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DANKA LUKÁČOVÁ[1], **GABRIEL BÁNESZ**[2]

Teacher Qualifications – an Important Factor in the Subject of Technology

[1] ORCID: 0000-0003-0186-5447, Ph.D., Associate professor, Constantine the Philosopher University in Nitra, Faculty of Education, Department of Technology and Information Technologies, Slovakia
[2] ORCID: 0000-0002-0002-9044, Ph.D., Associate professor, Constantine the Philosopher University in Nitra, Faculty of Education, Department of Technology and Information Technologies, Slovakia

Abstract

The subject of technology in primary schools has not been sufficiently provided with space and material since the reform changes in 2008 and subsequently since the curriculum innovation in 2015. Research by several authors points to this fact. In this article, we investigate the relationship between the views of teachers of the subject of technology on the material and technical equipment of schools for teaching this subject and the qualification of teachers.

Keywords: questionnaire, teacher, technique, qualification, spatial and material-technical equipment

Introduction

There is quite a lot of research that examines the relationship between teacher qualifications and student achievement. For example, Darling-Hammond, Berry, and Thoreson (2001) found a strong relationship between teacher certification and student achievement in their study. Similar conclusions are published by Wayne and Young (2003), who state that there is a relationship between teacher certification and student achievement in mathematics instruction. Clotfelter, Ladd, and Vigdor (2007) report that teacher experience, test scores, and licensing have a positive impact on student outcomes. These effects were most evident for teachers teaching mathematics and reading. Similarly, a longitudinal study by Se Woong Lee and Eunjung Alice Lee found a positive relationship between stu-

dents' highest educational attainment and the cumulative rates of experience, level of education, and expertise of the teachers who taught them.

Fewer studies focus on examining the relationship between teacher qualifications and teachers' views on students' attitudes toward the subject, or the material and technical support of the subject. Among other things, a quality technology teacher is expected to use not only a sufficient amount of traditional tools and technical consumables in teaching but also a wide range of modern 3D teaching aids (Pavelka, 2018; Pavelka, Plachá, 2018). However, if the teacher is not qualified, they may not even have the necessary material resources at their disposal. The qualification of technology teachers in Slovakia was studied by Hašková (2016) and Hašková and Bánesz (2015), who found that in the sample of 509 elementary schools from regions across Slovakia, the teaching of technology was covered by qualified teachers at a level of 39% of the total number of schools.

Aim and methodology of the research

The aim of the research was to determine the opinions of technology teachers on the material, technical, and spatial support for teaching the subject of technology in elementary schools and students' attitudes toward this subject.

In line with our research objective, we formulated the following hypotheses:

H1: Opinions on the material, technical, and spatial equipment for teaching technology differ between teachers who are professionally qualified to teach it and those who are not.

H2: Opinions on students' attitudes toward the subject of technology differ between teachers who are professionally qualified to teach it and those who are not.

The questionnaire for teachers contained 13 items: five identification items aimed at determining gender, age, length of teaching experience, professional qualification, and the number of years respondents have taught the subject of technology. Another six items were closed-ended. In the sixth item, respondents could choose between yes/no answers, and for items seven to eleven, they could select from scaled responses: slightly agree, agree, slightly disagree, disagree. The last, 12th item of the questionnaire, was open-ended and supplemented item 11.

The questionnaires were distributed to all technology teachers in the Nitra region through the Regional School Administration Office and the Diocesan Office in Nitra. The collected data were evaluated using MS Excel. The data were processed using standard mathematical-statistical methods. Descriptive statistics were used for analyzing the questionnaire items, with absolute and relative frequencies of individual responses. The hypotheses were tested using statistical tests. The output data were statistically verified using the Mann-Whitney U test. The Mann-Whitney U test is used when testing the difference between two independent groups of a continuous variable (Borůvková, Horáčková, Hanáček, 2014). In this test, we test the null hypothesis, which states that

the two samples from which the selections are made have the same median value. If the value of the test statistic is greater than the critical value, the null hypothesis is rejected. In conducting the test using a statistical program, the rejection of the null hypothesis depends on the p-value. If the p-value is less than the set significance level of 0.05, the null hypothesis is rejected.

Research results

The research involved 63.10% women and 36.90% men. The gender of respondents was not considered during the selection process; however, as we can see, women teach the subject of technology in elementary schools more often than men.

Approximately one-third of technology teachers participating in our research were aged 31–42, while less than one-third (29.2%) were aged 42–55, and 26.20% were aged 56-65. The smallest group of respondents (12.30%) was under 30 years of age or exactly 30.

An interesting finding is that approximately the same number of respondents (almost a quarter) have been teaching for either more than 25 years (26.15%) or less than 5 years (24.62%). Around 16.92% of respondents reported a total teaching experience of 6–10 years, and 15.38% had 21–25 years of experience. The duration of working as a teacher for 16–20 years was reported by 9.23% of technology teachers, while 7.69% had been teaching for 11–15 years. Based on this, we can conclude that although experience in teaching this subject is essential, in our opinion, new employees in schools can bring fresh ideas and suggestions for the subject.

More than half of technology teachers in the Nitra region do not have the professional qualification to teach the subject. Only 49.20% of teachers are qualified to teach technology, which likely affects the quality of the teaching process.

We also examined how many years the surveyed teachers have been teaching technology. More than half of the respondents have been teaching the subject for less than five years. Approximately 20% of respondents have taught technology in elementary schools for 6–10 years. The same proportion of respondents – 9.23% – have been teaching the subject for 11–15 years and more than 25 years. Approximately 5% (4.62%) have been teaching technology for 16–20 years, and the smallest group of respondents (3.08%) has been teaching the subject for 21–25 years. From this, we can infer that while technology teachers in elementary schools in the Nitra region have generally been teaching for a long time, only a small portion of them have extensive experience specifically with the subject of technology, which may be related to a lack of expertise in teaching. More than 70% of respondents have been teaching this subject for less than 11 years.

In the 6th item of the questionnaire, we asked whether "The school has spatial equipment for teaching the subject of technology (workshops, school grounds, practice kitchen)."

The majority of respondents, 78.5%, agreed that their school has the necessary spatial equipment for teaching technology, including workshops, school grounds, and a practice kitchen. A total of 13.80% agreed to a lesser extent, and 6.20% slightly disagreed. Only 1.50% of respondents completely disagreed with the statement. Based on this, it can be concluded that most of the elementary schools surveyed in the Nitra region have good spatial facilities for teaching the subject of technology.

Next, respondents were asked to express their opinion on the statement: "The spatial and material-technical equipment of the school allows me to teach the subject of technology in accordance with the State Educational Program (SEP) and the School Educational Program (SchEP) (hour allocation and educational standards)". According to 61.50% of respondents, the level of spatial and material-technical equipment in their school allows them to meet the educational standards in accordance with the SEP and SchEP. Less agreement with this opinion was expressed by 26.20% of respondents, while 10.80% slightly disagreed, and 1.50% disagreed with this statement. From these results, it follows that approximately 13% of elementary schools, according to the opinion of technology teachers, do not have sufficient material and spatial equipment to meet the educational standards of the technology subject, which negatively impacts students' acquisition of practical skills.

The eighth item of the questionnaire investigated respondents' opinions on whether students have the opportunity to develop their work skills through independent work. Almost three-quarters of respondents (72.30%) answered that, in their opinion, students have the opportunity to develop work skills through independent work. Less agreement with this opinion was expressed by 18% of technology teachers. Slightly disagreeing with the idea that students have the opportunity to develop work skills through independent work were 7.70% of technology teachers in elementary schools in the Nitra region, while 1.50% disagreed entirely, which aligns with the negative responses given by teachers to the previous two items concerning school equipment. According to the majority of technology teachers, students do have the opportunity to develop their work skills through independent work.

The ninth item of the questionnaire sought teachers' opinions on whether students are interested in learning the subject of technology. More than half of the respondents (50.80%) answered that, in their opinion, students show interest in learning technology. Less agreement with this view was expressed by 38.5% of teachers, while 9.20% slightly disagreed with the statement that students are interested in learning technology, and only 1.50% of technology teachers disagreed.

Item 10 of the questionnaire asked whether today's students are skilled in using hand tools, according to the teachers' opinions. Only 13.8% of respondents agreed with this statement, 50.80% agreed to a lesser extent, and 23.10% slightly disagreed

with the idea that today's students are skilled in using hand tools, while as many as 12.30% of respondents disagreed that students are skilled in using tools.

In item 11, we wanted to gather teachers' opinions on whether the subject of technology influences students' career choices. Nearly half of the teachers believe that the subject of technology influences students' choice of future profession. Approximately one-third of respondents somewhat agreed that this subject affects students' career choices. 12.30% of respondents slightly disagreed with the influence of the subject of technology on students' career choices, while 7.70% of technology teachers in elementary schools disagreed entirely with this statement. These results suggest that most respondents believe that this subject influences students when choosing their future careers.

We supplemented this item with item 12, in which respondents could explain their previous opinions in their own words. Nine respondents did not use this opportunity, and 18 respondents said they could not express an opinion on the issue. The other responses were categorized based on which statement they were explaining.

Reasons supporting the statement that the subject of technology influences students' career choices:

– it depends on the technical proficiency of the student (7 respondents),
– through this subject, students acquire technical skills, learn to cook, work with finances, etc., and develop an interest in technical skills (7).
– an enthusiastic teacher can influence a student (1).

Reasons supporting the statement that the subject of technology does not influence students' career choices:

– students are not interested in manual work (12),
– teaching the subject of technology requires material-technical and spatial equipment that not all schools have (3),
– other factors have a greater influence on students' decisions – parents, the internet (3),
– limited scope of technology education (2),
– unqualified teacher (1),
– not every topic covered in the subject affects students' future career choices (1) (Štetková, 2023).

Verification of Hypothesis H1

Table 1 presents how teachers' views on the material-technical and spatial equipment for teaching the subject of technology are influenced by their professional qualifications. Nearly 34% of teachers with professional qualifications for teaching technology agreed that elementary schools in the Nitra region are adequately equipped for teaching technology, while for teachers without professional qualifications, this share was 28%. Less agreement with this opinion was expressed by 17% of respondents without professional qualifications and 9% of respondents with professional qualifications.

Table 1. Teachers' Views on the Material-Technical Equipment for the Subject of Technology

	The school has the spatial facilities for teaching the subject of technology (workshops, school grounds, practice kitchen).				
	I somewhat disagree	I somewhat agree	I do not agree with the statement	I agree	Total
qualified	6.15%	9.23%	0%	33.85%	49.23%
unqualified	4.62%	16.92%	1.54%	27.69%	50.77%
Total	10.77%	26.15%	1.54%	61.54%	100%

We tested the null hypothesis: The views on the material-technical and spatial equipment for teaching the subject of technology do not differ between teachers who have the professional qualifications to teach it and those who do not.

Table 2. Mann Whitney U-test for H1 hypothesis

Mann-Whitney U	471.000
Wilcoxon W	1032.000
Z	–.865
p	.387

For the possible rejection of the null hypothesis, the size of the p-value, which is shown in Table 3 under the row "Asymp. Sig. (2-tailed)," is decisive. In our case, the p-value is greater than 0.05 (p=0.387), so we do not reject the null hypothesis: "The views on material-technical and spatial equipment for teaching the subject of technology are the same for teachers who have the professional qualifications to teach it and those who do not." In practice, this means that the difference between the views on material-technical and spatial equipment for teaching the subject of technology between teachers who are qualified to teach it and those who are not is not statistically significant.

Verification of Hypothesis H2

In Table 3, we present how teachers' professional qualifications influence their views on students' attitudes towards the subject of technology.

Table 3. Teachers' opinions on students' attitudes towards the subject of technology

	Students are interested in learning in the subject of technology.				
	I somewhat disagree	I somewhat agree	I do not agree with the statement	I agree	Total
qualified	1.54%	15.38%	0.00%	32.31%	49.23%
unqualified	7.69%	23.08%	1.54%	18.46%	50.77%
Total	9.23%	38.46%	1.54%	50.77 %	100%

We tested the null hypothesis: The opinions on students' attitudes towards the subject of technology do not differ between teachers who have the professional qualification to teach it and those who do not.

Table 4. Mann Whitney U-test for H2 hypothesis

Mann-Whitney U	361.500
Wilcoxon W	922.500
Z	–2.425
p	.015

As we can see, the p-value is less than 0.05, specifically 0.015. This indicates that the difference in opinions regarding students' attitudes towards the subject of technology between teachers who have the professional qualification to teach it and those who do not is statistically significant.

Discussion and conclusion

We found that most technology teachers in the Nitra region do not have professional qualifications to teach the subject; however, the differences were minimal, as nearly 50% of teachers are qualified to teach it. In our opinion, this fact also affects students' interest in the subject of technology. According to the technology teachers, elementary schools in the Nitra region have adequate spatial and material-technical equipment for teaching technology. They also believe that students are interested in the subject, and, according to most respondents, it also influences their choice of future career. However, as reported by the teachers, students are not very skilled in using hand tools.

Although the technology teachers did not indicate that students have significant problems performing practical activities, they did respond that working with hand tools is not entirely easy for them. We found that there is no statistically significant difference between the opinions of teachers who are qualified to teach technology and those who are not regarding material-technical and spatial equipment for teaching the subject. On the other hand, the difference in opinions on students' attitudes towards the subject between qualified and non-qualified teachers is statistically significant. Teachers who are qualified to teach technology are more optimistic in believing that students are interested in the subject. We think these two attributes are interconnected. A qualified teacher is enthusiastic about the subject of technology, which can be reflected in their students' interest in technology. Conversely, if a student is interested in technology, a qualified teacher will further support that interest.

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