in education is limited by: low level of digital competences of students and teachers; presenting only instructional content by teachers; writing only digital texts by students.	**Practical:** These findings make an important contribution to the field as they directly challenge the persistent idea that access to technology, coupled with clear ideas about digital competences that students should develop in a variety of subjects, will lead to the implementation and uptake of ICT and a range of new skills.
Parsons, D., Adhikari, J. (2016)	The apparently simple adoption of digital tools has a deeper impact on classroom structure and efficiency.	**Practical:** Students perceive their digital skills as rapidly developing, while teachers are more cautious. It is suggested that this is because staff members consider their skill development in the context of transforming school practice, which requires a broader skill set than student use of one-on-one devices. **Research**: It is suggested to study dissonances between new forms of teaching and learning and traditional assessment structures.

Source: own elaboration.

Methods and Results

The results of empirical research presented in the paper concern the assessment of digital infrastructure on the example of Polish secondary schools and the assessment of students' approach to the development of digitization and its impact on the economy. Data was collected at the turn of 2019-2021 using survey questionnaires.

The survey respondents were secondary school students of all profiles and types of schools (general and technical secondary schools) from the Malopolska region in Poland. The study was conducted during classes for high school students as part of the Malopolska Educational Cloud program, the purpose of which is to popularize remote forms of education. A group of 311 students from different schools located in various regions of Poland was asked to answer the questionnaire. As a consequence 307 valid answers were collected. Age structure of the respondents is presented in the Figure 1.

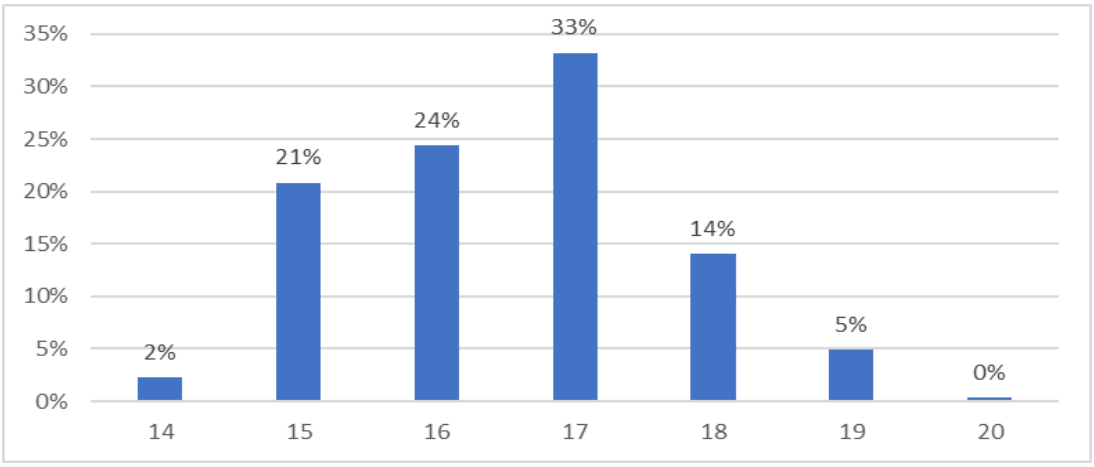

Fig 1. Age structure

Source: own elaboration.

The group of respondents consisted mainly of people between 15 to 18 years old. They represented two types of schools that are typical for Polish students in that age: technical secondary school and general secondary school. The results of the study show that the majority of questioned people was from technical secondary schools (56%) whereas the rest represented general secondary schools. Women make up most of the respondents (62%) and men represent only 38%. It was found that gender structure among respondents was similar in both types of schools (Figure 2).

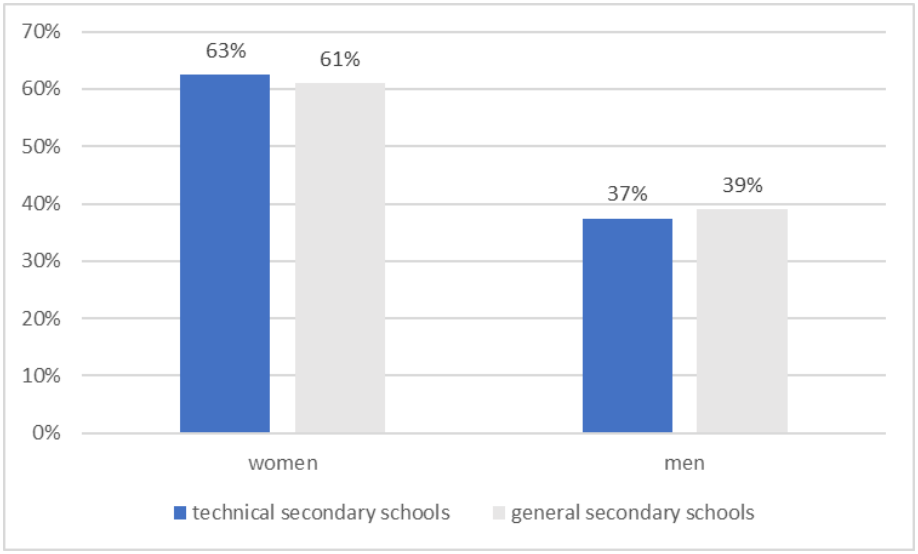

Fig 2. Comparison of gender structure in both types of schools

Source: own elaboration.

In order to evaluate the digital infrastructure (especially computers and Wi-Fi) present in Polish schools students were asked two questions. First of them was about access to computers at schools. The second question was about access to Wi-Fi at school. The answers are presented in the Figure 3.

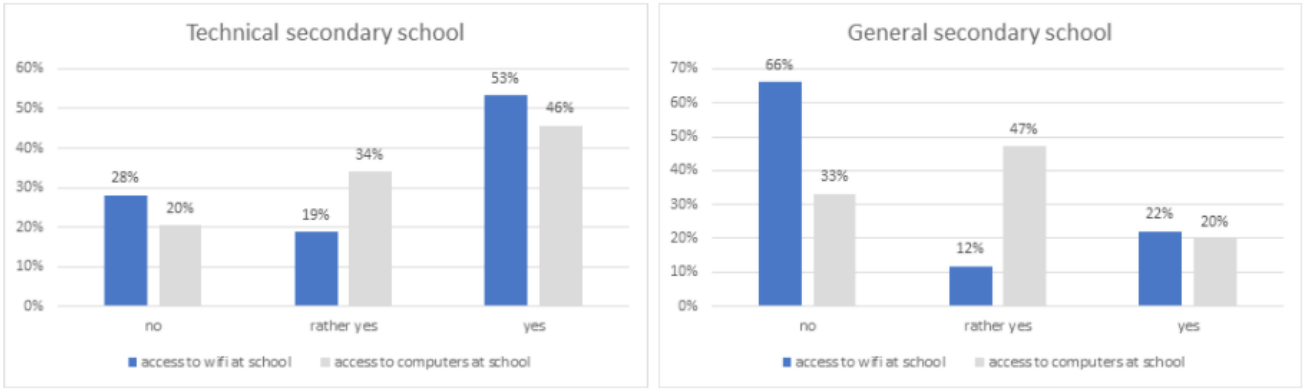

Fig 3. Access to Wi-Fi and computers in both types of schools

Source: own elaboration.

The situation in technical secondary schools is satisfying. The majority of students has access to both Wi-Fi and computers. Only 28 % of people answered that there is no Wi-Fi at school and 25% answered there is no access to computers.

The situation in general secondary schools is different. The majority of people said they have no access to Wi-Fi. Moreover, 33% has no access to computers. There are also many people unsure about their access to the computers which means that this type of equipment may not be used very often by students. Thus, it can be observed a gap between general secondary schools and technical secondary schools.

Conclusions

The digital infrastructure of secondary schools is a very important element of the education and distance learning system. Learning in the conditions of technological development and Revolution 4.0 is a challenge both for students and their parents, but also for schools, teachers and the education system.

An attempt to analyse the literature on the assessment of digital infrastructure in secondary schools has shown that there is still a lot to be explored in this respect. The main conclusions of the research carried out give implications that could support the online education system. However, the authors of the paper emphasize the need to conduct further research in this area and to propose solutions that simplify distance learning for students as an introduction to student and professional life in the conditions of a dynamically changing environment.

As far as RQ1 is concerned, on the example of secondary schools in Poland, it can be confirmed that they are equipped at an average level in terms of digital infrastructure. When it comes to RQ2, it should also be emphasized that technical schools have better facilities than general schools when it comes to access to computers and Wi-Fi.

However, the authors of the paper recommend conducting further research and verification of the level of digital infrastructure in other regions of the country and abroad, in order to propose solutions in the future to improve the conditions of distance learning.

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