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# Virtual Reality in the Context of Opinions and Preparation of Teachers for Its Use in the Educational Process. A Large-Scale Survey

*Kamila Majewska*

**CONTACT:** *Kamila Majewska, PhD, Faculty of Philosophy and Social Sciences, Nicolaus Copernicus University in Toruń, Toruń, Poland, E-mail:* majewska@umk.pl

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**Abstract:**

Virtual reality (VR) is an interesting teaching tool that is increasingly being incorporated into the educational process. Thanks to VR goggles equipped with appropriate sensors and software, it is possible to support the educational process to various extents and at various levels. Of course, in order to achieve the expected results, it is important to properly prepare the teacher – the leader of the educational process. In the context of working with VR goggles, both knowledge and skills in using the new technology are important.

At present, little is known about preparing teachers to work with VR technology. As a result, it was decided to conduct mixed research (qualitative and quantitative), verifying the level of knowledge and preparation of teachers to use VR technology in the educational process. As part of the procedure, teachers' opinions on the possibilities of the educational use of virtual reality were also verified. The research was carried out using a survey sent to randomly selected schools. As a result, the research covered 870 teachers working in both primary and secondary schools. During the research, depending on the analysed values, the following were determined: mean, mode, median, Spearman's rho correlation, and Cramer's V correlation were used. The collected data have shown that teachers' opinions on virtual reality are correlated with their age, gender, and the subject taught.

Regarding the preparation of teachers to use VR goggles during education, it should be noted that approximately 74% of them have very low or low knowledge in this area. 18% of teachers have average knowledge of VR goggles, dedicated software, as well as the possibilities and principles of their use in the VR virtual space. On the basis of the collected data, it can be concluded that only 8% of teachers are adequately prepared to teach classes using VR goggles, and their knowledge in this area is at a good or very good level.

## Introduction

Research analyses have shown that teachers' willingness to incorporate VR goggles into the teaching process is usually the result of several factors. Important are: the attitude of teachers (Ismail et al. 2010; Majewska 2018), educational strategies used by them (Ertmer & Glazewski 2015), access to educational resources dedicated to VR (Majewska 2018). The research conducted in 2017 and 2019 showed that – "the sensory preferences of teachers determine significantly the choice of computer teaching tools used in the teaching process" (Majewska 2020a, pp. 177-178).

As a result, we can expect that VR goggles will be a particularly valuable teaching tool in the context of visual and kinaesthetic learners, as well as teachers with a mixed sensory style (where one of the senses is the sense of sight). After some thought, this correlation is quite intuitive, because we are more likely to reach for solutions that are tailored to our experiences and needs. Thirdly, when considering the factors favouring the use of VR goggles in the educational process, it should be emphasized that the teaching approaches and

strategies used by teachers play a significant role in this context (Ertmer & Glazewski, 2015). Research by Lori Wozney, Vivek Venkatesh, and Philip Abrami found that teachers who favoured student-centred approaches were more likely to report using new technologies, as well as using them in more sophisticated ways (Wozney et al., 2006).

The literature on the subject emphasizes that the valuable is also a sense of security is important, including both technical and training support.

96.66% teachers emphasize that if they were to use VR goggles, they would feel safer if they could take part in a training session where they would learn: the principles of operation of the device, the principles of working with the device, and virtual databases that can be used during classes (Majewska 2021, p. 433).

Many teachers do not know how to integrate new technologies into the course of the subject they teach (Hu & Garimella 2014, Siemieniecka 2021). Especially since many teachers (including some young people, the so-called digital natives), are efficient at using new technologies in the context of entertainment and free time, but less so in the case of professional work (Majewska 2020). All the more so because the knowledge and skills acquired during studies quickly become outdated and significantly different from the realities of life. This was also pointed out by Zhanat Alma Burch and Shereeza Mohammed (2019). In one of the articles they noted that emerging technologies would always create a new kind of digital gap in the education system, especially since some young people, the so-called digital natives, are efficient at using new technologies in the context of entertainment and free time, but less so in the case of professional work (Majewska, 2020a). Meanwhile, as shown by a study conducted at the level of academic education "inadequate preparation for working with VR goggles (inadequate training of users, failure to set an action plan, or inappropriate time control) may result in the inability to achieve the intended educational goal" (Majewska, 2023, p. 68). Very often in available interviews or surveys, teachers indicate that it is important for them to secure educational resources dedicated to VR goggles that enable the implementation of classes, especially since a large group of teachers identify in their work with the role of a digital consumer, not a digital creator (Majewska, 2019). To sum up, it is worth mentioning that direct and unhindered access to VR goggles also plays a significant role in the context of using them.

## Teachers' opinions on VR goggles

The research conducted in 2020-2021 shows that the knowledge of Polish primary school teachers about the possibilities of using VR goggles in the educational process is incomplete. Most of them do not own the equipment and associate this tool mainly with entertainment. Statistical data collected in the aforementioned group show that approximately 70% of early school education teachers are unable to assess the benefits and risks resulting from the use of VR goggles in the educational process, or do not feel the internal need to use them when working with students aged 7-10. The reasons for this decision mentioned by teachers included: lack of sufficient knowledge and skills, lack of time during classes, fear of chaos related to the use of new technologies in a group of 20-25 people, and general negative attitude towards new media (Majewska 2021, p. 432). Analyses made by Iuliia Sergeevna Khukalenko**,** Regina Kaplan-Rakowski, Yunjo An, and Vera Dmitrievna Iushina also confirmed that teachers "had moderately positive perceptions of VR use in teaching and learning" (2022, p. 11605). The survey conducted with teachers to assess statements regarding VR (on a scale from 1 to 6, where 1 meant strongly disagree and 6 – strongly agree) showed for example, that VR goggles:

— are a tool suitable for students with different abilities (M = 4.32, SD = 0.90), taking into account their individual characteristics (M = 4.21, SD = 0.89),
— motivate students to become more involved (M = 4.31, SD = 0.94),
— improve students' assimilation of basic concepts and ideas (M = 4.20, SD = 0.89),
— in order to improve educational outcomes, they require the involvement of teachers, e.g. participation in the selection and implementation of VR technologies (M = 4.38, SD = 0.87),
— are effective provided that they are used by properly trained teachers (M = 4.61, SD = 0.99), that extensive technical resources are available (M = 4.40, SD = 0.94), and that the equipment itself is regularly maintained by IT staff (M = 4.57, SD = 1.00),
— do not require additional time to plan educational activities (M = 4.38, SD = 0.95) (Ibidem p. 11599).

It is worth emphasizing that even the negative attitude of teachers towards the use of VR goggles in the educational process may change. The research conducted by Kamila Majewska shows that the opportunity to experience working with VR goggles plays a huge role in this context. As a result, it is extremely valuable to analyse the students' actions, activities, and emotions revealed during the use of the equipment, i.e. to experience real classes with VR goggles as an observer (without worrying about the way the classes are conducted, the teaching materials, lack of experience, etc.). After participating in the classes, teachers changed their minds about their technical preparation and willingness to use VR goggles for educational purposes in their daily work. This was "because of the students who were having a great time and were learning at the same time. They just lived through it all" (Majewska 2021, p. 423). Additionally, taking part in virtual classes made teachers aware that "using goggles is not difficult" (Ibidem), and "VR goggles could help clarify a number of issues" (Ibidem). In the case of the surveyed teachers, it also turned out that an important argument for accepting the tool was the fact that "virtual presentations are very interesting and make possible both individual and group work" (Ibidem, p. 433), as well as "activate all students" (Ibidem p. 432) – which is not easy in the traditional course of education.

## VR goggles in teachers' work, statistical data

„The global virtual reality in education market size was valued at USD 14.55 billion in 2023. The market is projected to grow from USD 17.18 billion in 2024 to USD 65.55 billion by 2032" (Business Insights, 2025). The cited data and forecasts regarding the educational aspect of the development of the VR market show that year by year, teachers' and students' access to VR goggles will become increasingly easier.

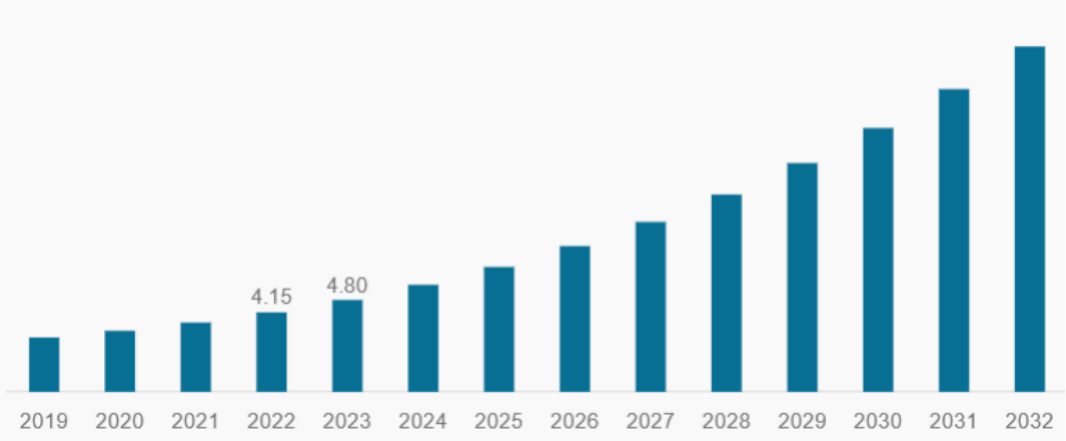


**Chart 1.** North America Virtual Reality in Education Market Size, 2019-2032 (USD Billion)

*Source: Business Insights. Hardware & Software IT Services. Virtual Reality in Education Market. https://www.fortunebusinessinsights.com/industry-reports/virtual-reality-in-education-market-101696.*

Of course, access to equipment alone does not guarantee its high quality use in the educational process. The research carried out in 2020 showed that „most of the participants (71.7%) were at the first three levels in terms of VR technology integration (awareness, learning, and understanding)" (Sergeevna Khukalenko et al., 2022, p. 11605). Teachers emphasized that they were aware of the existence of technology, but did not use it. Sometimes they get anxious or even avoid them at the thought of using VR goggles. Some of them try to learn the basics of working with VR, but sometimes they feel frustrated with using the technology. Additionally, teachers complain about a lack of confidence when using the equipment. Among teachers, we can also distinguish a third group – those who are beginning to understand the point of using VR goggles and are able to plan tasks in which they can be useful. It must be clearly emphasized that currently „less than 30% of the participants felt comfortable with the VR technology and could use it as an instructional tool in the classroom" (Ibidem, p. 11606). Analyses carried out among Polish early school education teachers in 2020-2021 showed that knowledge of virtual reality in this group is rather theoretical.

76.66% of respondents saw work with VR goggles on the Internet (on Facebook, on YouTube, in advertising); 3.33% of teachers read about virtual reality in the specialist press; 6.66% of teachers saw VR goggles at their friends' houses, and 13.33% had the opportunity to test the equipment in a games room, in a shop, during a conference, etc. None of the teachers surveyed owned VR goggles (Majewska, 2021, p. 430).

As a result, on average every fifth primary school teacher had real contact with VR goggles. Another study conducted among 129 teachers from schools of various levels showed that 27.1% of them had access to VR goggles in the facility. "Interestingly, the results make it possible to conclude that there is a group of teachers who use VR at least once a month (4.7%), every 1-2 weeks (5.4%), or even every few days (7%)" (Ignaciuk, 2022, p. 78).

Generally, teachers see the greatest opportunities for using VR goggles at school in the activities of science clubs. These devices are also recommended for teaching natural sciences, foreign languages, or pure sciences. VR goggles are less frequently assessed as an effective or very effective support in the context of teaching humanities or sports subjects (Ibidem, p. 87). The popularity of VR goggles among teachers is still limited by their price, lack of internal conviction in the innovative form of work, attachment to traditional activities, as well as insufficient motivation to use them in the educational process (Majewska, 2021, p. 431).

## Material and methods

The presented research was conducted in the first quarter of 2024 and was of diagnostic nature (Konarzewski 2020). The main objective was to verify:

— teachers' level of knowledge about VR goggles, dedicated software, and the possibilities and principles of their use in the educational process,
— teachers' opinions on virtual reality and preparation for its use in the educational process,
— the existence of a correlation between teachers' opinions on the use of VR goggles in the educational process and their age, gender, or subject taught.

The research was of a mixed nature (quantitative and qualitative). The source of data that served as the basis for comprehensive analyses was a knowledge test and a mixed survey – containing both open-ended and closed-ended questions. Research tools were standardized and normalized during the planning and development phases of the research procedure. The knowledge test consisted of 10 questions enabling verification of knowledge about virtual reality hardware, software, as well as the possibilities and principles of using VR goggles in the educational process. The survey contained 10 closed-ended questions and 5 open-ended questions on the following topics: teachers' preparation for using VR goggles, willingness to work with them, the justification for their use, as well as the benefits and possible risks associated with the use of the equipment.

The research covered a group of 870 Polish teachers working at various levels of education (in primary and secondary schools). The selection of people for the research was random. When designing the study, a sample size calculator determined that the minimum required sample was 384 participants. This figure was derived based on the total number of teachers employed in schools in 2023, assuming a 5% margin of error, 95% confidence level, and a population proportion of 0.5. A total of 96 schools took part in the study (with at least four teachers per school expected to participate). Proportional sampling was used, accounting for both province (including all 16 voivodeships) and school location (rural vs. urban) (Portal dla Edukacji, 2023; Gov.pl, 2024). A list of schools was prepared, and randomly selected teachers were invited to complete both a questionnaire and a test. In most cases, schools assisted in reaching study participants. In total, 1412 teachers received the Google Forms link, and 870 returned fully completed responses.

All participants gave their informed consent prior to their inclusion in the study, which was performed in accordance with the ethical standards and approved by the Faculty of Philosophy and Social Science of the Nicolaus Copernicus University in Toruń.

As a consequence, the following research questions were formulated:

1. What is the level of knowledge of teachers about VR goggles and the educational software dedicated to them?
2. What is the level of teachers' knowledge about the possibilities and principles of using VR goggles in the educational process?
3. How do teachers assess their preparation for using VR goggles in the educational process?

4. What do teachers think about the use of virtual reality (VR) in the educational process?
5. Is there a correlation between teachers' age and their opinion on the use of virtual reality (VR) in the educational process?
6. Is there a correlation between teachers' gender and their opinion on the use of virtual reality (VR) in the educational process?
7. Is there a correlation between the subject taught and teachers' opinions on the use of virtual reality (VR) in the educational process?

During the research, depending on the analysed values, the following were determined: mean, mode, Spearman's rho and Cramer's V correlations were used. The obtained values were interpreted using the Stanisz scale.

## Results and analysis

A detailed analysis of the research sample showed that the largest subgroup in the study was composed of women aged 51 to 60, teaching humanities subjects.

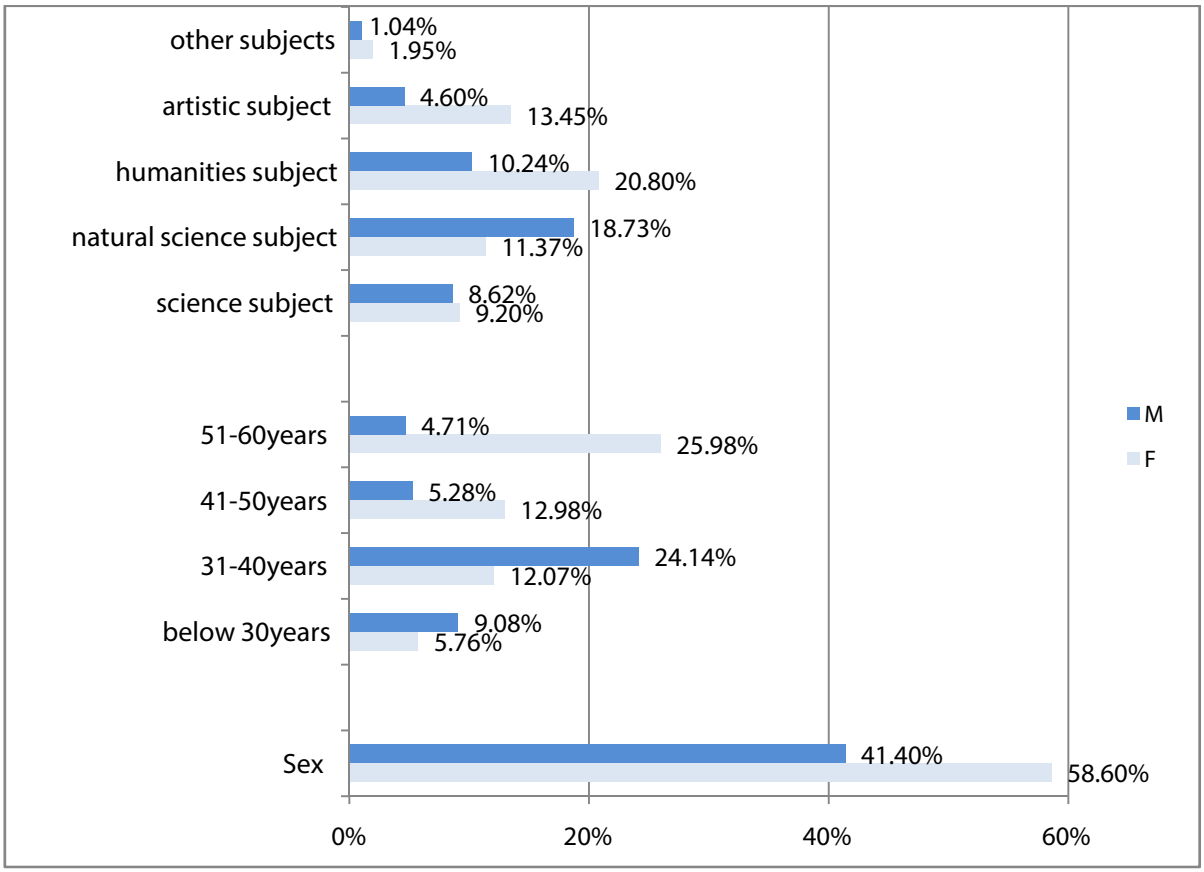


**Chart 2.** *Characteristics of the research group*

*Source: Own development.*

The collected data showed that most teachers have a low level of knowledge about VR goggles and the educational software dedicated to them (D = 2, SD = 0.97), as well as about the possibilities and principles of using virtual reality in the educational process (D = 2, SD = 0.98). It is worth emphasizing that the average level of teachers' knowledge about VR goggles and educational software was M = 2.14 (on a scale from 1 to 5). What is important is that 24.70% of teachers had a very low level of knowledge, 49.20% had a low level of knowledge, 18.05% – an average level of knowledge, 3.8% – a high level of knowledge, and 4.25% had a very high level of knowledge about VR goggles and the educational software dedicated to them. As the tests showed, a similar distribution was observed for the values presenting the average level of teachers' knowledge about the possibilities and principles of using VR technology in the educational process M = 2.13 (on a scale from 1 to 5). Case in point: 25.50% of teachers had a very low level of knowledge, 48.15% had a low level of knowledge, 18.28% – an average

level of knowledge, 3.8% – a high level of knowledge, and 4.25% had a very high level of knowledge about the possibilities and principles of using VR goggles in the educational process. Cramer's V correlation showed that there is an average relationship between gender and teachers' knowledge about:

— VR goggles and educational software dedicated to them $V = 0.380$; $p < 0.05$,
— the possibilities and principles of using VR goggles in the educational process $V = 0.364$; $p < 0.05$.

**Table 1.** Cross-tabulation of gender * teacher knowledge

| | **gender * teachers' knowledge of VR goggles and the educational software dedicated to them** | | | **gender * teachers' knowledge of the possibilities and principles of using VR goggles in the educational process** | | |
|---|---|---|---|---|---|---|
| | **Sex** | | **Total** | **Sex** | | **Total** |
| level of knowledge | **M** | **F** | | **M** | **F** | |
| 1 | 40 | 175 | 215 | 47 | 175 | 222 |
| 2 | 189 | 239 | 428 | 183 | 236 | 419 |
| 3 | 83 | 74 | 157 | 82 | 77 | 159 |
| 4 | 31 | 2 | 33 | 31 | 2 | 33 |
| 5 | 33 | 4 | 37 | 33 | 4 | 37 |
| Total | 376 | 494 | 870 | 376 | 494 | 870 |

*Source: Own development.*

It is worth emphasizing that among the research group, high and very high levels of knowledge in the broadly understood field of work with VR goggles were mainly characterized by men (Tab.1). Data analysis also showed that mainly teachers of natural sciences and humanities had a high and very high level of knowledge about VR goggles and educational software dedicated to them, as well as about the possibilities and principles of using VR goggles in the educational process (Tab. 2). This may be owing to the greater number of training courses, educational videos available online, and ready-made VR educational materials dedicated to these subjects (developed in Polish).

**Table 2.** Cross-tabulation of teaching subject * teacher knowledge

| | **subject taught * teachers' knowledge of VR goggles and the educational software dedicated to them** | | | | | | **subject taught * teachers' knowledge of the possibilities and principles of using VR goggles in the educational process** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **subject taught** | | | | | **Total** | **subject taught** | | | | | **Total** |
| **level of knowledge** | **scientific** | **natural scientific** | **humanities** | **artistic** | **other** | | **scientific** | **natural scientific** | **humanities** | **artistic** | **other** | |
| 1 | 36 | 53 | 27 | 74 | 25 | 215 | 43 | 53 | 27 | 74 | 25 | 222 |
| 2 | 117 | 109 | 127 | 75 | 0 | 428 | 103 | 114 | 127 | 75 | 0 | 419 |
| 3 | 2 | 62 | 84 | 8 | 1 | 157 | 9 | 57 | 84 | 8 | 1 | 159 |
| 4 | 0 | 18 | 15 | 0 | 0 | 33 | 0 | 18 | 15 | 0 | 0 | 33 |
| 5 | 0 | 20 | 17 | 0 | 0 | 37 | 0 | 20 | 17 | 0 | 0 | 37 |
| Total | 155 | 262 | 270 | 157 | 26 | 870 | 155 | 262 | 270 | 157 | 26 | 870 |

*Source: Own development.*

The analysis of the relationship between teachers' knowledge of VR and their age, performed using Spearman's rho correlation, showed that there is a weak negative correlation between teachers' age and their knowledge of:

— VR goggles and educational software dedicated to them $r_S = -0.246$; $p < 0.05$,
— the possibilities and principles of using VR goggles in the educational process $r_S = -0.221$; $p < 0.05$.

As a result, it should be emphasized that the older the teachers, the lower their knowledge about VR goggles, the software dedicated to them, and the possibilities and principles of their use. In the course of the research it was noted that there was an almost certain correlation $r_S = 0.976$; $p < 0.05$ between knowledge about VR goggles and educational software dedicated to them, as well as knowledge about the possibilities and principles of using VR in the educational process. Teachers who had high and very high knowledge about the broadly understood work with VR goggles indicated that: they participated in training in the field of working with VR (12.86%), they acquired their knowledge as part of conferences dedicated to teaching (32.86%), they participated in a VR demonstration lesson as part of their subject (14.29%), and they followed social media channels dedicated to modern education (41.43%). None of the teachers acquired the competences required to work with VR goggles as part of academic education. Generally, in the group of teachers with good and very good knowledge of the broadly understood work with VR goggles, 32.86% of them were able to give the name(s) of applications that may be helpful in subject-related education in the field of their interests. 14.29% of teachers were able to indicate the sources of scenarios for classes with VR goggles. 18.57% of respondents were able to discuss the methods and principles of work using VR goggles. The benefits and risks of using VR goggles turned out to be known to 70% of them. Regarding topics and areas within the subject taught where it is worth using VR goggles – 41.43% of respondents commented.

It is worth noting that regardless of gender, age, or subject taught, teachers rate their preparation for working with VR higher than their actual level of knowledge might indicate. The analyses found that teachers usually assess their preparation for working with VR goggles as average M = 3.19, D = 3, SD = 0.95. The collected data shows that: 24.83% of teachers assessed their preparation for using VR goggles in the educational process as poor, 43.44% as average, 19.43% as good, and 12.30% as very good. None of the surveyed teachers assessed their preparation for working with VR goggles as very poor. The analyses performed prove that there is a very high correlation between the individual assessment of their preparation for working with the VR space and the actual knowledge of:

— VR goggles and educational software dedicated to them $r_S = 0.719$; $p < 0.05$,
— the possibilities and principles of using VR goggles in the educational process $r_S = 0.733$; $p < 0.05$.

Regarding the opinions on the use of virtual reality (VR) in the educational process, it is worth emphasizing that the majority of teachers (55.06%) have a positive opinion on the use of VR in the educational process D = 4, SD = 1.16. Data collected from the survey have shown that: 39.66% of respondents had a positive, and 15.40% had a very positive attitude towards the use of VR goggles in the educational process. On average, 23.79% described their opinion on the use of VR goggles in the educational process as neutral. On average, every fifth surveyed teacher (21.15%) had a negative and very negative attitude towards the use of VR goggles in the classroom.

Teachers indicate that their positive attitude towards virtual reality usually results from:

— current knowledge about VR technology and no fear of using it
„I know the benefits that can be gained from using VR goggles" (n121), „I am not afraid of novelties, it is always an interesting experience" (n199), „VR experiences can increase the effectiveness of the educational process" (n109), „learning with VR goggles arouses positive emotions in students" (n209),
— the desire to provide interesting and valuable activities for students
„young people have a positive attitude towards VR goggles" (n231), „I feel pleasure when I see that students are satisfied, in my opinion this is the only reason why it is worth changing something in education" (n277), „I am happy about the opportunity to organize interesting and modern classes" (n334), „working with VR goggles is interesting for students" (n76),
— awareness of the benefits of using VR goggles
„thanks to goggles and virtual presentations we can get to know interesting places" (n346), „for me, in the context of VR, the possibilities of presenting places and things that are inaccessible to students within the

walls of school are important" (n425), „I justify my assessment with the belief in the beneficial effect of VR goggles on teaching results" (n569).

Negative opinions, as emphasized by teachers, were mainly related to:

— a sense of uncertainty and lack of experience in working with the equipment
„I would have to complete training in this field" (n89), „I don't know how to work with VR goggles" (n779), „I don't have a good head for technology, and operating this equipment is quite difficult" (n731),
— no need to work with VR
"what would I do with VR goggles in PE" (n212), "technology is not needed for religious education" (n713), "I don't see the possibility of using VR goggles during my lesson. High school mathematics has such a tight schedule that I don't have time for this type of entertainment" (n466),
— attachment to traditional forms of education
„for years I have been telling students what to pay attention to, and I write down the most important things on the board, how to do it with goggles..." (n645),
— concerns about costs
„to use goggles I would have to complete training, which is another cost that I have to cover from my own pocket" (n727), „working with VR goggles requires expensive software" (n88),
— concerns about health complications resulting from the use of goggles
„VR goggles cause headaches and nausea" (n21).

In order to answer the question about the relationship between teachers' age and their opinion on the use of virtual reality (VR) in the educational process, Spearman's rho correlation was used. The analysis performed showed that there is an average correlation between the age of teachers and their opinion on the use of virtual reality (VR) in the educational process $r_S = -0.360$; $p < 0.05$. The older the teachers, the more negative are their opinions about the use of VR goggles in the educational process.

**Table 3.** Cross-tabulation of age * teacher opinion

| | age * teachers' opinion on the use of virtual reality (VR) in the educational process | | | | |
|---|---|---|---|---|---|
| | teachers' age | | | | Total |
| opinion on a scale of 1 to 5 | under 30 years of age | 31-40 years | 41-50 years | 51-60 years | |
| 1 | 1 | 1 | 0 | 79 | 80 |
| 2 | 1 | 1 | 19 | 82 | 103 |
| 3 | 120 | 11 | 54 | 22 | 207 |
| 4 | 6 | 175 | 83 | 81 | 345 |
| 5 | 1 | 127 | 3 | 3 | 134 |
| Total | 129 | 315 | 159 | 267 | 870 |

*Source: Own development.*

Interestingly, in the group of the youngest teachers, under 30 years of age, the opinion on the use of virtual reality (VR) in the educational process was mostly (93.02%) neutral. Among the respondents, teachers aged 31-40 were particularly positive about the use of VR goggles in the educational process. On the one hand, they already have experience in working with students, but on the other hand, they are still educationally active and show a willingness to continue their education and expand their work. In this group, it was noted that 55.56% of the respondents expressed a positive and 40.32% a very positive opinion on the use of virtual reality in the educational process. Only 0.63% of respondents expressed a negative or very negative opinion on the use of VR in the educational process, while 1.26% of people aged 31 to 40 expressed a neutral opinion. In the group of 41-50 year-olds, 11.95% of respondents had a negative or very negative opinion on the use of virtual reality in the educational process, while in the group of 51-60 year-olds – 18.51% of teachers.

In order to answer the question about the relationship between teachers' gender and their opinion on the use of virtual reality (VR) in the educational process, V Cramer's correlation was used. The analysis performed

showed that there is an average correlation between the gender of teachers and their opinion on the use of virtual reality (VR) in the educational process V = 0.595; p < 0.05. It was noticed that men expressed more positive opinions about the use of VR goggles in the educational process than women (Chart 3).

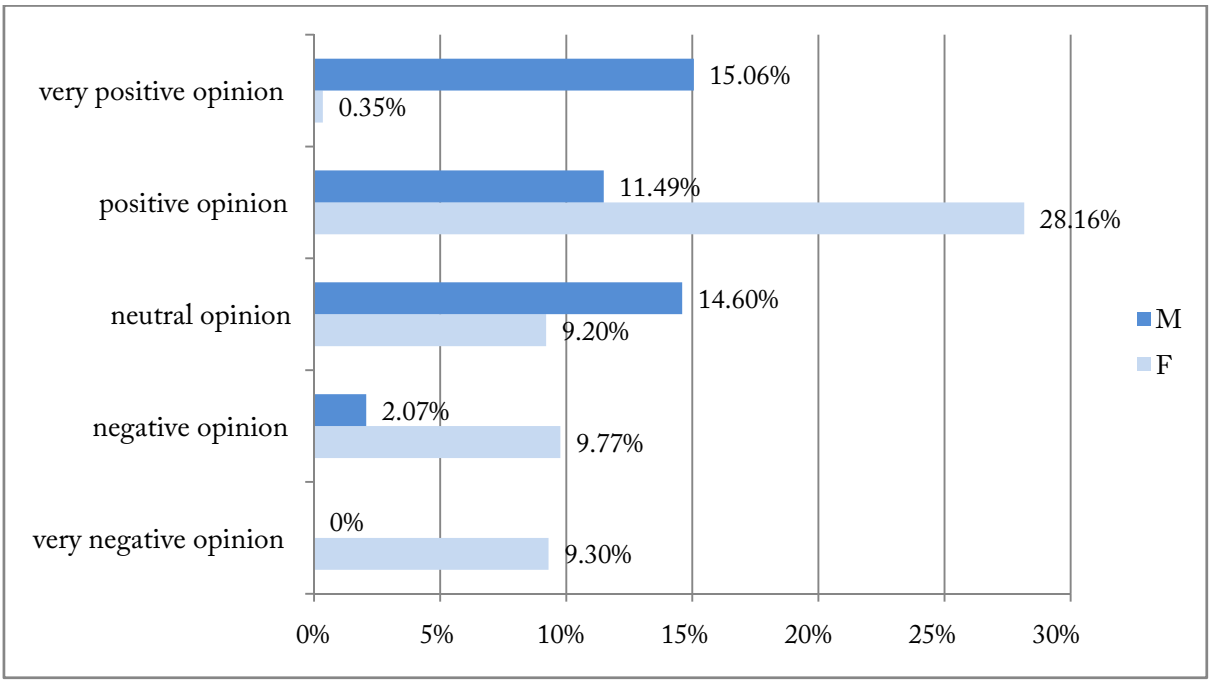


**Chart 3.** Teachers' opinions on the use of VR goggles in education

*Source: own development.*

In order to answer the question about the relationship between subject taught and teachers' opinion on the use of virtual reality (VR) in the educational process, V Cramer's correlation was used. The analysis performed showed that there is an average correlation between the subject taught and teachers' opinion on the use of virtual reality (VR) in the educational process V = 0.501; p < 0.05.

**Table 4.** Cross-tabulation of subject taught * teacher opinion

| | subject taught * teachers' opinion on the use of VR in education | | | | | |
|---|---|---|---|---|---|---|
| | subject taught | | | | | Total |
| Opinion on the use of VR | scientific | natural scientific | humanities | artistic | other | |
| 1 | 27 | 0 | 0 | 43 | 11 | 81 |
| 2 | 21 | 0 | 1 | 72 | 9 | 103 |
| 3 | 107 | 40 | 12 | 42 | 6 | 207 |
| 4 | 0 | 148 | 197 | 0 | 0 | 345 |
| 5 | 0 | 74 | 60 | 0 | 0 | 134 |
| Total | 155 | 262 | 270 | 157 | 26 | 870 |

*Source: Own development.*

Interestingly, the survey found that science teachers had a very negative (17.42%), negative (13.55%) or neutral opinion (69.03%) about the applications of virtual reality (VR) in the educational process. The

situation was similar in the case of teachers of artistic subjects (very negative assessment – 27.39%, negative assessment – 45.86%, neutral assessment – 26.75%) and others (very negative assessment – 42.30%, negative assessment – 34.62%, neutral assessment – 23.08%). Positive and very positive opinions were recorded only in the case of teachers teaching natural sciences and the humanities, which may be related to greater access to specialist software that directly supports their work. As a result, 84.73% of teachers of natural sciences and 95.18% of teachers of the humanities expressed a very good or good opinion in this context.

## Discussion & conclusion

The collected data have shown that most teachers have a low level of knowledge about VR goggles and the educational software dedicated to them (D = 2, SD = 0.97), as well as the possibilities and principles of using virtual reality in the educational process (D = 2, SD = 0.98). Research analysis has shown that approximately 74% of them have very low or low knowledge in this area. 18% of teachers have average knowledge of VR goggles, dedicated software, as well as the possibilities and principles of their use in the VR virtual space. On the basis of the collected data, it can be concluded that only 8% of teachers are adequately prepared to teach classes using VR goggles. As a result, it should be emphasized that the older the teachers, the lower their knowledge about VR goggles, the software dedicated to them, and the possibilities and principles of their use. This situation may be dictated by the educational activity of teachers and their presence in the Internet space, which are directly related to the age of the individual. Especially that in this group, as established in the course of the research, knowledge is mainly acquired in the space of social media – providing easy, convenient, and in most cases, free access to information.

Regarding the broadly understood work with VR goggles, it was noticed that teachers usually assess their preparation in this area higher than their actual knowledge indicates. As a result, this group assessed their competences in educational work with VR goggles as average. On the one hand, this is a positive trend, as a low assessment of one's preparation for working with technology and a sense of fear associated with its use reduces the likelihood of including it in the course of education. On the other hand, it should be emphasized that inadequate assessment of one's skills and knowledge may result in a lack of internal need for further training in a given area and, as a result, in inappropriate use of technology.

In general, it is worth emphasizing that most teachers have a positive opinion about the use of virtual reality (VR) in the educational process. This situation can be used to popularize VR goggles in the school education process, also during training in the use of virtual reality, which is currently necessary. According to the respondents' comments, the mentioned courses should be free of charge for them or paid for from school funds. Practical, hands-on workshops—utilizing both VR hardware and software—are currently quite costly. These typically cover topics such as ClassVR headset configuration, designing VR-based lessons, engaging VR users, exploring the Metaverse, working with the ClassVR portal, and other educational tools tailored for VR headsets (Edubama, 2024a; Edubama, 2024b; Pro Futuro Foundation, 2024; Edukacja 3.0, 2024). Free webinars and conference recordings are available on YouTube, for example from Centralny Dom Technologii (2022). However, they do not provide direct contact with the lecturer, which significantly reduces their quality. Teachers are fully aware of this, hence the demand for financing. The literature also highlights the importance of synchronous online and hybrid training, which is more flexible from the teachers' point of view (Siemieniecka & Majewska, 2025).

Statistical analyses showed that there was an average correlation between the age of teachers and their opinion on the use of virtual reality (VR) in education. It was observed that the older the teachers are, the more the number of negative opinions related to the use of VR goggles in the educational process increases, which is a direct result of their ignorance and lack of experience with VR goggles. Regarding the relationship between gender and teachers' opinions on the use of virtual reality (VR) in the educational process, the existence of a high correlation was noted between the gender of teachers and their opinions in this regard. The data collected showed that men expressed more positive opinions about the use of VR goggles in the learning process than women. In general, this situation is consistent with the general trend that men have greater benefits from using at using VR than women (Stanney et al. 2020; Felnhofer 2012), which is directly reflected in the collected research material. In addition, it was noted during the course of the training that there was a high correlation between the subject taught and the teachers' opinion on the use of virtual reality (VR) in

the learning process. Good and very good opinions on the use of VR goggles in the educational process were mainly shared by teachers of the humanities and natural sciences. This situation was directly linked to the larger number of ready-made VR resources for work at school and courses dedicated to teachers from this group (available in Polish).

## Contributions and limitations

The goal of the study was to obtain data from a vast set of respondents (870) to study among others, they knowledge in the broadly understood educational work with VR goggles. The data were based on knowledge test, what may be a limitation. Follow-up studies should include analyses based on direct observation a teachers' work with VR goggles during lessons and the evaluation of this activity.

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