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Using Large-Scale Data to Understand and Improve Education

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This special issue of *Edukacja* is devoted to the analysis of large-scale assessments (LSAs), which play a vital role in monitoring and comparing educational outcomes across populations, contexts, and time. LSAs provide education researchers and policy-makers with an indispensable resource, offering robust empirical data to diagnose systemic challenges, identify inequalities, and design targeted interventions. The volume showcases contributions based on both international LSA programs—such as PISA (Programme for International Student Assessment), TIMSS (Trends in International Mathematics and Science Study), PIAAC (Programme for the International Assessment of Adult Competencies), TALIS (Teaching and Learning International Survey) and ICCS (International Civic and Citizenship Education Study)—as well as national-level assessments inspired by international large-scale assessment, such as TICS (Tests for International Comparisons of Knowledge and Skills). Whether coordinated by organizations like the OECD or the IEA or developed within individual countries, these studies offer complementary perspectives on learners' knowledge, skills, attitudes, teachers' views and practices, and the learning environments.

The included articles reflect a rich diversity of research questions, target groups, and analytical strategies employed in LSA-based research. Analysing TICS 2021, Wrona and Gajderowicz (2023) demonstrate how high school students adjust their learning preferences and classroom expectations as they approach high-stakes exams. Their findings show that students nearing exams prioritize structured and teacher-led instruction, dedicating more time to in-person learning, which suggests heightened efficiency-seeking behaviour under exam pressure.

Another contribution, by Chyl-Tanaś (2023), utilizes PIAAC data to identify risk factors associated with low reading proficiency among adults. The study's findings highlight the significance of educational attainment, early home literacy environments, and the unique challenges adults encounter in everyday reading. Based on these results, a screening approach is proposed to detect those at risk, highlighting the urgent need for targeted adult learning strategies.

Pagliarani's (2023) study, which used TIMSS 2019 data from eight Balkan countries, focuses on bullying, socioeconomic status, and student confidence. The article reveals that students exposed to bullying benefit particularly from higher confidence and supportive backgrounds, whereas systemic school-level variables seem less predictive. Based on these findings, the study emphasizes the importance of personalized, student-centred interventions in conjunction with broader school improvement efforts.

Drawing on data from the International Civic and Citizenship Education Study (ICCS 2022), Wasilewska (2023) examines the environmental attitudes and behaviours of Polish eighth-grade students. The study confirms significant gender differences, indicating that girls have more pronounced pro-environmental orientations. Findings further show that civic knowledge is a strong predictor of engagement on behalf of environmental protection, while the effects of socioeconomic background are more nuanced. The results suggest that education for sustainability must go beyond fear-based messaging and instead cultivate a sense of agency and responsibility, especially among boys and disadvantaged groups.

The contribution of Kaźmierczak, Weremiuk, and Bulkowski (2023) analyses the performance of Polish students in the creative thinking assessment introduced in PISA 2022—the first large-scale international measurement of this competency. Their item-level quantitative analysis identifies specific task types where Polish 15-year-olds, despite overall strong results, scored statistically lower than their OECD peers. These include tasks requiring idea fluency and contextual understanding in social problem-solving scenarios. The findings point to areas where targeted curricular adjustments could further enhance students' creative potential.

The issue also features an analysis by Sitek and Bielecki (2023) of career expectations and readiness among Polish adolescents. Using PISA 2022 data, the study finds notable misalignment between students' aspirations and educational tracks, particularly in vocational education. Socioeconomic status, parental involvement, and mathematics performance are key determinants of this alignment, while the effects of formal career guidance appear to be limited. The authors advocate better-targeted support to reduce inequalities and foster more informed youth decision-making.

Finally, the issue concludes with a secondary analysis of TALIS 2018 data from six Central and Eastern European countries. Paczuska and colleagues (2023) investigate the relationship between school climate, socioeconomic context, teacher job satisfaction, and occupational well-being. The findings highlight the crucial role of relational and organizational factors in promoting teacher retention and well-being. The elements of school climate—particularly participatory leadership, collegial relations, and classroom dynamics—in shaping teacher satisfaction and well-being. Disciplinary problems were a key driver of elevated stress levels, which in turn reduced job satisfaction. By contrast, school socioeconomic status showed only minimal effects.

The articles in this issue reflect the growing methodological sophistication in large-scale assessment research. Authors draw on a wide array of analytical strategies, including discrete choice experiments (Wrona and Gajderowicz, 2023), predictive modelling (Chyl, 2023), multilevel mixed-effects models (Pagliarani, 2023), regression and categorical data analysis (Wasilewska, 2023), mixed-methods (Kaźmierczak et al., 2023), and various applications of structural equation modelling—including multigroup alignment modelling (Bielecki and Sitek, 2023; Paczuska et al., 2023). This diversity highlights the expanding toolkit available to researchers working with complex educational data, reinforcing the need for more nuanced, theory-driven, and context-sensitive approaches.

The contributions demonstrate how large-scale assessment data, whether gathered at the national or international level, can be utilized not only to track trends and identify disparities but also to gain meaningful insights into students' attitudes, preferences, and aspirations. The methodological developments enhance the interpretability of findings but also broaden the potential for informing evidence-based policy across diverse educational systems. These studies reinforce the importance of large-scale assessments as a vital component of evidence-based education policy and practice. Additionally, they raise important questions about data interpretation, comparability, and the complexity of educational outcomes.

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Upcoming high-stakes exams make students eager to choose effective learning strategies and classroom organization

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Abstract

This paper reveals how students' preferences for learning strategies covering different dimensions of the learning process, including mode of delivery, assessment, individual learning practices, and class organization, change over the time left until high-stakes exams are taken. We used data from the TICKS 2021 study covering high school students' preferences. Results show that the anticipation of upcoming high-stakes exams impacts students' preferences for learning strategies and classroom organization. As the exam date approaches, students increasingly prioritize effective learning methods, although not all the differences revealed in class organization attributes were found to be statistically significant. Secondary school students taking exams in the survey year indicated that they would devote an additional 3.9 hours per week to in-person learning over remote. Those with exams the following year would commit just 0.15 extra hours, while students with exams two years away would forgo 0.4 hours of free time to choose remote over in-person classes. Students closest to their exams were also willing to sacrifice twice as much free time to avoid group work and attend teacher-led classes compared to those with one more year left, and over three times more than those with two more years remaining. Notably, their preferences regarding external factors, such as the organization of classes, were more likely to shift than their preferences for their own learning practices.

Keywords: **Students' preferences, discrete choice experiment, high-stakes exams, learning strategies.**

Nadchodzące egzaminy końcowe skłaniają studentów do wyboru skutecznych strategii nauki oraz organizacji pracy w klasie

Streszczenie

Artykuł przedstawia, jak preferencje uczniów dotyczące strategii uczenia się, obejmujące różne aspekty procesu edukacyjnego, takie jak sposób dostarczania treści, ocena, indywidualne praktyki uczenia się oraz organizacja zajęć, ulegają zmianie w miarę zbliżania się do egzaminów końcowych. Wykorzystano dane z badania TICKS 2021, które obejmowało preferencje

uczniów szkół średnich. Wyniki pokazują, że perspektywa nadchodzących egzaminów wpływa na preferencje uczniów w zakresie strategii uczenia się oraz organizacji zajęć, choć nie dla wszystkich atrybutów organizacji klasowej ujawnione różnice są statystycznie istotne. W miarę zbliżania się terminu egzaminów uczniowie coraz bardziej skupiają się na efektywnych metodach nauki. Uczniowie, którzy przystępowali do egzaminów w roku badania, poświęciliby dodatkowe 3,9 godziny tygodniowo na naukę stacjonarną w porównaniu do zdalnej. Ci, którzy mieli egzaminy w kolejnym roku, poświęciliby jedynie 0,15 dodatkowej godziny, natomiast uczniowie, którym zostały dwa lata do egzaminów, zrezygnowaliby z 0,4 godziny wolnego czasu, wybierając naukę zdalną zamiast stacjonarnej. Uczniowie najbliższe egzaminów są również skłonni poświęcić dwa razy więcej wolnego czasu, aby unikać pracy grupowej i uczestniczyć w zajęciach prowadzonych przez nauczyciela, w porównaniu do tych, którzy mają przed sobą jeszcze jeden rok, oraz ponad trzy razy więcej niż ci, którzy mają dwa lata do egzaminów. Co istotne, większe prawdopodobieństwo zmiany mają preferencje uczniów dotyczące czynników zewnętrznych, takich jak organizacja zajęć, niż preferencje dotyczące ich własnych praktyk uczenia się.

Słowa kluczowe: Preferencje uczniów, eksperyment wyboru dyskretnego, egzaminy o wysokiej stawce, strategie uczenia się.

1. INTRODUCTION

As students' motivation levels fluctuate, influencing the effort they invest in learning, their preferences for learning techniques—which vary in terms of the engagement required and effectiveness—may also change. A factor that can influence students' extrinsic motivation to learn is exams. The proximity of final assessments can significantly shape students' motivational levels (Smith, 2004), thereby influencing the amount of effort they invest in their education, as well as their approaches to both learning and teaching strategies (Harlen et al., 2002; Kickert et al., 2022; Klein, 2016). As the awareness of impending exams intensifies, students' desire to achieve favourable outcomes may lead to a shift in their preference for more effective and targeted learning methods and forms of class organization. This article aims to verify whether such a phenomenon actually occurs. Past research indicates that students adapt their learning methods to the form of the exam (Iannone et al., 2020).

Using discrete choice experiment data from the Test for International Comparisons of Knowledge and Skills (TICKS), we analysed the utility students gain from various learning strategies and class organization, contingent on the time remaining before final exams. Our study focused specifically on techniques familiar to students, emphasizing strategies used by teachers—such as classroom activities and assessments—as well as individual learning methods. To evaluate how students prioritize different aspects of the learning process, we calculated willingness-to-pay (WTP), which quantifies the trade-off between free time and specific educational experience features. This approach avoids the biases often associated with Likert scales and offers a unique comparison between students' preferences and their academic performance in the context of the current understanding of learning strategy effectiveness.

2. LITERATURE CONTEXT AND HYPOTHESIS

An integral part of the educational process and common classroom practice, in addition to acquiring knowledge and competencies and developing critical thinking skills, is examinations. They not only set the standards for students and teachers but primarily measure learning outcomes and enable the monitoring of students' progress and the identification of learning deficiencies, which can serve as the basis for planned improvements in teaching (Jimaa, 2011).

From the students' perspective, exams can serve as a source of motivation for learning (French et al., 2024). The will to learn stems from a sense of deep meaning or purpose and can be described as a willingness to invest effort in the educational process (Harlen et al., 2002). Exam-type motivation should be classified as extrinsic motivation, in which students' behaviours are driven by external stimuli such as grades, awards, certificates or avoiding the consequences of failure, rather than internal interest and satisfaction from what students learn and the learning process itself (Yilmaz, 2017).

The level of motivation induced by any factor, including exams, depends on the personal meaning assigned to it, as well as the social context in which it is undertaken and the implications and consequences (Baumert & Demmrich, 2001). Research indicates that exams having an impact on academic status and career opportunities, defined as high-stakes exams, elicit a higher level of motivation compared to low-stakes exams (Barry & Finney, 2009; Boud & Falchikov, 2006; French et al., 2004; Knekta & Sundström, 2019; Penk, Pöhlmann, & Roppelt, 2014). An example of a high-stakes exam is final examinations, which are crucial in university admissions. Students perceive low-stakes exams as less important and exert less effort (Knekta & Sundström, 2019).

Higher motivation driven by high-stakes exams facilitates and enhances learning (Carless, 2017; Entwistle & Entwistle, 1991; Kickert et al., 2022). Numerous studies indicate that high-stakes exams contribute to improved student performance (Holme et al., 2010; Jürges & Schneider, 2010; Woessmann, 2005) and are even associated with better economic indicators such as earnings, unemployment rates, economic growth (Woessmann, 2018). Woessmann (2002) also found that the impact of high-stakes exams on student performance tends to intensify as students advance through secondary education.

However, some scholars (Caves & Balestra, 2016; Hansson & Riesler, 2022) challenge the notion that high-stakes exams significantly enhance students' educational outcomes. They argue that score improvements may stem from increased test familiarity and instruction tailored specifically to test-taking strategies rather than genuine skill and knowledge acquisition (Harlen et al., 2002; Jürges et al., 2012). Furthermore, exams serve as a motivational tool only for a subset of students and may be particularly effective for those anticipating success (Dawadi, 2020).

Jürges et al. (2012) note that the better results due to high-stakes exams come at the expense of students being less intrinsically motivated in school. This is because external rewards can weaken intrinsic motivation, thereby undermining preparation for lifelong learning (Deci, Koestner & Ryan, 1999; Hidi, 2000; Hidi & Harackiewicz, 2000; Harlen & Deakin Crick, 2003) and harm student self-regulation. Exams shift students' focus, even among the highest achievers, towards performance goals (grades) rather than learning goals, reinforcing extrinsic motivation over intrinsic motivation. Meanwhile, research highlights that intrinsic motivation is far more crucial in education (Ryan & Deci, 2000), as it fosters active engagement in learning and encourages students to pursue education both formally and informally, even when the external stimulus ceases.

The type of motivation can influence both the extent and quality of learning (Harlen, 2002). Research shows that high-stakes exams impact students' behaviour, teachers' practices, and the overall functioning of schools. High-stakes examinations motivate students to dedicate time and effort to exam preparation. However, students often focus solely on studying the content most likely to help them achieve higher grades (Williams, 2014). Moreover, they tend to adjust their learning strategies to match the exam format (Iannone et al., 2020; Zhan & Andrews, 2014), aiming to become familiar with the structure of assessments and develop test-taking strategies to improve chances of success (Harlen et al., 2002; Reay & William, 1999). Regarding learning strategies, Biggs et al. (2022) noted that during exam preparation, students prioritize traditional study methods, such as rote memorization or reviewing past exams, rather than engaging in application-based learning or adopting more meaningful and reflective study approaches.

High-stakes exams can have varying effects on students. According to Desalegn (2023), these effects may differ depending on students' proficiency in the subject. High-achieving students tend to be more persistent, employ more effective test-taking strategies, and have a more positive self-perception than their low-achieving peers (Harlen et al., 2002). Lower-proficiency students are more frequently engaged in non-test-related activities (Buyukkeles, 2016). Differences in the impact of high-stakes exams may also stem from students' family backgrounds (Woessmann, 2002).

Changes in students' behaviour and learning approaches may stem from students' personal choices but can also be shaped by classroom practices. Campbell et al. (2001) underline that teachers' instruction strategies influence students' perceptions and the learning approaches they use. In some cases, high-stakes testing leads to a shift toward test-centred instruction, where the primary focus is on improving exam performance rather than fostering deep understanding and critical thinking (Desalegn et al., 2023). Under the influence of high-stakes exams, teachers focus on exam-related content, adjusting the curriculum to align with exam requirements and adopting specific teaching styles (Harlen et al., 2002; Klein, 2016). Hammack & Wilson (2019) observed that instructional practices shifted before examinations, with teachers incorporating review games, flashcards, and drilling techniques into their lessons.

In summary, exams impact the amount of effort students put in, what they learn, and how they learn. The desire to do well among students may lead them to prefer and choose more effective and focused class organization and learning methods.

This research examines the potential impact of upcoming high-stakes examinations on students' learning preferences. All students are aware of final exams and their impact on future educational opportunities. Their level of motivation may fluctuate depending on the time left until the exam, which may be reflected in varying learning practices and preferences. This change may result from an individual student's choice or be influenced by changes in the organisation of classes before exams.

Given that students may place different values on exams, their impact on motivation and student behaviours and preferences may also vary, for example, high-achieving students with greater expectations for their future career paths may place more value on exams and be more inclined to adopt learning strategies that help them maximize their final exam scores and achieve their goals. Based on this, we formulated the following hypotheses:

Learning strategies hypothesis: As the time remaining until the final exam decreases, students become more inclined to choose more effective learning strategies.

Achievement hypothesis: Highest-performing students are more likely to choose more effective learning strategies as the final exam approaches.

In the following sections, these hypotheses will be tested by employing the discrete choice experiment (DCE) approach. As the statistical model, we use the multinomial logistic (MNL) model and the random parameter logistic (RPL) model as the framework.

3. METHODOLOGY

3.1. Data collection

To determine students' preferences, we used data collected as part of the TICKS 2021 – a yearly study conducted in Warsaw. TICKS is based on the Programme for International Student Assessment (PISA) and includes mathematics, reading comprehension, and science knowledge tests. The results of these tests are presented on the PISA scale. In addition to tests and questionnaires, the study incorporates a preference module using the discrete choice experiment (DCE) approach.

TICKS 2021 was conducted using a representative sample of Warsaw secondary school students. Only a selected sample of classes could participate in the study. The target population comprised students attending full-time, daytime secondary schools for youth, excluding special, hospital, and prison schools. The sampling procedure was designed to ensure that the sample accurately reflected the structure of Warsaw's secondary schools in terms of school type. A double-stratified random sampling approach was employed, incorporating proportional selection based on the number of students in class divisions within each school and cluster sampling at the school level. Stratification was applied based on school location and type. Due to the limited number of schools in certain districts of Warsaw, some districts were grouped to maintain statistical representativeness. Schools were drawn proportionally to the number of students enrolled in classes. Within each selected school, three classes were randomly chosen using simple random sampling. The data was collected in October and November 2021, when students had recently undergone remote learning, with some schools still using a hybrid model. In total, 5,006 students from 83 schools participated in the study. The study was available online; students took it in a school setting in accordance with the provided guidelines.

Although the study encompassed 2nd and 3rd-year students from secondary schools, technical schools, and vocational schools, only secondary school students are considered in the paper because of the different programs and exams taken by students from different school types. In Poland, vocational school students do not take final exams after completing the first cycle and are significantly less likely to continue further education. Secondary school students take only final exams, while students of technical secondary schools, in addition to final exams, have vocational exams. The lack of an exam in vocational schools and additional exams in technical schools may influence students' motivation differently depending on the type of school they attend and distort the results; therefore, we limit our study to secondary school students who take only the final exams. Therefore, the results cannot be generalized to all students.

The analysed sample, limited to secondary school students who completed mathematics tests and the entire DCE module (all choice situations), consisted of 2,815 students from over 90 classes. In our limited sample, 814 (28.92%) students were about to take the final exams in the school year of the study, 977 (34.71%) would take the final exams in 1 year, and 1024 (36.38%) in 2 years.

3.2. Choice experiment design

This study utilizes [DCE] to examine decision-making processes by assuming that individuals make rational choices to maximize utility (satisfaction) (McFadden, 1974). [DCE] is a stated preference method wherein respondents make choices in hypothetical scenarios described with a set of features with varying levels. Respondents evaluate trade-offs between features, where an increase in one attribute may be balanced by a decrease in another, keeping overall utility constant.

Each respondent faced a series of 8 hypothetical choice situations with two alternatives. In each situation, the students were asked to choose the preferred way of organizing the course they would attend in the next semester. A sample choice card is presented in Figure 1. The attributes used to describe the classes were derived from the existing literature (Agarwal et al., 2021; McDaniel et al., 2009; Raes et al., 2021) and included the mode of class organization, the dominant way of working during classes, the type of assessment, learning methods, and the time students spent on learning (weekly) apart from the two hours of in-school classes. The levels of these attributes are detailed in Table 1.

Table 1 *Attributes and levels of [DCE]*

Attribute labels	Levels
Time spent on learning (weekly) apart from the 2 hours of classes	1 hour 3 hours 6 hours
Form of classes	In-person (reference level) Hybrid mode Remote
Dominant way of working in class	Material presented by the teacher (reference level) Group work Individual work
Assessment	Open question test (reference level) Multiple choice test Oral responses
The way of learning	Studying the material from the textbook (reference level) Group project Creating mind maps Quizzes and tests (not graded!)

Figure 1 *Sample choice card*

Attribute	Opcja 1	Opcja 2
Czas poświęcony na naukę (tygodniowo) poza 2 godzinami lekcyjnymi w szkole	3 h nauki własnej	1 h nauki własnej
Forma zajęć	Stacjonarna	Zdalna
Dominujący sposób pracy	Praca grupowa	Materiał wykładany przez nauczyciela
Sposób zaliczenia	Projekt grupowy	Test z pytaniami zamkniętymi
Sposób uczenia się	Tworzenie map myśli	Quizy i testy (nie na ocenę!)
ZAZNACZ WYBÓR:	☐	☐

To determine whether students' preferences shift over time and whether students become more inclined to select more effective learning and organizational methods before high-stakes exams, first, it is essential to identify which of the selected methods are more effective and contribute to higher student performance. The effectiveness of learning strategies has been extensively explored (Hattie, 2018). Based on research, we can identify which levels of attributes should be considered the most effective. Specifically, in the context of "the way of learning", quizzes and tests, which are forms of retrieval practice, are recognized as highly effective learning tools. This is particularly true when these practices are supplemented with feedback and repeated at intervals over time. They lead to improved learning outcomes and better retention of information (Binks, 2018). Most studies have demonstrated medium to large benefits from retrieval practice (Agarwal et al., 2021). Despite its growing evidence base, retrieval practice is infrequently implemented in schools compared to other strategies that are less empirically supported. In second place in terms of effectiveness are mind maps, notable for their ability to engage students with the material and require the establishment of detailed connections between concepts. They facilitate the integration of theory and practice (Machado & Carvalho, 2020), promote the development of critical thinking skills (Moattari, Soleimani,

Moghaddam, & Mehbodi, 2014), and contribute to enhanced student learning outcomes (Dinarvand & Vaisi-Raygani, 2013; Hwang, Huang, Wang, & Zhu, 2021; Veronese, Richards, Pernar, Sullivan, & Schwartzstein, 2013). Research indicates that students who employed mind maps in science classes achieved higher scores on subsequent tests compared to those who used standard note-taking methods (Abi-El-Mona & Abd-El-Khalick, 2008). However, the educational benefits of concept mapping may not surpass those achieved through simpler methods, such as re-reading the text (Karpicke & Blunt, 2011; Lechuga, Ortega-Tudela, & Gómez-Ariza, 2015). Regarding traditional learning strategies such as re-reading, note-taking, and verbal recitation, these methods exhibit the lowest correlation with performance on assessments (McDaniel et al., 2009). Wallace, Elliot and Rogge (2022) further demonstrated that re-reading does not have a positive predictive relationship with exam results.

Regarding assessment modes and perceptions of examinations, different formats vary in the required level of effort. For instance, open-ended tests and oral responses are generally much more demanding. Students typically prefer multiple-choice exams over essay-type questions (Struyven, Dochy, & Janssens, 2005). Van de Watering, Gijbels, Dochy, and Van der Rijt (2008) observed that students favour written tests, including take-home exams, papers, and projects, while they tend to least prefer oral tests, computer-based tests, and portfolios. Similarly, Sander, Stevenson, King, and Coates (2000) found that students preferred coursework assessments such as essays, research projects, and problem-solving exercises.

In the case of instructional formats, remote teaching has been deemed ineffective in some contexts (Mollah & Parvin, 2020). While purely online modes may lack efficacy, blended learning presents a promising alternative (Paudel, 2021). Hybrid classes, which integrate online and in-person elements, offer flexibility in time and space (Raes et al., 2022). Research indicates that students in hybrid instruction either perform comparably to those in face-to-face settings or excel beyond those in traditional or online courses (Bowen, Chingos, Lack, & Nygren, 2012; McFarlin, 2008).

When it comes to the dominant way of working in class, the literature does not clearly identify which instructional method is the most effective. However, it is important to note that individual work tends to be more demanding compared to the material presented by the teacher or group work.

3.3. Preference modelling

By examining the choices made by respondents, we assess the underlying utility linked to various alternatives. The analysis follows the random utility model (McFadden, 1974), where the utility U_{ijt} for individual i , choosing alternative j in situation t , is expressed as:

$$U_{ijt} = X_{ijt} \beta + e_{ijt}$$

Here, X_{ijt} represents observed attributes, β is a vector of parameters, and e_{ijt} is the stochastic component capturing unobserved factors. If e_{ijt} follows an independent and identically distributed extreme value (type I) distribution, this leads to the multinomial logit (MNL) model, widely used for estimating utility parameters from observed choices.

However, the MNL model is limited in accounting for taste variations that are not linked to observable characteristics and does not handle unobserved factor correlations over time. To address these limitations, we also employed the random parameters mixed logit (RPL) model, which enables the identification of preference heterogeneity and potential correlations between alternatives and observed choices.

The RPL model accommodates systematic taste variation, capturing unobservable factors beyond those explained by observed characteristics. In the RPL model, we assume that all parameters, except for time, follow a normal distribution, while the time variable is kept constant. For the random parameters, we estimate both the mean and the standard deviations of their distributions, which reflect the diversity in individual preferences.

The parameters from the estimated models indicate preferences relative to reference attribute levels. The coefficients of the models do not have a direct interpretation; a significant positive coefficient signifies a greater likelihood of preference for the option compared to the reference level.

As the model includes time as a continuous variable, we computed the time equivalents for the preference parameters (WTP) to enhance interpretability. [WTP] represents the trade-off between attributes that students make when making choices. It is quantified as the ratio of an attribute's coefficient to the time attribute's coefficient, representing the respondent's willingness to trade their free time.

We start the analysis with the multinomial logit model (MNL) and the random parameter logit model (RPL) for all high school students participating in the study, and then we present the preferences depending on the time left until the exam and the students' results in mathematics.

4. RESULTS

4.1. General preferences

In Table 2, we present the estimates of the MNL and RPL models and [WTPs] for preferences for the whole sample derived from the RPL. The results of the models are consistent and lead to the same conclusions. Compared to the baseline levels, high school students have positive [WTP] for hybrid mode and negative [WTP] for remote mode, with in-person learning being

a reference level. Students would be willing to forego 1.9 hours more of their free time weekly to have classes in hybrid mode and 0.68 hours to avoid the remote mode of education.

The positive attitude of students towards hybrid classes can be explained by the fact that this approach combines the benefits of in-person and remote mode (Mladenova et al., 2021; Nikolopoulou, 2022). Students value the hybrid format's flexibility (Baker et al., 2020; Muthuprasad et al., 2021) and the opportunity to interact with others (Raes, 2022). Fully remote classes do not provide students with sufficient levels of interaction with their peers (Sellnow-Richmond et al., 2019).

Students' preferences regarding learning strategies are as follows: they prefer learning by doing quizzes and tests or mind maps rather than studying material from textbooks. They are willing to spend 2.8 hours more learning by doing tests and nearly 1.2 hours more learning with mind maps to avoid studying material from textbooks. Regarding the dominant way of working in class, group work and individual work provide students with lower utility than having the material presented by the teacher. We can relate this to results by Hativa and Birenbaum (2000), showing that students prefer when the teacher is well-organized and provides for students' learning needs. This may suggest that students believe that classes conducted by the teacher are of higher quality or prefer to shift the additional effort to teachers.

Students show reluctance towards more engaging and demanding forms of testing knowledge. Their [WTP] expressed in relative terms is substantially higher for multiple-choice tests and group projects when referred to open-question tests. They are willing to forego respectively 5.4 and 3.4 hours more of their free time to be tested in these ways. At the same time, they are reluctant towards oral answers and prefer to prepare longer for a test with open questions. Multiple-choice tests are often seen as easier assessments, where high scores can be achieved with only a partial understanding of the material by employing certain strategies specific to the test format (Simkin & Kuechler, 2005). In addition, multiple-choice questions are used in high-stakes exams. Open-question tests require a higher order of thinking and deeper learning for constructed responses (Melovitz Vasan et al., 2018). Oral assessments generate more stress (Huxham et al., 2010), especially in a large group of students (Hazen, 2020), and unlike the other two assessment types, they are not used in final examinations for most subjects and are not considered during university admissions.

Table 2 *Students' attitudes of high school students – MNL and RPL estimates*

Variable	MNL model	RPL model		
	Coefficient	Mean	SD	WTP (hours weekly)
Time spent on learning (weekly) apart from the 2 hours of classes	- 0.0780*** (0.004)	- 0.122*** (0.006)		
<i>Reference level: In-person</i>				
Hybrid mode	0.1379*** (0.024)	0.233** (0.038)	0.971* (0.067)	1.911** (0.331)
Remote	0.0344** (0.017)	0.083** (0.038)	1.592* (0.052)	0.684** (0.310)
<i>Reference level: Material presented by the teacher</i>				
Group work	0.2131*** (0.026)	0.293*** (0.037)	0.596* (0.047)	2.400*** (0.324)
Individual work	0.1042*** (0.025)	0.118*** (0.036)	0.169 (0.121)	0.966*** (0.302)

Reference level: Test with open questions

Multiple choice test	*	0.4298** (0.028)	*	0.669** (0.046)		0.309* (0.146)	*	5.488** (0.443)
Oral responses		-		-		0.929* (0.063)		-
		0.2445*** (0.027)		0.463*** (0.041)	**			3.792*** (0.365)
Group project	*	0.2812** (0.023)	*	0.416** (0.034)	**	0.869* (0.047)	*	3.410** (0.311)
<i>Reference level: Studying the material from the textbook</i>								
Creating mind maps		0.0582** (0.027)	*	0.144** (0.038)	**	0.487* (0.075)	*	1.186** (0.314)
Quizzes and tests (not graded!)	*	0.2032** (0.022)	*	0.342** (0.030)	**	0.343* (0.061)	*	2.806** (0.285)
Constant		-0.0417 (0.019)						

		-		-13808.993
Log-likelihood		14669.945		
Number of observations		45,040		45,040
Standards errors are in parenthesis.				
* p<0.1, ** p<0.05, ***p<0.01.				

The significant standard deviation parameters in the RPL model imply the heterogeneity of students' preferences. One of the factors differentiating students' preferences may be the time left until students take the final exams testing their knowledge.

4.2. Preferences of secondary school students at different intervals until the time of the final exams

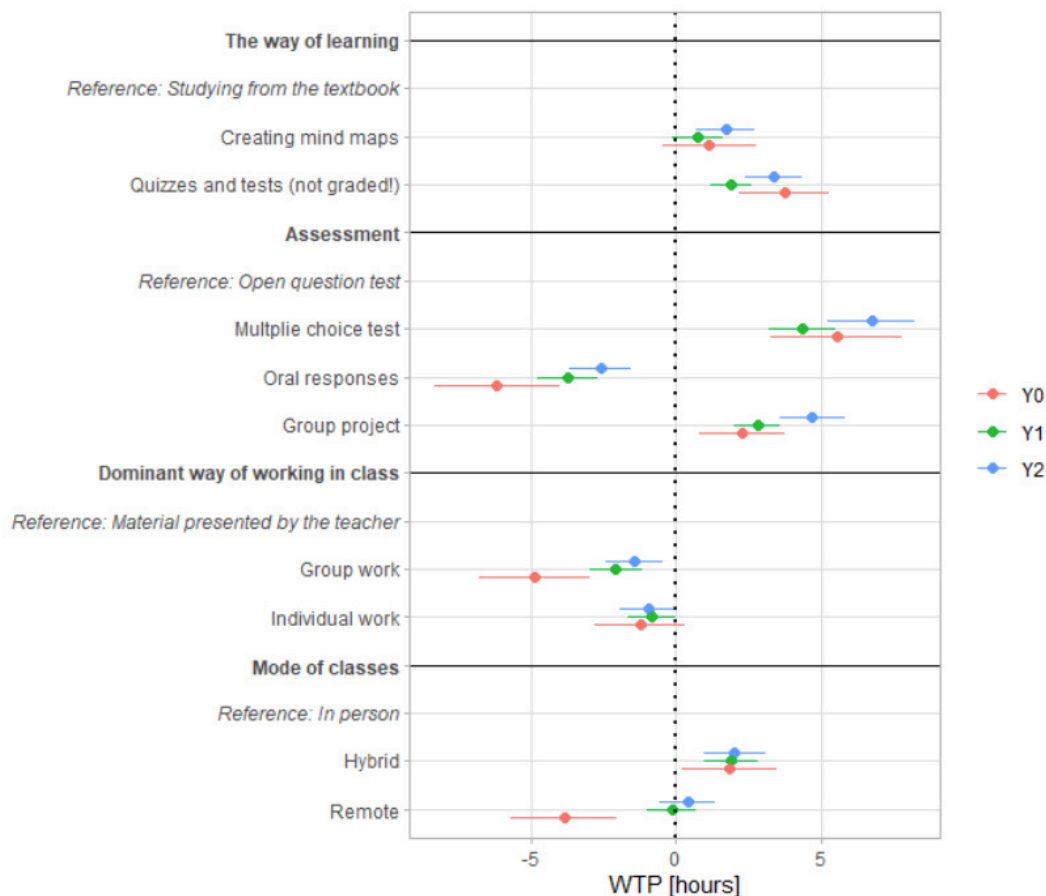
To examine how preferences vary by the time left until the high-stakes assessment is conducted, we ran three separate RPL models for students depending on the time they have until the exam. In light of the upcoming exams, which are the basis for university admission, students tend to choose more effective forms of class organization, with clearly distinguished preferences for in-person teaching among those students who will be taking the exam in the year of the study. In Figure 2 with the [WTPs] of high school students taking final exams in two (Y2), one year (Y1) and the year of the survey (Y0), respectively, only the last show a statistically significant reluctance to participate in classes remotely, compared to in-person classes (Figure 2). They would devote an additional 3.9 hours of their free time to in-person learning to avoid remote learning. The more time left until the exam, the weaker the preference for in-person classes. Students with an exam in a year's time would prefer to spend only 0.15 hours more per week to have classes in-person rather than remotely (the difference is not statistically significant). In comparison, students with an exam in two years would prefer to forego 0.4 hours more of their free time to have remote rather than in-person classes.

While the direction of preference for the dominant way of working in the classroom is the same regardless of the time left before the exam, Y0 present stronger preferences for classes with teachers presenting the material than their Y1 and Y2 colleagues. They would be ready to allocate twice as much free time to avoid group work (-4.9 hours) and have classes dominated by teachers' presentations than Y1 students (-2.1 hours) and over three times more than Y2 (-1.4 hours). Similarly, in the case of individual work, they are also willing to spend more time to avoid this form of work for classes where the teacher mainly presents the material. However, here, the differences are not significant. It is worth emphasizing, however, that for Y0 students, individual work provides the same utility as material presented by the teacher (no statistically significant differences), while Y1 and Y2 students prefer classes with the teacher presenting the material.

In terms of the way of learning, the link between the time left until the exam and choosing more effective ways of learning is less clear. While creating mind maps is more effective than studying material from a textbook, and taking quizzes and tests is the most effective way of learning among the analysed strategies, which is reflected in the students' choices, students taking final exams in the year of the study do not value these methods more highly compared to other groups of students (no statistical differences were revealed). Y1 students would be willing to devote 1.89 hours more of their free time to study with quizzes and tests and 0.76 hours to create mind maps rather than study material from the textbook. For Y0, this would be 3.74 and 0.15 hours, respectively, and for Y2, 3.39 and 1.72 hours. To summarize, those for whom the exam is the most distant and the nearest tend to spend time using more effective learning strategies. It is worth emphasizing that for Y0, there are no statistical differences between preferences for studying from a textbook and creating mind maps, while for Y1 and Y2, these differences occur in favour of mind maps (at 1% and 5% significance levels, respectively).

Regardless of the time remaining until final exams, the direction of students' preferences towards the assessment approach remains the same. However, we find that Y2 have a lower reluctance to oral responses and greater preference towards group projects and multiple-choice tests when referred to open-question tests, compared to Y1 and Y0; however, the difference is significant only between Y2 and Y0 for oral responses.

Figure 2 *Students' attitudes depending on the time left to final exams - [WTP] based on [RPL] estimates*



The results suggest that students are willing to dedicate more time to studying to adopt some of the more effective strategies. This finding aligns with previous research, which indicates that the approach to exams can influence students' motivation and study practices (Harlen et al., 2002). However, the differences between students in relation to the time remaining until the exam are not significant for all aspects of class organization. Students primarily pay attention not to their own learning practices but to the external factors of class organization. This suggests that students rely heavily on the school to prepare them for their final exams, which is its responsibility; however, without adequate student involvement, the method of class organization itself may not yield the expected educational outcomes.

Further, we verified whether the time until the exam might affect students with higher and lower educational achievements differently. We estimated three RPL models, depending on the time left until the exam, interacting attributes with a variable defining whether the student was in the top 20% (representing highest performing students) or lowest 20% (representing the lowest performing students) from the math results in the TICKS assessment. The results of TICKS are more reliable and comparable than students' school grades. The interactions were included in the model as fixed parameters.

The results reveal some differences in preferences between the highest and lowest-performing students, confirming past research findings, which also underlined that high-performing students spent much time preparing for exams (Harlen et al., 2014; Pan et al., 2014). Among Y0, the highest-performing students were significantly more likely to prefer open-question tests than oral responses or group projects. Moreover, they preferred individual work over classes with the material presented by the teacher (significant at a 10% significance level). In the case of Y1 and Y2, no such differences were revealed between the highest- and the lowest-performing students. Concerning the mode of classes, regardless of the time left until the exam, the best students were significantly more reluctant to participate in remote learning than the weakest students.

Table 3 Results of RPL models with interactions in utility units

Variable	Y0	Y1	Y2
	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)
Time spent on learning (weekly) apart from the 2 hours of classes	-0.05 (0.022)**	-0.135 (0.02)***	-0.101 (0.02)***
<i>Reference: In-person</i>			
Hybrid mode	0.323 (0.148)**	0.275 (0.139)**	0.423 (0.144)***
Remote	-0.023 (0.16)	0.403 (0.135)***	0.519 (0.132)***
<i>Reference: Material presented by the teacher</i>			
Group work	-0.4 (0.146)***	-0.112 (0.131)	-0.121 (0.14)
Individual work	-0.254 (0.146)*	-0.039 (0.128)	-0.155 (0.131)
<i>Reference: Open question test</i>			
Multiple choice test	0.451 (0.184)**	0.417 (0.152)***	0.577 (0.158)***
Oral responses	-0.162 (0.154)	-0.431 (0.147)***	-0.314 (0.154)**
Group project	0.411 (0.137)***	0.423 (0.116)***	0.343 (0.117)***
<i>Reference: Studying from the textbook</i>			
Creating mind maps	0.27 (0.16)*	0.155 (0.133)	0.052 (0.14)
Quizzes and tests (not graded!)	0.449 (0.119)***	0.317 (0.103)***	0.285 (0.11)***
<i>Interactions</i>			
Time spent on learning (weekly) apart from the 2 hours of classes x top20	-0.064 (0.031)**	0.007 (0.027)	-0.039 (0.029)
Hybrid mode x top20	-0.186 (0.212)	-0.152 (0.195)	-0.268 (0.207)
Remote x top20	-0.706 (0.232)***	-0.713 (0.192)***	-1.093 (0.193)***
Group work x top20	0.147 (0.206)	-0.254 (0.186)	-0.004 (0.2)
Individual work x top20	0.346 (0.208)*	-0.14 (0.183)	0.104 (0.191)
Multiple choice test x top20	-0.119 (0.261)	-0.086 (0.217)	0.195 (0.224)
Oral responses x top20	-0.461 (0.221)**	-0.041 (0.205)	-0.229 (0.218)
Group project x top20	-0.33 (0.193)*	-0.17 (0.159)	0.176 (0.169)

Creating mind maps x top20	-0.158 (0.228)	0.125 (0.191)	0.098 (0.2)
Quizzes and tests (not graded!) x top20	0.025 (0.167)	0.047 (0.145)	0.186 (0.157)
Standard deviation			
Hybrid mode	0.892 (0.184)***	-0.977 (0.17)***	1.075 (0.18)***
Remote	1.633 (0.149)***	1.463 (0.123)***	1.425 (0.123)***
Group work	0.39 (0.173)**	-0.505 (0.121)***	0.722 (0.114)***
Individual work	0.225 (0.217)	-0.108 (0.303)	0.051 (0.298)
Multiple choice test	-0.472 (0.296)	-0.11 (0.286)	-0.085 (0.516)
Oral responses	0.697 (0.191)***	-0.939 (0.155)***	1.104 (0.16)***
Group project	0.874 (0.129)***	0.641 (0.124)***	0.759 (0.125)***
Creating mind maps	-0.645 (0.173)***	-0.409 (0.187)**	-0.524 (0.177)**
Quizzes and tests (not graded!)	-0.006 (0.267)	0.046 (0.199)	0.378 (0.139)
Log-likelihood	-1585.4041	-1934.4573	-2006.0953
Number of observations	5200	6256	6544
Standards errors are in parenthesis.			
* p<0.1, ** p<0.05, ***p<0.01.			

The differences between the lowest and highest-performing students who take the exam in the year of the study may confirm that high-stakes tests do not motivate the unmotivated students, as stated in a review by Harlen et al. (2002), or motivate them to a lesser extent.

Assuming that actions align with preferences, higher-performing students may adopt more effective study methods before high-stakes exams than their peers with lower academic performance. As a result, they may improve their test-taking abilities, further widening the gap between high and low achievers. This raises important questions: how can we encourage the adoption of effective learning strategies, and what factors contribute to lower-performing students having weaker preferences for them? Is it a lack of awareness or lower expectations regarding their educational future, leading to a diminished emphasis on final exams? Teachers are the primary source of knowledge about learning strategies and play a crucial role in shaping students' behaviours and preferences (Beusaert et al., 2013). The teaching environment is responsible for changes in the initial learning approaches used by students (Struyven et al., 2006). Therefore, it is vital to prioritize the promotion of effective, rather than trendy, learning strategies among educators.

5. CONCLUSIONS AND IMPLICATIONS

In our discussion on students' preferences, the main concern is how students perceive learning strategies and course organization in light of upcoming exams. Research has shown that, indeed, students' preferences differ due to the time left until high-stakes assessments are conducted. However, these differences are significant only for selected features of the organization of classes and learning. The revealed differences may be caused by increased student motivation. The study results clearly indicate that the closer the exam is, the more students prefer in-person lessons, which allow for direct contact and improve interaction between students and the teacher. In addition, the results show that students with final exams in the year of the study do not note differences between studying from textbooks and creating mind maps.

Irrespective of the time remaining until final exams, students' preferences for assessment methods remain stable. However, among students with final exams in the year of the study, the highest-performing students are less likely to prefer oral responses and group projects than their low-performing peers. This may be due to the fact that they rather prefer methods adapted to the exam format. This would confirm the results by Iannone et al. (2020) as well as Zhan and Andrews (2014) that

higher-performing students care about the results of final exams more and take actions that will familiarize them with exams and increase their chances of maximizing results.

Schools should foster a learning goal orientation and cultivate intrinsic interest in a subject, rather than focusing on a performance orientation. Meanwhile, exams can shift the primary purpose of education towards achieving high exam scores (Breault, 2000), which negatively impacts students' attitudes towards subjects, leading them to derive less enjoyment from learning (Jürges & Schneider, 2010). Exams can, at the same time, encourage the adoption of more effective learning methods. However, it is important to emphasize that students should use and benefit from such methods throughout the entire educational process rather than appreciate them exclusively before high-stakes exams. Final exams are not the primary purpose of education and should not overshadow the fundamental functions of the education system. It is essential to raise students' awareness and foster their ability to apply strategies and practices that will enable them to maximize the development of their knowledge and skills.

6. STUDY LIMITATIONS

The study and the methodology employed in it are associated with certain limitations. First, students' preferences may not necessarily reflect their learning practices. As the method places the student in a hypothetical situation, we cannot determine whether there is an actual change in students' behaviour before exams.

Second, preferences may not arise from students' recognition of more or less effective strategies but rather from their experiences and familiarity with specific learning methods and forms of class organization. Although Hativa and Bierenbaum (2000) indicate that students prefer approaches perceived as beneficial, even if they have not experienced them, Khalaf et al. (2020) underlined that students are more satisfied with strategies in which they have more experience. This emphasizes the teachers' role in shaping students' experiences and preferences. Moreover, there may be some discrepancies in the interpretation of certain terms and strategies referred to by the authors in the study, resulting from students' different experiences. For example, although all students experienced remote learning during the COVID-19 pandemic, the way of conducting classes and their quality could have been very diverse, which is why some students may have had slightly more and others less positive experiences.

Third, conducting the study during the pandemic, which significantly impacted the mode of education, could have greatly influenced students' behaviours and responses. The organization of classes, often inadequate, was new to students, potentially causing discomfort and shaping their preferences.

Last, the study was conducted on a representative sample of students from Warsaw; however, the sample used in the paper was limited to secondary school students. Therefore, the findings are not generalizable to other groups. Additionally, since the data represent different cohorts, not the same students, at different intervals from the exam, we do not directly observe whether the preferences of the same students change over time.

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SUPPLEMENTARY MATERIAL

Appendix 1 *Estimates of the RPL model*. Supplementary data for this article can be found online at [HTTPS://IBE.EDU.PL/IMAGES/EDUKACJA/NUMERY/2023_04/1_EDU_4_23_APPENDIX1.PDF](https://ibe.edu.pl/images/edukacja/numery/2023_04/1_edu_4_23_appendix1.pdf)

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Identyfikacja czynników ryzyka niskiej umiejętności czytania u dorosłych

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Streszczenie

U osób dorosłych niska umiejętność czytania może wiązać się z ekonomicznymi, prawnymi i zdrowotnymi konsekwencjami. Według badania PIAAC z 2012 roku problem ten dotyczy niemal co piątej osoby dorosłej w Polsce. Takie osoby mogą mieć trudność z rozumieniem nawet prostych tekstów napisanych codziennym językiem. Pomimo tego, wciąż brakuje skutecznych metod diagnozy, dzięki której możliwe byłoby lepsze opisanie tego zjawiska, zbadanie i wprowadzenie skutecznych interwencji. Ten artykuł przedstawia reanalizę danych PIAAC, mającą na celu wybór najbardziej predykcyjnych dla umiejętności czytania pytań kwestionariuszowych. Następnie opisuje badanie, w którym osoby dorosłe o zróżnicowanym wieku i poziomie wykształcenia (N = 400) wykonały test czytania i odpowiedziały na serię pytań o cechy demograficzne, warunki życia i nawyki związane z czytaniem. Analiza regresji wykazała, że niższy poziom wykształcenia, mała liczba książek w domu w wieku 14 lat, raportowana potrzeba pomocy przy czytaniu materiałów medycznych, a także własna niska ocena poziomu czytania wyjaśniają istotną wariancję modelu i wskazują na niższe wyniki w czytaniu. Dodatkowy model, uwzględniający pytania o pracę u osób zatrudnionych (N = 246), wskazywał również wykonywanie pracy fizycznej jako związane z niższym wynikiem. Proponowane pytania mogą posłużyć do stworzenia kwestionariusza ułatwiającego identyfikację osób dorosłych z ryzykiem problemów z czytaniem. Jednocześnie nie mogą zastąpić testu wykonaniowego, wprost mierzącego umiejętność praktycznego wykorzystywania umiejętności czytania.

Słowa kluczowe: Analfabetyzm funkcjonalny, umiejętność czytania, czytanie ze zrozumieniem, czytanie u dorosłych.

Identifying Risk Factors for Low Reading Proficiency in Adults

Abstract

Low reading proficiency among adults may be associated with economic, legal, and health-related consequences. According to the 2012 PIAAC survey, this issue affects nearly one in five adults in Poland. Such individuals may struggle to comprehend even simple texts written in everyday language. Despite this, there are still few effective diagnostic methods that would allow for a better description of this phenomenon, its examination, and the subsequent introduction of effective interventions. This article presents a reanalysis of PIAAC data aimed at selecting the most predictive background questionnaire items for reading proficiency. It then describes a study in which adults of varying ages and educational levels (N = 400) completed

a reading comprehension test and answered questions regarding demographic characteristics, living conditions, and reading habits. The regression model showed that lower educational levels, a low number of books in the home at age 14, a reported need for assistance with reading medical materials, and a self-assessed low reading proficiency accounted for a significant portion of the variance in the model and were associated with lower reading scores. An additional model, which included questions about work tasks among employers (N = 246), also indicated that performing physical work was associated with lower scores. The proposed questions may serve as a basis for creating a questionnaire to help identify adults at risk of having reading difficulties. At the same time, they cannot replace a performance-based test that directly measures the practical application of reading skills.

Keywords: Functional illiteracy, reading skill, reading comprehension, reading in adults.

1. WPROWADZENIE

1.1. Dorośli o niskiej umiejętności czytania w Polsce

W Polsce temat niskich kompetencji dotyczących umiejętności czytania i rozumienia tekstu u czytających dorosłych jest znany już od czasów powojennej akcji „likwidacji analfabetyzmu”, która miała znacznie mniej spektakularne efekty od publicznie ogłaszanych (Landy-Tołwińska, 1961). Pomimo społecznej wagi tego zagadnienia, prowadzono nieliczne badania empiryczne nad zjawiskiem problemów z czytaniem u dorosłych (Przybylska, 2014). Brak podstawowej kompetencji w czytaniu może wykluczać dorosłych z życia społecznego i mieć różnego rodzaju konsekwencje: ekonomiczne, prawne i zdrowotne (Vágvölgyi i in., 2016). Takiego rodzaju trudności z czytaniem nie należy mylić z analfabetyzmem rozumianym jako zupełny brak umiejętności czytania i pisanie. Warto na wstępie zaznaczyć, że w omawianym kontekście często do tej pory używano terminu „analfabetyzm funkcjonalny” (functional illiteracy). Obecnie to pojęcie jest zastępowane przez terminy bardziej opisowe i mniej stygmatyzujące (np. low literacy skills). Ta praca zawiera więc termin „niska umiejętność czytania” oraz „dorośli o niskiej umiejętności czytania”. W cytowanej literaturze wciąż można jednak spotkać dawniej używany termin (Przybylska, 2014).

Do najważniejszych źródeł wiedzy o niskiej umiejętności czytania u dorosłych w Polsce, jej przyczynach i konsekwencjach należy wieloletnie badanie podłużne prowadzone przez Zbigniewa Kwiecińskiego w Toruniu (Kwieciński, 2002). Badanie obejmowało rocznik 1957 i składało się z pomiaru kompetencji w 1972 (N = 7500, wiek = 15 lat) i pogłębionych wywiadów biograficznych w 1988 (N = 4831, wiek = 31) oraz 1998 (N = 1047, wiek = 41). Ustalenie progu „dobrego” i „złego” czytania nie było w tym badaniu oparte na kryteriach funkcjonalnych. W zależności od analizy, za „źle czytających” uznawano 13% lub 33% osób z najniższymi wynikami w czytaniu. Badanie wykazało, że niskie kompetencje w czytaniu ze zrozumieniem w wieku 15 lat były związane ze znacznie niższym poziomem wykształcenia i późniejszym bezrobociem lub wykonywaniem pracy fizycznej. Wiązały się też z nieufnością do demokracji i kapitalizmu, częstszym piciem alkoholu, a także większą religijnością. Badanie pokazało też rodzinne implikacje problemów z czytaniem: osoby gorzej czytające, rozpoczynając dorosłe życie, dostały mniejsze wsparcie materialne od własnej rodziny, odnosiły się też do tradycji rodzinnych z mniejszym krytycyzmem i chętniej przekazywały je własnym dzieciom (Kwieciński, 2002). Źródłem wiedzy o kompetencjach dorosłych w Polsce jest także badanie PARP Bilans Kapitału Ludzkiego (BKL), nie zawiera ono jednak bezpośredniego pomiaru umiejętności czytania.

Danych o stanie umiejętności rozumienia tekstu dorosłych Polaków dostarczyło pierwsze Międzynarodowe Badanie Alfabetyzmu Dorosłych koordynowane przez Statistics Canada (International Adult Literacy Survey, IALS; OECD & Statistics Canada, 2000). Zostało przeprowadzone w latach 1994-1995 na reprezentatywnej próbie losowej (N = 3000). Wyniki tego badania w Polsce były zaskakująco słabe – ponad 70% respondentów ułożyło się na najniższych poziomach wskazujących na niepełną umiejętność czytania (1 i 2), a zaledwie kilka procent dysponowało najwyższymi umiejętnościami (4 i 5), zakładającymi np. krytyczną ocenę treści. Rozważając niskie wyniki Polaków i Polek, przeanalizowano dane zebrane w kwestionariuszach IALS mówiące o rodzaju wykonywanej pracy i wykorzystywanych w niej umiejętnościach. Okazało się, że badani w Polsce rzadziej niż inni czytali i pisali w pracy, również na wyższych poziomach umiejętności. Wyjątkowo rzadko podnosili też swoje kompetencje (Gulczyńska, Świerzbowska-Kowalik, 2016). Z drugiej strony nie jest jasne, jak dalece trafne było badanie IALS w Polsce początku lat 90. Choć w badaniu tym założono kulturową niezależność i ekwiwalencję wyników, zadania dotyczące rekrutacji do firm i reklam mogły być bliższe mieszkańcom kapitalistycznych krajów o dojrzałszej demokracji, a mniej zrozumiałe w Polsce okresu przemian ustrojowych i społecznych (Gomez, 2000). Około połowy tekstów używanych w IALS było zaś identycznych (zob. przykładowe zadania na <https://nces.ed.gov/surveys/ials/items.asp>). Wskazuje się też na anomalie i możliwe błędy w badaniu polskiej próby i zebranych danych, co sprawia, że polskie wyniki IALS należy traktować z ostrożnością (Paccagnella, 2016). Nawet jeśli badana grupa nie radziła sobie „funkcjonalnie” z czytaniem tekstów typowych dla USA czy Kanady, ich kompetencje w rozumieniu tekstu w ówczesnej Polsce mogły być wystarczające.

W następcy IALS, Międzynarodowym Badaniu Umiejętności Dorosłych (Programme for the International Assessment of Adult Competencies, PIAAC; OECD, 2015), czytanie również zostało podzielone na poziomy umiejętności (zob. Rys. 1).

Ich zakres rozciąga się od wskazywania pojedynczych informacji w krótkich tekstach (poniżej poziomu 1), aż do krytycznej oceny i wyciągania wniosków (poziom 5). Podobnie jak w IALS, umiejętności zlokalizowane poniżej poziomu 2 można uznać za „niewystarczające” we współczesnym świecie do codziennego życia, które często przecież wymaga czytania. W badaniu, prowadzonym w 2011-2012 roku, wzięło udział ponad 9000 Polaków z reprezentatywnej losowej próby. Odsetek osób o niskich kompetencjach w Polsce był znacznie mniejszy niż w badaniu IALS, a średni wynik w Polsce wzrósł najbardziej spośród wszystkich uczestniczących krajów (Rynko i Palczyńska, 2014; Paccagnella, 2016). Może to świadczyć o procesach globalizacyjnych w Polsce, a co za tym idzie większej trafności badania PIAAC niż IALS. Jednak wciąż niemal co piąta badana osoba (19%) w PIAAC miała problemy z czytaniem i rozumieniem tekstów na podstawowym poziomie, osiągając najwyżej poziom 1 (Burski i in., 2013; Chłóń-Domińczak i in., 2015). Był to wynik słabszy niż średnia krajów OECD uczestniczących w badaniu (OECD, 2013), jednak lepszy niż wynik pochodzący z nowego cyklu badania – PIAAC 2023 (Sitek i in., 2024). W najnowszym badaniu PIAAC Polacy i Polki osiągnęli jeden z najniższych wyników wśród wszystkich badanych krajów, a kompetencje na najniższych poziomach miało aż 39% osób badanych. Przy średniej OECD wynoszącej 26% odsetek ten jest bardzo wysoki.

Rysunek 1 Poziomy czytania w Międzynarodowym Badaniu Umiejętności Dorosłych PIAAC



Źródło: <https://eduentuzjasci.pl/piaac-postpiaac>

1.2. Konsekwencje problemów z czytaniem u dorosłych a dysleksja rozwojowa

Pomimo alarmujących danych z badań międzynarodowych, w Polsce nowe badania nad konsekwencjami problemów z czytaniem w wieku dorosłym właściwie nie są prowadzone. Inaczej jest w krajach takich jak Francja (Information et Vie Quotidienne, IVQ), Wielka Brytania (Skills for Life) czy Niemcy (Level-One Studie; Przybylska, 2014). Wiadomo, że trudności z czytaniem u dorosłych wiążą się z konsekwencjami społecznymi, ekonomicznymi i zdrowotnymi (Vágvölgyi i in., 2016). W Polsce wyjątkiem są nieliczne badania dotyczące problemów z czytaniem o podłożu dyslektycznym (Bogdanowicz, 2012). Choć brakuje badań wprost porównujących grupy dorosłych, których problemy z czytaniem wynikają z dysleksji lub mają inną etiologię, jest jasne, że przynajmniej część tych osób ma dysleksję, a ich trudności z czytaniem rozpoczęły się już w pierwszych latach edukacji (Vágvölgyi i in., 2021). Tego źródła informacji nie należy więc lekceważyć.

Badania nad dysleksją u dorosłych pokazują problemy z czytaniem jako przyczynę długotrwałego stresu oraz niepowodzeń edukacyjnych. Starsi uczniowie z dysleksją, przeżywając niepowodzenia szkolne, mogą doświadczać trudności z motywacją, frustracji oraz zaburzeń emocjonalnych, w tym depresji i myśli o charakterze samobójczym (Bogdanowicz, 2012). Z prac przeglądowych (Livingston, Siegel, Ribary 2017) wiadomo, że po ukończeniu edukacji, często przedwczesnym, osoby z dysleksją mają złe wspomnienia ze szkoły, obniżone poczucie własnej wartości, przekonanie, że muszą wstydzić się i ukrywać to zaburzenie, a także różnego rodzaju problemy emocjonalne i społeczne. Osoby z dysleksją i innymi problemami z uczeniem się są też nadreprezentowane wśród osób w kryzysie bezdomności i więźniów, częściej przejawiają zachowania antyspołeczne i agresywne, mogą być też mniej empatyczne i częściej cierpieć na problemy psychiczne. To wszystko może wiązać się z wcześniej poniesioną porażką edukacyjną, wynikającą z niej długotrwałego stresu i poczucia niedostosowania (Livingston, Siegel i Ribary, 2017). Zdarza się też odwrotna zależność – problemy psychiczne w dzieciństwie mogą utrudniać uczenie się i wypełnianie norm społecznych. W kontekście życia zawodowego osoby z dysleksją mają niższą samoocenę w pracy, niższą ocenę własnych kompetencji i odczuwają większy lęk związany z pracą (Nalavany, Logan, Carawan, 2016).

Wskazuje się też na deficyty poznawcze, które mogą wiązać się z problemami z czytaniem w wieku dorosłym, m.in. problemy z pamięcią roboczą (Vágvölgyi i in., 2016).

Można też założyć, że intensywnie badane na świecie konsekwencje dysleksji (Livingston, Siegel i Ribary, 2017) w podobnym stopniu mogą dotyczyć osób, u których podłoże problemów z czytaniem nie jest związane z dysleksją rozwojową. Na pewno bowiem nie wszystkie trudności z czytaniem można tłumaczyć dysleksją, nawet jeśli miały one wczesny początek. Do innych przyczyn należą czynniki społeczno-ekonomiczne, na przykład rodzinne doświadczenie migracji, ale przede wszystkim niski status społeczno-ekonomiczny (SES) rodziny (Vágvölgyi i in., 2016). Niski SES i mało stymulujące środowisko, np. w pracy, nie jest zaś bodźcem wspierającym rozwój umiejętności czytania, choć jest on przecież możliwy również w dorosłości, co pokazały niemieckie badania podłużne (Wicht i in., 2021). Co istotne, zarówno dysleksja rozwojowa, jak i SES, mogą być dziedziczone (Grotluschen i Riekman, 2011), o czym świadczą również polskie badania (Kwieciński, 2002), w tym neuroobrazowe (Jednoróg i in., 2012; Dębska i in., 2016). Również z tego powodu problemy z nauką czytania o dowolnej etiologii, a także czytaniem w dorosłości, powinny być objęte większą troską przez politykę edukacyjną.

1.3. Kwestionariusze jako źródło wiedzy o umiejętności czytania

Pomiar umiejętności czytania naraża wielu problemów i często jest przypisywany okresowi nauki szkolnej (egzamin, diagnoza dysleksji, itd.). W tym świetle ankieta wydaje się być prostym i intuicyjnym sposobem pomiaru, dzięki któremu można oszacować, jak dorosła osoba badana ocenia swoje umiejętności i możliwe deficyty w tych kompetencjach. Istnieje szereg narzędzi samoopisowych, wykorzystywanych w badaniach, mających na celu określenie poziomu motywacji do czytania (Schutte i Malouff, 2007), nawyki czytelnicze (Applegate i in., 2014), ocenę problemów z czytaniem o podłożu dyslektycznym (Lefly i Pennington, 2000; polska wersja: Bogdanowicz i in., 2015), czy wreszcie krótkie ankiety przesiewowe mające ocenić możliwe problemy z umiejętnością czytania (Brice i in., 2014; Morris i in., 2005).

Takie podejście do pomiaru, choć wygodne w badaniach i przydatne w praktyce edukacyjnej, nie jest bez wad. Osoby badane mogą nie w pełni zdawać sobie sprawę ze swoich kompetencji i ograniczeń, bo ich ocena na poziomie metapoznawczym jest trudna (Boudard i Jones, 2003). Umiejętność czytania może mieć zresztą związek ze zdolnościami metapoznawczymi, wprowadzając systematyczny błąd do pomiaru. Po drugie, temat trudności w czytaniu może być podatny na efekt społecznych oczekiwań (Olson i in., 2011). W efekcie wyniki z równoległe prowadzonych badań kwestionariuszowych i wykonaniowych są rozbieżne, a te wykonane kwestionariuszowo znacznie bardziej optymistyczne (Hautecoeur, 2000). Co więcej, błąd w takim pomiarze może być systematyczny: niektóre grupy badanych, np. kobiety i osoby w średnim wieku, raportują swoje kompetencje i ograniczenia dokładniej niż mężczyźni i osoby młodsze (Gilger, 1992). Dłuższe opracowanie dotyczące kwestionariuszy samoopisowych dostępnych w literaturze można znaleźć w nowej pracy przeglądowej dotyczącej sposobów oceny czytania u dorosłych (Chyl i in., 2024).

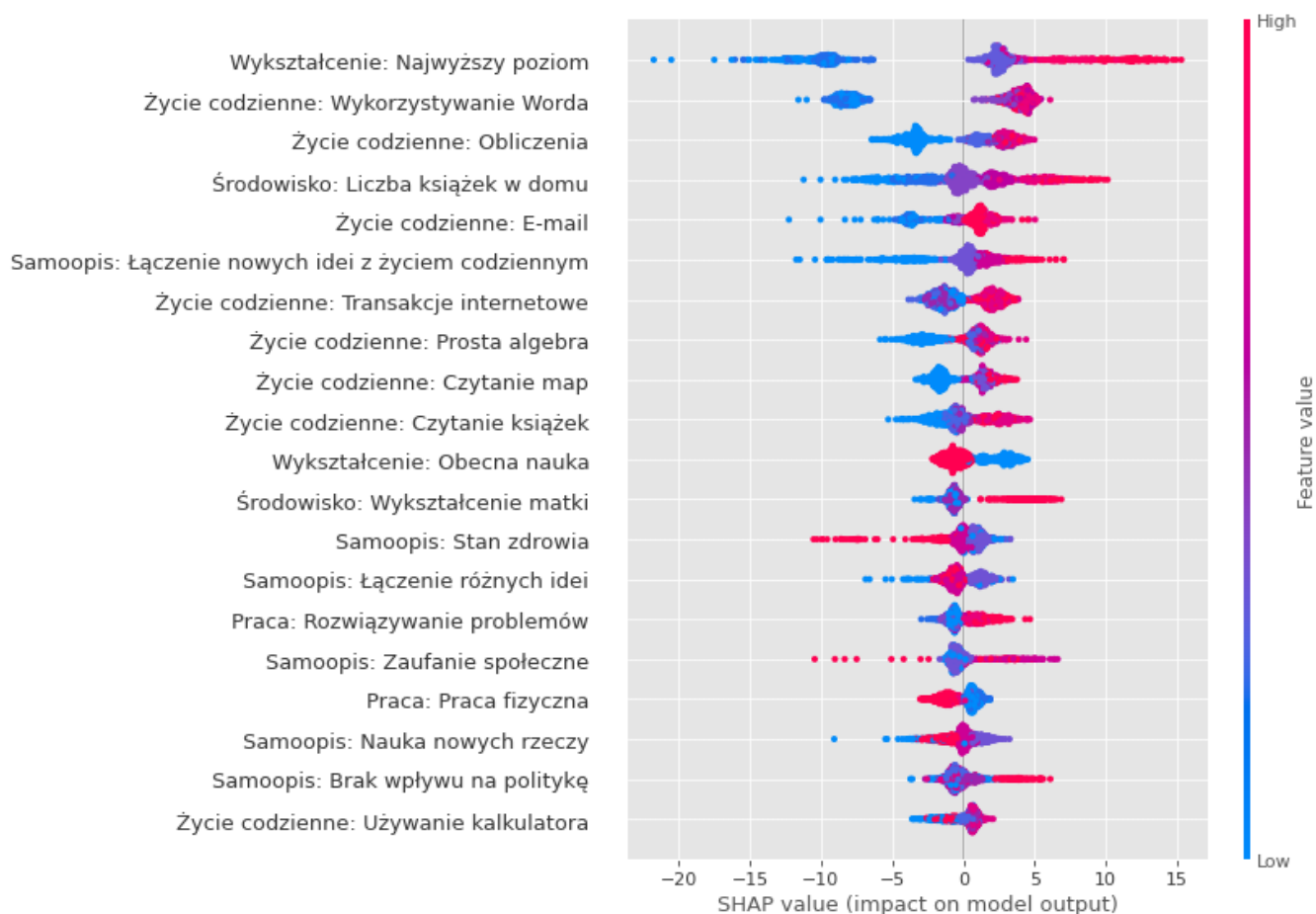
Bez względu na ograniczenia metody kwestionariuszowej prostota jej stosowania, np. w kontekście szeroko prowadzonych badań przesiewowych, których w Polsce obecnie brakuje, byłaby nie do przecenienia. Z tego powodu za wartościowe należałoby uznać opracowanie kwestionariusza opartego na danych empirycznych. Scenariusz ten z dużym prawdopodobieństwem wskazywałby osoby z grupy ryzyka problemów z czytaniem, pytając o fakty z życia, o których wiemy, że są skorelowane z poziomem umiejętności czytania. Demograficzny opis tej grupy pomógłby natomiast ustalić, w jakich populacjach w pierwszej kolejności należałoby wdrożyć programy wspierające rozwój umiejętności podstawowych osób dorosłych. Obecne badanie jest próbą takiego właśnie opisu i weryfikacji wstępnego zestawu pytań, które mogłyby być włączone do ankiety przesiewowej.

2. BADANIE WSTĘPNE: REANALIZA DANYCH PIAAC

W badaniu wstępnym wykorzystano publicznie dostępne polskie dane z badania PIAAC, zawierające oszacowanie poziomu kompetencji w czytaniu (PVLIT) i pełne dane kwestionariuszowe wykorzystywane w badaniu (<https://www.oecd.org/skills/piaac/publicdataandanalysis>). Pytania w kwestionariuszach PIAAC (background questionnaires) dotyczą informacji demograficznych, ukończonej edukacji i szkoleń, historii zatrudnienia, doświadczenia zawodowego, umiejętności wykorzystywanych poza pracą, a także poglądów na kwestie społeczne. Celem było zarówno ustalenie, które pytania z kwestionariuszy z badania PIAAC są najsilniej związane z umiejętnością czytania, jak i wybór pytań najlepiej przewidujących umiejętność czytania (Chyl i Molak, 2022). Kod stworzony w tej analizie jest dostępny na osf (<https://osf.io/s4t92/>).

Wśród pięciu pytań najsilniej związanych z poziomem czytania ze zrozumieniem były pytania o wykształcenie (B_Q01a), wykorzystywanie umiejętności w życiu codziennym, w tym umiejętności cyfrowe (H_Q05f, H_Q03c, H_Q05a), oraz liczbę książek w domu (J_Q08). Pełną listę pytań po polsku i angielsku, a także ich kody PIAAC, można znaleźć w Aneksie 1.

Rysunek 2 Wykres przedstawiający hasłowo 20 najlepszych pytań wybranych w analizie. Na osi x wartości Shapleya (Lundberg i Lee, 2017). Skala kolorystyczna na osi y wskazuje na wartość cechy



Źródło: Chyl i Molak, 2022

Większość pytań wskazanych przez analizę jest zbieżna ze zmiennymi powszechnie uznawanymi za predykcyjne dla umiejętności czytania. W analizie danych PIAAC z 33 krajów pytania o formalne wykształcenie, liczbę książek w domu rodziców, czytanie książek i inne aktywności związane z czytaniem i liczeniem w życiu codziennym również wykazały największą wartość predykcyjną (Kyröläinen i Kuperman, 2021). Podobne pytania można znaleźć też w kwestionariuszach samoopisowych (Chyl i in., 2024). Wykształcenie matki w obu analizach okazało się istotne dla poziomu czytania, zaś wykształcenie ojca było wskazane jako istotne wyłącznie w analizie międzynarodowej (Kyröläinen i Kuperman, 2021).

Pytania, które zostały wybrane w naszej analizie jako predykcyjne dla czytania, a których nie raportowała międzykrajowa analiza (Kyröläinen i Kuperman, 2021), dotyczyły po pierwsze kwestii stosunkowo abstrakcyjnych (I_Q04b; *Kiedy słyszę lub czytam o nowych pomysłach, próbuję odnieść je do sytuacji z życia, do których mogłyby mieć one zastosowanie*; I_Q04l; *Lubię wymyślać, jak można pogodzić ze sobą różne pomysły*), po drugie zaufania społecznego (I_Q07b; *Jeśli się nie jest ostrożnym, inni ludzie to wykorzystają*), a po trzecie poczucia własnej skuteczności (I_Q06a; *Ludzie tacy jak ja nie mają nic do powiedzenia na temat tego, co robi rząd*). Te pytania nie miały na ogół aż tak dużego wpływu na model, jak pytania znane z literatury. Wyjaśniały jednak niezależną od innych pytań wariancję w teście czytania.

3. WYBÓR PYTAŃ KWESTIONARIUSZOWYCH

Przeprowadzona reanaliza danych PIAAC posłużyła do wyboru listy pytań kwestionariuszowych towarzyszących pomiarowi umiejętności czytania w opracowanym przez nasz zespół teście czytania dla dorosłych, opartym o praktyczne teksty znane z życia codziennego i pytania o ich rozumienie. Szczegółowy opis konstrukcji testu, badania pilotażowego i badania normalizacyjnego można będzie znaleźć w odrębnej publikacji (Chyl-Tanaś i in., w przygotowaniu).

Na podstawie reanalizy polskich danych PIAAC (Chyl i Molak, 2022) włączono do kwestionariusza towarzyszącemu testowi czytania 13 pytań (met_5_education, met_11_finances, met_15_wwwsocial, met_13_motheredu, met_14_wwwshopping, met_16_maths, met_17_health, met_22_workphysic, met_24_workreading, arh_3_booksat14, arh_4_readbooks, arh_5_readtexts, arh_10_socialtrust, arh_11_locuscontrol). W niektórych przypadkach nieznacznie zmieniono ich brzmienie. Nie wszystkie pytania wskazane w analizie znalazły się w kwestionariuszu. W szczególności wykluczono te, które na podstawie jakościowego badania pilotażowego (Chyl-Tanaś i in., w przygotowaniu) oceniono jako zbyt skomplikowane i przez to niezrozumiałe dla części osób badanych – zwłaszcza tych, których dotyczyło ryzyko problemów z czytaniem. Wyeliminowano pytania, które mogły stracić na aktualności. Nieznacznie zmieniono także brzmienie niektórych pytań. Liczba tych włączonych do analizy była więc kompromisem pomiędzy chęcią dogłębnego zbadania sytuacji osób badanych w samoopisie, a możliwym zmęczeniem wywołanym wypełnianiem długiego kwestionariusza.

Zostały do niego włączone również dodatkowe pytania demograficzne (met_0_sex, met_1_year, met_2_lang, met_3_lan-gother, met_4_home, met_6_student, met_7_employment). Pozwalają one ustalić profil demograficzny osób zmagających się z trudnościami w czytaniu. Ponadto, uwzględniając kontekst badań nad dysleksją, wybrano trzy pytania z polskiej wersji kwestionariusza Adult Reading History Questionnaire (ARHQ) o największej mocy dyskryminacyjnej i najsilniej skorelowane z całą skalą (arh_0_ARHQ_learnreading; arh_1_ARHQ_readingskill; arh_2_ARHQ_learnspelling; Bogdanowicz i in., 2015), zebrano również dane o historii dysleksji (arh_8_dyslexia, arh_9_fhd). Na podstawie przeglądu literatury dodano również przetłumaczone na język polski pytanie z Single Item Literacy Screener (SILS) dotyczące korzystania z pomocy przy czytaniu materiałów medycznych (arh_7_readhelp; Brice et al., 2014). Waga SES w badaniach nad czytaniem doprowadziła do dodania dwóch pytań o postrzegany własny status materialny. Zaczepnięto je z kwestionariuszy CBOS (met_11_finances, met_12_finances_worry). Na podstawie badań pilotażowych dołączono pytania o rutynę w pracy (met_23_workroutine), wzrok (met_19_sight), a także długość snu (met_20_sleeptoday, met_21_sleepmonth). Zapytano również o samoocenę czytania (arh_6_readassd) Bezpośrednio po wykonaniu testu czytania, osoby badane oceniały też poprawność rozwiązania testu, swoje skupienie, wysiłek i pośpiech, z którym pracowały, a także narzędzie, z którego korzystały do pracy (komputer, telefon, tablet). Pełna lista pytań zadawanych osobom badanym jest dostępna w Aneksie 2.

4. BADANIE EMPIRYCZNE: KWESTIONARIUSZE I TEST CZYTANIA

4.1. Metoda: uczestnicy badania

Dane empiryczne przedstawione w tym artykule pochodzą z badania normalizacyjnego testu czytania, przeprowadzonego w grupie 400 osób (Chyl-Tanaś i in., w przygotowaniu). Próba została dobrana metodą kwotową, tak aby struktura wieku, wykształcenia i płci odpowiadała danym dotyczącym populacji Polski (GUS, 2021). Osoby badane samodzielnie wykonywały test w przeglądarce – link otrzymały e-mailem i wypełniały towarzyszące mu kwestionariusze. Jedynie 5% osób było nadzorowanych przez badacza w trakcie wykonywania testu. Ich wyniki nie odbiegały od rozkładu wyników w pełnej grupie i są uwzględnione w danych zbiorczych. Wszystkie osoby badane posługiwały się polskim jako pierwszym językiem.

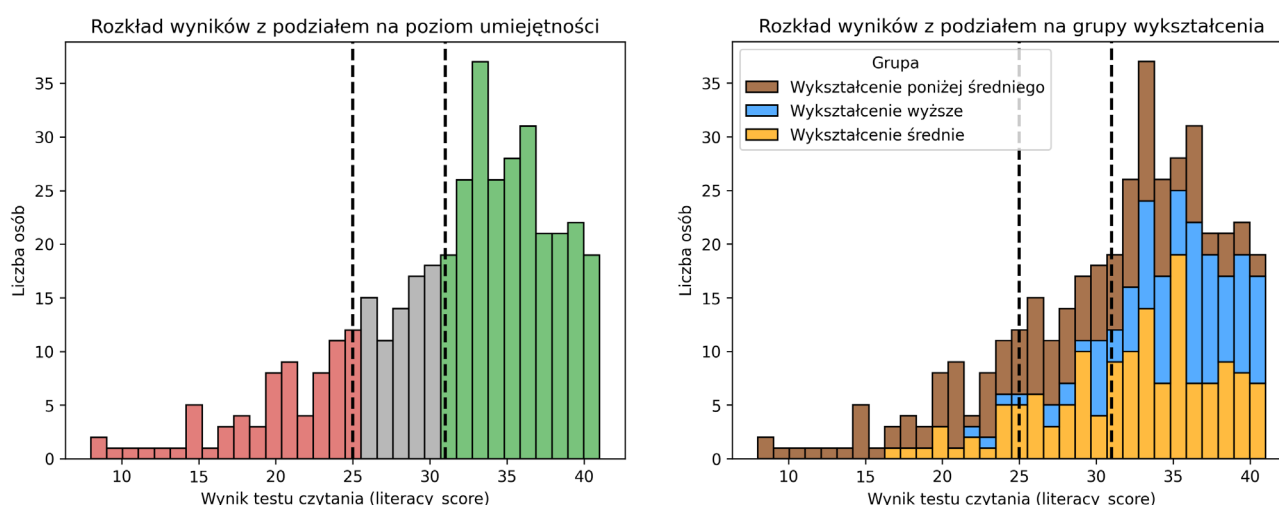
Tabela 1 Cechy demograficzne osób badanych (N = 400). Zastosowano dobór krzyżowy do grupy badawczej (wiek x wykształcenie)

Grupy wiekowe	19-35	36-50	51-65	Mężczyźni	200
Grupy wykształcenia				Kobiety	200
Podstawowe/zawodowe	48	44	56	Wieś	166
Liceum/technikum	47	52	46	Małe miasto	123
Wykształcenie wyższe	35	35	37	Duże miasto	113

4.2. Metoda: test czytania

Wyniki testu czytania są reprezentowane przez zmienną `literacy_score`. W teście można było zdobyć maksymalnie 41 punktów ($M = 31.16$, $std = 6.51$, $max = 41$, $min = 8$). Pominięcie pytania było traktowane jako zła odpowiedź i rzadko stosowane przez osoby badane (0.5% odpowiedzi zostało pominiętych). Czas rozwiązywania testu nie był ograniczony, a średni czas udzielania odpowiedzi na pytania nie był skorelowany z poprawnością w zadaniach ($\rho = -0.06$, $p = 0.22$). Zgodnie z normami testu (Chyl i in., w przygotowaniu), osiągnięcie wyniku 25 punktów lub niższego oznaczało, że poziom wykonania testu przez osobę badaną kwalifikował ją do grupy z ryzykiem trudności z czytaniem ($N = 75$, $M = 20.44$, $std = 4.26$). Osiągnięcie wyniku 31 i wyższego kwalifikowało do grupy skutecznie czytającej ($N = 250$, $M = 35.28$, $std = 2.75$). Punkty 26-30 oznaczają stan pośredni pomiędzy dobrym a złym wykonaniem testu ($N = 75$, $M = 28.16$, $std = 1.46$), co w praktyce edukacyjnej również powinno prowadzić do objęcia takich osób dalszą diagnozą lub wsparciem. Rozkład wyników wraz z podziałem na grupy i poziomy wykształcenia jest przedstawiony na Rys. 3.

Rysunek 3 a) Rozkład wyników w teście czytania w podziale na grupę czytającą dobrze (zielony), źle (czerwony) i wykluczoną z porównań grupowych (szary). b) Rozkład wyników w teście czytania w podziale na poziomy wykształcenia



Program wymuszał udzielenie odpowiedzi na wszystkie pytania kwestionariuszowe. Jako że pominięcie pytania w kwestionariuszach nie było możliwe, dysponujemy kompletem odpowiedzi ($N = 400$) na większość pytań. Wyjątkiem są pytania dotyczące pracy i stanu zdrowia. Osoby, które w pytaniu o pracę (`met_7_employment` "Co najlepiej opisuje Pana//Pani sytuację zawodową?") wybrały odpowiedź "pracuję zarobkowo", otrzymały trzy dodatkowe pytania: `met_22_workphysic` („Jak często w swojej pracy pracuje Pan/Pani fizycznie przez długi okres?”), `met_23_workroutine` ("W jakim stopniu w swojej pracy może Pan/Pani wybierać lub zmieniać kolejność wykonywanych zadań?") oraz `met_24_workreading` („Jak często w swojej pracy Pan/Pani czyta?”). Z tego powodu dla tych trzech pytań dysponujemy 246 odpowiedziami zamiast 400. Zareportowanie bardzo złego stanu zdrowia w pytaniu o ocenę stanu zdrowia (`met_17_health`) odblokowywało dodatkowe pytanie o niepełnosprawność (`met_18_badhealth`), ale tylko jedna osoba udzieliła takiej odpowiedzi. Pytanie o niepełnosprawność zostało więc wyłączone z analizy.

4.3. Metoda: analiza danych

Wynik testu czytania jest zmienną ilościową o rozkładzie lewoskośnym i odbiegającym od normalnego (test Shapiro-Wilka: $W = 0.935$, $p < 0.001$), zaś większość zmiennych kwestionariuszowych jest na skali porządkowej. To zadecydowało o zastosowaniu testów nieparametrycznych. W analizach korelacji wykorzystano współczynnik ρ Spearmana. Z uwagi na dużą liczbę zmiennych (27) korelowanych z wynikiem w teście czytania, zastosowano poprawkę Bonferroniego w celu skorygowania wyników pod kątem wielokrotnych porównań.

Analizę danych przeprowadzono z wykorzystaniem pakietu Scipy (Python 3.11) i JASP (2019). Wszystkie dane wykorzystane w tym badaniu są dostępne na Open Science Framework (<https://osf.io/k4tx8/>).

4.4. Analiza korelacji

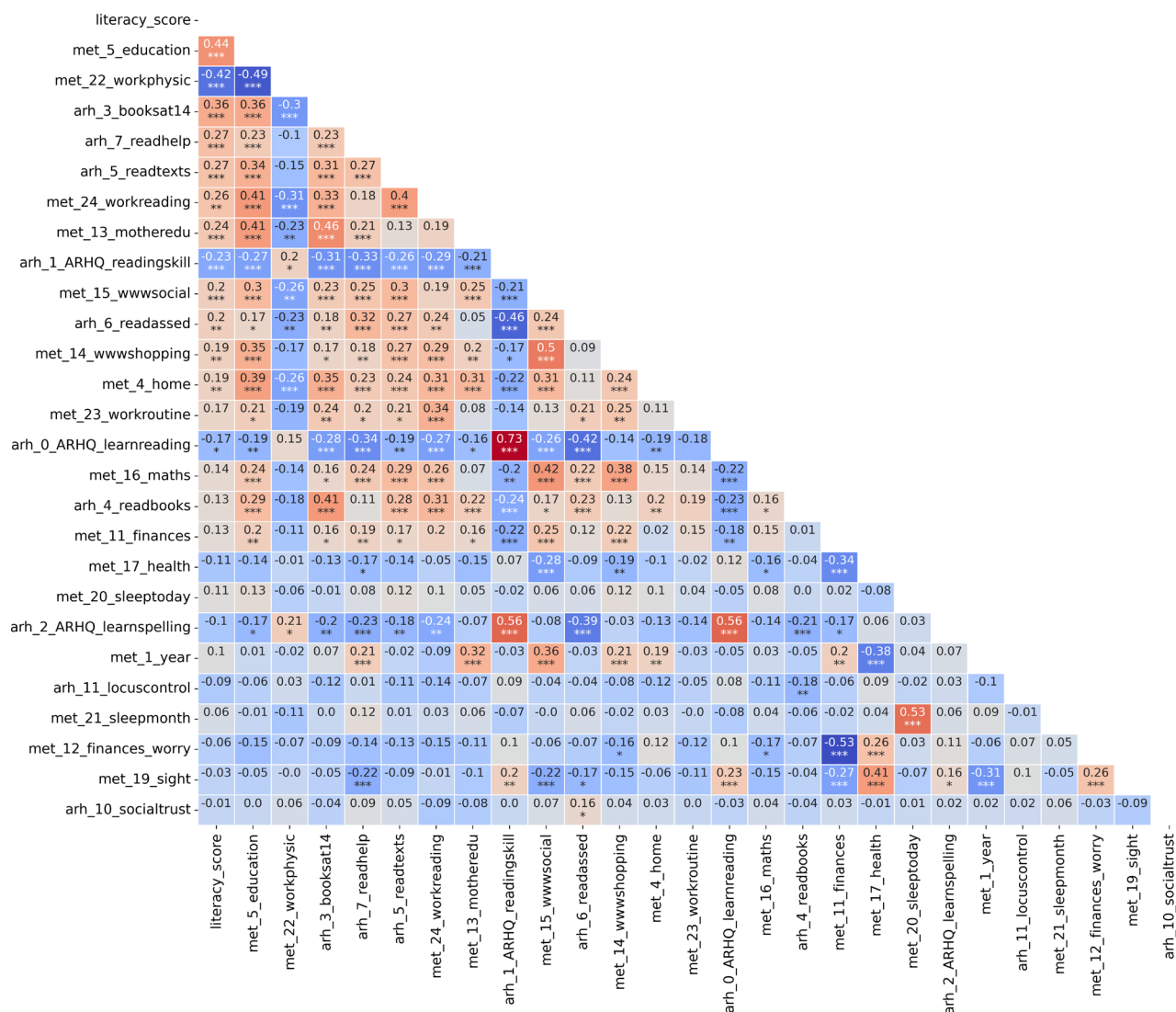
Pytania kwestionariuszowe najsilniej skorelowane ze zmienną `literacy_score` ($\rho > 0.3$) to osiągnięty poziom wykształcenia (`met_5_education`, $\rho = 0.44$, $p < 0.001$), wykonywanie pracy fizycznej (`met_22_workphysic`, $\rho = -0.42$, $p < 0.001$), oraz szacowana liczba książek w domu w wieku 14 lat (`arh_3_booksat14`, $\rho = 0.36$, $p < 0.001$). W dalszej kolejności była to pomoc potrzebna przy czytaniu materiałów medycznych (`arh_7_readhelp`, $\rho = 0.27$, $p < 0.001$) oraz czytanie tekstów

w życiu codziennym (arh_5_readtexts, rho = 0.27, p < 0.001). Następnie (rho ≥ 0.2) było to czytanie w ramach obowiązków służbowych (met_24_workreading, rho = 0.26, p < 0.001), wykształcenie matki (met_13_motheredu, rho = 0.24, p < 0.001), porównanie własnego poziomu czytania w szkole podstawowej do poziomu innych dzieci (arh_1_ARHQ_readingskill, rho = -0.23, p < 0.001), korzystanie z e-maila i komunikatorów w codziennym życiu (met_15_wwwsocial, rho = 0.2, p < 0.001). Mniej istotne zmienne to również własna ocena aktualnego poziomu czytania (arh_6_readassed, rho = 0.2, p < 0.01), korzystanie z zakupów i bankowości internetowej (met_14_wwwshopping, rho = 0.22, p < 0.001), miejsce zamieszkania, z mieszkańcami dużych miast rozwiązującymi test skuteczniej niż mieszkańcy wsi (met_4_home, rho = 0.19, p < 0.01) oraz ocena własnej nauki czytania w szkole podstawowej (arh_0_ArHQ_learnreading, rho = -0.17, p < 0.05).

Pozostałe pytania – o stosowanie obliczeń (met_16_maths), czytanie książek w życiu codziennym (arh_4_readbooks), możliwość zmiany kolejności wykonywanych zadań w pracy (met_23_workroutine), ocenę własnego statusu finansowego (met_11_finances), stan zdrowia (met_17_health), liczbę godzin przespanych danego dnia (met_20_sleeptoday) i miesiąca (met_21_sleepmonth), uczenie się pisania w podstawówce (arh_2_ARHQ_learnsPELLing), wiek (met_1_year), postrzeganie własnej możliwości wpływania na politykę (arh_11_locuscontrol), martwienie się o bezpieczeństwo finansowe (met_12_finances_worry), zaufanie do innych ludzi (arh_10_socialtrust) i wzrok (met_19_sight) – nie okazały się istotnie skorelowane z poziomem czytania. Wszystkie korelacje są przedstawione na rysunku 4, a pełne brzmienie pytań wraz z kodami i kompletem odpowiedzi można znaleźć w aneksie 2.

Poza wysoką korelacją pytań zaczerpniętych z kwestionariusza ARHQ (max rho = 0.73, $p < 0.001$) oraz aktualnym poziomem życia i zmartwieniem o przyszłe finanse (rho = 0.53, $p < 0.001$) odpowiedzi na pytania nie były skorelowane ze sobą wzajemnie silniej niż z czytaniem ze zrozumieniem.

Rysunek 4 **Macierz korelacji.** Zmienne uszeregowane są według wartości korelacji zmiennych kwestionariuszowych z wynikami w teście czytania (literacy score, pierwsza kolumna). Gwiazdki pokazują istotność korelacji (p)



Opis: * : $p < 0.05$, ** : $p < 0.01$, *** : $p < 0.001$. Wartości p dla zmiennej literacy_score uwzględniają liczbę porównań (poprawka Bonferroniego: $p / 27$)

4.5. Analiza regresji

Po przeprowadzeniu analizy korelacji zastosowano analizę regresji, aby sprawdzić, które zmienne kwestionariuszowe są najlepszymi predyktorami zmiennej *literacy_score*. Do analizy włączono wszystkie zmienne ilościowe, a także zmienne nominalne, takie jak płeć, status dysleksji i rodzinnego ryzyka dysleksji, status zatrudnienia. Zbudowano dwa modele, w których uwzględniono wszystkie osoby badane ($N = 400$, model I) oraz tylko osoby pracujące, które odpowiedziały na trzy dodatkowe pytania o rodzaj wykonywanej pracy ($N = 249$, model II).

Model I wskazał istotność czterech predyktorów: poziomu wykształcenia (*met_5_education*, $p < 0.001$), korzystania z pomocy przy czytaniu (*arh_7_readhelp*, $p < 0.001$); liczbę książek w domu w wieku 14 lat (*arh_3_booksat14*, $p = 0.002$) oraz własną ocenę poziomu czytania (*arh_6_readassed*, $p = 0.007$). Model osiągnął wartość R^2 równą 0.330, co oznacza, że wyjaśnia 33% zmienności *literacy_score*. Model był istotny statystycznie: $F(5;399) = 5.644$; $p < 0.001$; $R^2 \text{ adj.} = 0.271$.

Model II wskazał pięć zmiennych: poziom wykształcenia (*met_5_education*, $p < 0.001$); wykonywanie pracy fizycznej (*met_22_workphysic*, $p = 0.002$); korzystanie z pomocy przy czytaniu (*arh_7_readhelp*, $p = 0.007$); wiek (*age*, $p = 0.012$) oraz liczbę książek w domu w wieku 14 lat (*arh_3_booksat14*, $p = 0.049$). Model II osiągnął wartość R^2 równą 0.364, wyjaśniając 36.4% zmienności *literacy_score*. Model był istotny statystycznie: $F(5;245) = 4.267$; $p < 0.001$; $R^2 \text{ adj.} = 0.279$. W obu modelach najważniejsze predyktory cechowała niewielka współliniowość ($\max \text{ VIF} = 1.32$). Podsumowanie obu modeli, wraz ze statystykami opisowymi, jest dostępne w Aneksie 3.

5. DYSKUSJA

Przeprowadzone analizy miały na celu sprawdzenie, jakie zmienne demograficzne, nawyki i charakterystyki związane ze statusem społeczno-ekonomicznym najlepiej przewidują wynik w teście czytania opartym o praktyczne, codzienne materiały. Dysponując takimi wynikami, możemy ustalić, jakie osoby są najbardziej narażone na trudności z czytaniem, i zaproponować wstępny zestaw pytań do wykorzystania w formie kwestionariusza przesiewowego. Zarówno z perspektywy polityki edukacyjnej, jak i praktyki badawczej, takie narzędzie mogłoby okazać się przydatne. Z drugiej strony 33% wyjaśnianej wariancji w podstawowym modelu regresji sugeruje, że tego typu kwestionariusze nie mogłyby zastąpić testów wykonaniowych wprost mierzących umiejętność czytania ze zrozumieniem, co oznacza, że problemy z czytaniem nie są prostym odzwierciedleniem niższego wykształcenia, kapitału kulturowego i raportowanych nawyków związanych z czytaniem.

5.1. Cechy demograficzne

W obu modelach najważniejszą zmienną demograficzną związaną z poziomem umiejętności czytania jest najwyższy osiągnięty etap formalnego wykształcenia ($\rho = 0.44$, $p < 0.001$). Ten wynik jest spójny z badaniami wstępnymi (Chyl i Molak, 2022) i analizą danych z wszystkich krajów biorących udział w badaniu PIAAC (Kyröläinen i Kuperman, 2021). Nie jest on zaskakujący – formalna edukacja ekspozuje na trudniejsze teksty, ćwiczy rozumowanie, ale też rozwiązywanie testów. Warto jednak zwrócić uwagę na dwustronność relacji pomiędzy wykształceniem a czytaniem. Problemy z czytaniem w szkole podstawowej są silnym predyktorem wyboru szkoły średniej (Savolainen i in., 2008). Już na tym etapie kariera akademicka może się zakończyć, zwłaszcza dla osób pochodzących z rodzin o niskim SES (Jheng i in., 2022). Niższe wykształcenie, jak pokazały niniejsze badania, wiąże się też z podejmowaniem pracy, w której raczej nie korzysta się z umiejętności czytania ($\rho = 0.41$, $p < 0.001$). Problemy z czytaniem utrudniają więc dalszą edukację, a przedwczesne przerwanie edukacji może dodatkowo te problemy nasilać.

Wiek był związany z poziomem czytania ze zrozumieniem, ale dotyczyło to wyłącznie grupy pracowników. Pracujące osoby młodsze, nieco lepiej niż pracujące osoby starsze, rozwiązały test czytania ($r = -0.14$, $p = 0.028$). Ta podgrupa ($N = 249$), z której wykluczono osoby na emeryturze, rencie, a także zajmujące się domem, dziećmi i poszukujące pracy, jest nieco młodsza ($M = 41.12$ lat) niż pełna próba 400 osób ($M = 43.03$ lata). W badaniu uwzględniającym dane z PIAAC, IALS i ALL w kilkudziesięciu krajach OECD, wiek był czynnikiem przewidującym poziom czytania ze zrozumieniem (Barrett, Riddell, 2019). Płeć nie miała znaczenia dla poprawności rozwiązania testu.

5.2. Status społeczno-ekonomiczny

Najważniejszą zmienną w tej kategorii jest praca fizyczna wykonywana w ramach obowiązków służbowych ($\rho = -0.42$, $p < 0.001$). Ta zmienna łączyła się z poziomem wykształcenia ($\rho = -0.49$, $p < 0.001$). Pytanie o rodzaj wykonywanej pracy było zadawane tylko osobom, które zadeklarowały, że pracują, zebrane dane pochodziły więc od mniejszej próby ($N = 246$). Do zawodów wykonywanych przez osoby w zbadanej próbie i raportowanych jako te, w których często pracuje się fizycznie przez dłuższy okres, należała praca kucharza, kaletnika, cieśli, rolnika, blacharza czy fryzjera. Osoby badane wykonujące prace, które same określiły jako fizyczne, rzadziej czytały różnego rodzaju materiały związane z pracą, takie jak na przykład raporty lub notatki służbowe ($\rho = -0.31$, $p < 0.001$). Umiejętność efektywnego czytania ze zrozumieniem jest natomiast wspierająca w pracy: sprzyja lepszym i szybszym efektom szkoleń, wspiera komunikację w zespole, zwiększa wydajność pracowników (Bloom i in., 1997).

Pytanie o dużej mocy predykcyjnej dla czytania dotyczyło liczby książek w domu rodzinnym w wieku 14 lat (met_5_boksat14, $\rho = 0.36$, $p < 0.001$). Wraz z pytaniem ("Ile mniej więcej książek było w Pani domu, kiedy miała Pani 14 lat?") pojawiała się wskazówka, pomagająca oszacować tę liczbę ("Proszę nie uwzględniać czasopism, gazet ani podręczników szkolnych. Jeden metr półki to około 40 książek"). Zdecydowana większość (77,25%) osób badanych wskazywała trzy dolne przedziały odpowiedzi, z czego aż 24,5% raportowało, że w domu było 10 książek lub mniej. Liczba książek w domu była też wysoko skorelowana z wykształceniem matki ($\rho = 0.46$, $p < 0.001$) i z czytaniem książek dla przyjemności w dorosłym życiu ($\rho = 0.41$, $p < 0.001$), choć obie te zmienne w małym stopniu przewidywały wynik testu czytania ze zrozumieniem.

Pytanie o liczbę książek w domu jest często zadawane jako pośrednia miara domowego środowiska czytelniczego (home literacy environment), zobiektywizowanego kapitału kulturowego w rozumieniu Bourdieu (objectified cultural capital) oraz SES (Eriksson i in., 2022). Badania wykazały, że liczba książek w domu wyjaśnia wariację w rozumieniu języka i osiągnięciach akademickich, również przy kontroli wykształcenia i zawodu rodziców. Podobnego efektu nie wykazano dla liczby e-booków (Heppt, Olczyk, Volodina, 2022). Osoby z domów, w których jest więcej książek, bez względu na wykształcenie rodziców, ich zawód i klasę społeczną, kształcą się o trzy lata dłużej niż rówieśnicy z domów, w których nie było książek. Ten efekt został wykazany międzykulturowo w 27 krajach (Evans i in., 2010). Są jednak dowody na to, że w pomiarze mogą być systematyczne błędy: uczniowie o niższych osiągnięciach mogą raportować zaniżoną liczbę książek w swoim domu rodzinnym (Engzell, 2021), choć może dotyczyć to też uczniów o wysokich osiągnięciach (Eriksson i in., 2022). Posiadanie książek może wskazywać na proczytelnicze postawy rodzicielskie, ale też ułatwiać wspólne czytanie dzieciom i rodzicom (Ammermeuller i Pischke, 2009). Interwencje oparte na wręczaniu książek na własność rodzinom małych dzieci wydłużają czas spędzany przez rodziców na czytaniu dzieciom na głos, co z kolei może sprzyjać ich rozwojowi językowemu (Sanders i in., 2000).

Trudno ocenić, na ile pytanie o liczbę książek w domu jest podatne na problem aprobaty społecznej (social desirability bias). Znacznie częstsze raportowanie w naszym badaniu bardzo niskiej liczby książek (10 książek lub mniej – 24,5% odpowiedzi) niż liczby bardzo wysokiej (ponad 500 – 4% odpowiedzi) sugeruje, że nie jest to duży problem. Efekt liczby książek w domu i jego związku z umiejętnością czytania jest dobrze udokumentowany, silny i od dawna stosowany w badaniach (Eriksson i in., 2022). Pytanie o książki jest więc dobrym kandydatem dla kwestionariusza przesiewowego.

Inne miary, tradycyjnie związane z SES, nie okazały się szczególnie istotne dla poziomu wykonania testu czytania ze zrozumieniem. Status finansowy oraz martwienie się poziomem życia rodziny w ogóle nie były związane z czytaniem. Wielkość miejsca zamieszkania była słabo skorelowana z wynikiem w czytaniu, nie znalazła się jednak wśród istotnych zmiennych w modelach regresji, podobnie jak zdrowie, wzrok i długość snu. To sugeruje, że dla skutecznego czytania ma znaczenie społeczny, a nie ekonomiczny komponent SES.

5.3. Nawyki czytelnicze

Kolejną istotną zmienną związaną z poziomem wykonania testu okazało się pytanie o pomoc potrzebną przy czytaniu (arh_7_readhelp, „Jak często potrzebuje Pani pomocy przy czytaniu instrukcji, ulotek lub innych materiałów od lekarza lub z apteki?"). To pytanie zostało zapożyczony z Single Item Literacy Screener (Morris i in., 2006, "How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?") i oryginalnie pochodzi z Test of Functional Health Literacy in Adults (TOFHLA; Parker i in., 1995), kwestionariusza tłumaczonego na wiele języków i służącego do oceny health literacy (pl: świadomość zdrowotna, kompetencje zdrowotne). Konstrukty health literacy dotyczy nie tyle samej umiejętności czytania, co raczej motywacji i umiejętności rozumienia i stosowania informacji dotyczących opieki zdrowotnej i profilaktyki (Sørensen i in., 2012). Jest jednak wiele dowodów na to, że ta kompetencja wiąże się bezpośrednio z samą umiejętnością czytania (Morris i in., 2006), ale wiadomo również, że niskie kompetencje w czytaniu często wiążą się z problemami zdrowotnymi (Berkman i in., 2004; Malik, Zaidi i Hussain, 2017). W naszym badaniu w analizie korelacyjnej brak potrzeby korzystania z pomocy przy czytaniu materiałów medycznych był jednak nieco silniej związany z samą umiejętnością czytania ($\rho = 0.27$, $p < 0.001$) niż z problemami zdrowotnymi ($\rho = 0.17$, $p < 0.05$), problemami ze wzrokiem ($\rho = 0.22$, $p < 0.001$) i wiekiem ($\rho = 0.21$, $p < 0.001$). Jako jedyna spośród związanych ze zdrowiem zmiennych przewidywała też wynik w teście czytania w obu modelach regresji.

Pytanie z SILS dobrze obrazuje funkcjonalny aspekt kompetencji rozumienia tekstu. Nie wszystkie osoby z trudnościami w czytaniu mogą same uznawać się za "potrzebujące pomocy". Jedni mogą uważać, że pisemne materiały dotyczące zdrowia (np. ulotki leków) nie zawierają istotnych dla nich informacji, inni mogą nie mieć w zwyczaju prosić o pomoc lub nie mają kogo o nią prosić i po prostu nie biorą tego pod uwagę. Połowa osób ankietowanych odpowiedziała, że "nigdy" nie potrzebuje pomocy przy czytaniu. Jednak osoby potrzebujące pomocy "czasem", "często" i "zawsze" (15,75%) powinny jak najpilniej zostać objęte wsparciem. Takie wsparcie mogłoby wiązać się z podnoszeniem ich kompetencji, ale również upraszczaniem tego typu materiałów (Malik, Zaidi i Hussain, 2017). Grupa, która wskazała, że potrzebuje pomocy, była łatwa do zidentyfikowania, o metapoznawczej świadomości własnych kompetencji, być może więc również bardziej zmotywowana do ich podnoszenia. Zarówno w kwestionariuszu przesiewowym, jak i w praktyce opieki zdrowotnej, takie lub podobne pytanie powinno być już przyjętym standardem. Wiele osób poddawanych procedurom medycznym i przyjmujących leki może uzyskiwać istotnie gorsze efekty w związku z niedostatkami w swojej umiejętności czytania.

W I modelu regresji z udziałem pełnej grupy osób badanych istotnym pytaniem okazało się również pytanie samoopisowe (arh_6_readassess: "Jak ogólnie ocenia Pani swoją umiejętność czytania?"). W tym pytaniu zdecydowana większość osób

badanych oceniła swoją umiejętność czytania jako "bardzo dobrą" (39%) i "dobrą" (48%). Zwłaszcza biorąc pod uwagę małe zróżnicowanie wyników, te osoby, które same uznają swoją umiejętność czytania za niewystarczającą, powinny być objęte natychmiastowym wsparciem. Metapoznawczy dostęp do wiedzy o lukach w swoich umiejętnościach jest już przecież ułatwieniem dla wszelkich działań związanym zresztą bezpośrednio z poziomem kompetencji w czytaniu (Amzil, 2014). Z drugiej strony wiele osób o niskich kompetencjach uznaje je za co najmniej "przeciętne" i nie odczuwa lub nie raportuje problemów w tym zakresie.

Inne pytania bezpośrednio dotyczące nawyków czytelniczych nie okazały się istotne w modelach regresji w przewidywaniu poziomu czytania ze zrozumieniem, choć niektóre były z nim w jakimś stopniu skorelowane. Dotyczy to raportowanego czytania książek (arh_4_readbooks) i innych tekstów (arh_5_readtexts) w życiu codziennym, a także czytania w pracy w przypadku osób pracujących (met_24_workreading). Podobnie funkcjonowały trzy pytania zaczerpnięte z Adult Reading History Questionnaire oraz pytania dotyczące innych, pośrednio związanych z czytaniem, nawyków, takich jak wykorzystywanie e-maila i social mediów do komunikowania się z innymi, a także robienia zakupów przez internet. Dobry kwestionariusz przesiewowy dotyczący trudności z czytaniem powinien być możliwie krótki – sugerowane byłoby więc wybranie tylko najważniejszych pytań o potwierdzonej mocy predykcyjnej.

5.4. Dysleksja rozwojowa i rodzinne ryzyko dysleksji

Osoby z trudnościami w nauce czytania zdiagnozowanymi jako dysleksja rozwojowa gorzej się uczą, częściej wypadają z systemu edukacji i osiągają niższy poziom wykształcenia, a ich nauczyciele przejawiają utajone stereotypy i niechęć, co wpływa na oceny i nastawienie do uczniów (Hornstra i in., 2010). Ten problem dotyczył części osób badanych w tej próbie, choć zaledwie 17 z nich zaraportowało formalną diagnozę dysleksji (4,25%), a kolejne 24 osoby (6%) uznały, że mogą mieć dysleksję pomimo braku formalnej diagnozy. Krótka definicja dysleksji ("Dysleksja to poważne trudności z nauką czytania i czytaniem") została dodana do pytania o status dysleksji, aby upewnić się, że osoby badane w podobny sposób interpretują to pojęcie. Zgłoszone 10,25% osób z dysleksją w próbie odpowiada rozpowszechnieniu dysleksji w populacji ogólnej, szacowanemu na ok. 10% (Snowling, Hulme, Nation, 2020).

I choć w nieraportowanym w tej pracy teście decyzji leksykalnej osoby z dysleksją rzeczywiście wypadały nieco gorzej niż grupa kontrolna, rozpoznając słowa i pseudosłowa wolniej i mniej poprawnie (Chyl i in., w przygotowaniu), status dysleksji i jej rodzinnego ryzyka nie miał wpływu na wynik w teście czytania ze zrozumieniem. Jest to wynik spójny z poprzednimi badaniami. Choć dorośli z historią problemów z czytaniem wypadają gorzej w różnych miarach związanych z dekodowaniem i fonologią, nie różnią się w zakresie czytania ze zrozumieniem od grupy kontrolnej, co wykazała metaanaliza uwzględniająca również poziom przejrzystości ortograficznej języka (Reis i in., 2020). W raczej przejrzystych ortografiach, takich jak polska, deficyty dorosłych osób z dysleksją są jeszcze mniej wyraźne (Reis i in., 2020). Z jednej strony to optymistyczna konkluzja – trudności z czytaniem na etapie szkolnym nie determinują późniejszego losu dorosłych. Z drugiej niepokoi fakt, że pomimo adekwatnej nauki czytania w szkole podstawowej, w dorosłości umiejętność rozumienia tekstu może nie osiągnąć oczekiwanego poziomu. Dysleksja rozwojowa jednak zdecydowanie nie jest tym samym co trudności z czytaniem w dorosłości.

5.5. Nieistotne czynniki

Poza omówionymi pytaniami, w badaniu pytano o szereg innych kwestii wybranych na podstawie przeglądu literatury, ale również rozmów z osobami badanymi w trakcie wywiadów poznawczych w jakościowym badaniu pilotażowym. W tych pytaniach nie wykazano żadnego efektu w analizie regresji, ale również w analizie korelacyjnej skorygowanej pod kątem liczby porównań. Do takich pytań należy to o poczucie umiejscowienia kontroli w kontekście własnego wpływu na politykę (arh_11_locuscontrol: "W jakim stopniu zgadza się Pani ze zdaniem: «Ludzie tacy jak ja nie mają nic do powiedzenia na temat tego, co robi rząd?»"). W dużej metaanalizie opublikowanej w zeszłym roku ta zmienna wysoko korelowała z poziomem czytania ze zrozumieniem ($r = 0.45$, $p < 0.001$; Stanek i Ones, 2023), została też wybrana z reanalizy danych PIAAC (Chyl i Molak, 2022). Być może jednak zadane pytanie nie było adekwatne i wcale nie mierzyło założonego konstruktu. Podobne wyniki dało pytanie o zaufanie społeczne (arh_10_socialtrust, "W jakim stopniu zgadza się Pani ze zdaniem: «Jeśli się nie jest ostrożnym, inni ludzie to wykorzystają?»"). To pytanie również zostało wskazane w reanalizie danych PIAAC. Zaufanie społeczne jest łączone ze zdolnościami pozawczymi (Hooghe, Marien i De Vroome, 2012), choć może być też tłumaczone poprzez zmienne środowiskowe (Weinschenk i Dawes, 2019). W naszym badaniu nie okazało się w każdym razie istotne dla czytania.

Pewnym zaskoczeniem był brak istotnego związku pomiędzy czytaniem a raportowanym stosowaniem prostej matematyki w życiu codziennym. Jest wiele dowodów na związki pomiędzy umiejętnością czytania i liczenia u dorosłych, choć nowe badania pokazują też rozdzielność tych dwóch czynników (Vágvolgyi i in., 2024). Pytania o zwykłą długość snu, a także liczbę godzin przespanych poprzedniej nocy, nie miały związku z wynikiem w teście. Te pytania zostały dodane po jakościowym badaniu pilotażowym, w którym osoby badane z grupy ryzyka raportowały zmęczenie, niedospanie i przepracowanie. Nie wykazały jednak nawet słabej korelacji. Podobnie pytanie o wzrok i stan zdrowia – nie są to istotne czynniki dla czytania w tym badaniu, choć jak już wiemy, jest nim samo health literacy. Żadnego związku z czytaniem nie miały też raportowane finanse i stosunek do domowego budżetu (pytania CBOS). Nie jest oczywiste, że wszystkie te czynniki nie mają żadnego związku z poziomem umiejętności czytania, ale w tym badaniu takie związki nie zostały wykazane.

6. WNIOSKI

To badanie stanowi próbę opisu grupy ryzyka dla problemów z czytaniem w dorosłości, a także wyboru najbardziej predykcyjnych dla umiejętności czytania pytań. Wśród nich są pytania o poziom wykształcenia, postrzeganie własnej kompetencji w czytaniu, potrzebę pomocy przy czytaniu materiałów medycznych, liczbę książek w domu rodzinnym oraz rodzaj wykonywanej pracy u osób zatrudnionych. W obliczu rozpowszechnionego problemu z czytaniem ze zrozumieniem u dorosłych Polaków i Polek (Chłóń-Domińczak i in., 2015), kwestionariusz ułatwiający identyfikację osób dorosłych z ryzykiem problemów z czytaniem jest pilną potrzebą dla polityki edukacyjnej, ale również dla praktyki opieki zdrowotnej. Jednocześnie taki kwestionariusz przesiewowy nie może zastąpić testu wykonaniowego, wprost mierzącego umiejętność praktycznego wykorzystywania umiejętności czytania w życiu – wyjaśniana w tym badaniu wariancja to 33%.

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ZAŁĄCZNIKI

Aneksy 1-3 do artykułu są dostępne online pod adresami:

Aneks 1

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Aneks 2

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The interaction between bullying, socioeconomic background and attitudes on educational achievements: Evidence from the Balkan countries with TIMSS 2019 data

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Abstract

Despite substantial evidence about the negative impact of bullying on academic achievement, there is relatively scarce literature on the issue of bullying in the Balkan countries, which is an area that is prone to violence also in schools. In this study, we use data gathered from the 2019 TIMSS assessment of 4th grade students in eight Balkan countries, and implement mixed models of achievements in mathematics and science as well as student- and school-level explanatory variables to determine the interactions between these variables and bullying. The results indicate that students who are more frequently targets of bullying experience a stronger positive impact of confidence and socioeconomic background, while there is no significant impact of the school's emphasis on success and lower shortages of resources. Nonetheless, while student-level indicators generally have a lower impact on achievements than school-level ones, student-level confidence has a stronger effect than the average confidence at the school level. Our results provide evidence on possible interventions against bullying for policymakers in the region.

Keywords: **Bullying, Balkan countries, TIMSS 2019, achievements.**

Zależności między prześladowaniem, pochodzeniem społeczno-ekonomicznym i postawami wobec osiągnięć edukacyjnych: Dowody z badania TIMSS 2019 z krajów bałkańskich

Streszczenie

Pomimo wielu dowodów na negatywny wpływ przemocy rówieśniczej na wyniki w nauce, istnieje stosunkowo niewielka literatura dotycząca tego zjawiska w krajach bałkańskich, które są obszarem podatnym na przemoc również w środowisku szkolnym. W niniejszej pracy wykorzystujemy dane zebrane w międzynarodowym badaniu osiągnięć TIMSS 2019 przeprowadzonym wśród uczniów klasy czwartej w ośmiu krajach bałkańskich. W analizach wykorzystujemy modele wielopoziomowe, w których zmiennymi wyjaśnianymi są osiągnięcia uczniów w matematyce i naukach przyrodniczych, a zmiennymi objaśniającymi są czynniki na poziomie ucznia i szkoły. Badamy interakcje między tymi zmiennymi a zjawiskiem przemocy rówieśniczej. Wyniki wskazują, że im częściej doświadczają jej uczniowie, tym silniej odczuwają pozytywny wpływ pewności siebie oraz statusu społeczno-ekonomicznego. Nie zaobserwowano istotnego wpływu nacisku szkoły na sukces i mniejszych niedoborów zasobów. Mimo iż wskaźniki na poziomie ucznia mają zwykle mniejszy wpływ na osiągnięcia niż wskaźniki na poziomie szkoły, indywidualna pewność siebie ucznia ma silniejszy efekt niż średnia pewność siebie w szkole. Nasze wyniki dostarczają dowodów wskazujących możliwe obszary interwencji przeciw przemocy rówieśniczej dla decydentów w regionie.

Słowa kluczowe: **Przemoc rówieśnicza, dręczenie szkolne, kraje bałkańskie, TIMSS 2019, osiągnięcia edukacyjne.**

1. INTRODUCTION

Bullying in schools is a pervasive issue that has garnered significant attention from researchers and policymakers alike (Smith, Ananiadou & Cowie, 2003). It is well-established that bullying can have long-lasting negative effects on the psychosocial health of both victims and perpetrators. Victims and perpetrators of bullying often experience a decline in mental health, which can persist into adulthood, manifesting in lower psychosocial health, as well as affluence (Wolke, Copeland, Angold, & Costello, 2013; Flaspohler, Elfstrom, Vanderzee, Sink, & Birchmeier, 2009). The negative impact of bullying on educational achievement has been consistently documented across various countries and academic domains. For instance, studies by Murillo and Román (2011), Ponzo (2013), Van der Werf (2014), as well as Al-Raqqad, Al-Bourini, Al Talahin, and Aranki (2017) provide robust evidence that bullying correlates with lower academic performance. The psychological stress caused by bullying can lead to a negative perception of the educational environment, and this impacts learning and therefore achievements.

Despite the large amount of literature on bullying globally, there is a relative scarcity of studies focused on the Balkan countries. The limited evidence available, such as the work by Kovačević (2019), suggests that schools in this region are particularly susceptible to violence, including bullying. This susceptibility is likely influenced by broader societal issues, including political instability, economic hardship, and cultural attitudes towards violence. Nikolaidis et al. (2018) and Kovačević (2019) indicate that the prevalence of bullying in Balkan schools is substantially high, further emphasizing the need for effective interventions. The high incidence rates in this region may reflect underlying societal norms that may not be able to limit and prevent aggressive behaviour, making it more challenging to implement anti-bullying policies that are effective in other contexts.

This paper investigates the relationship between student bullying, socioeconomic background, and student attitudes in influencing educational outcomes. Specifically, it explores how bullying influences the relationship between a student's socioeconomic status, their confidence, and their academic achievement. The analysis uses data from the 2019 Trends in International Mathematics and Science Study (TIMSS) assessment of 4th grade students (Mullis et al., 2020), with a focus on the Balkan countries that took part in the assessment. By focusing on this geographic region, the study aims to contribute to the growing body of research that examines how factors such as bullying can impact academic performance in underrepresented contexts in educational research.

2. LITERATURE REVIEW

Emerging research has begun to explore the relationship between bullying and socioeconomic background, revealing that students from more affluent backgrounds may be more likely to engage in bullying behaviour, targeting their less affluent peers (Silva et al., 2024). This dynamic can be understood through the lens of social dominance theory, which posits that individuals or groups with more resources or power may assert their dominance over those with fewer resources. Jansen et al. (2012) also observed that disadvantaged students are more frequently targeted by bullies, although this pattern does not seem to be significantly influenced by the overall socioeconomic profile of the school. This finding suggests that individual socioeconomic status may play a critical role in bullying dynamics.

However, Tippet and Wolke's (2014) meta-analysis highlights that the relationship between socioeconomic status and bullying is complex and non-linear, suggesting that all students, regardless of their socioeconomic background, are at risk of being involved in bullying, either as victims or perpetrators. This complexity underscores the need for interventions designed on evidence that address bullying across all socioeconomic strata. Furthermore, it is also important to consider gender gaps in bullying, which usually sees boys as being the victims and perpetrators more often (see for instance Cosma et al., 2022). Yet, this could also affect achievement gaps. For instance, the results from the 2019 edition of TIMSS indicate that boys tend to outperform girls in mathematics, while the opposite is observed in science (Mullis et al., 2020). It is therefore important to assess if and how gaps in bullying can influence gaps in achievements, considering the role of gender influencing both aspects.

Socioeconomic status is not only a factor in bullying but also moderates the broader school climate, influencing the incidence of bullying and violence in schools (Deniz, 2015; Jain et al., 2018). A positive school climate can reduce the adverse effects of a low socioeconomic background on student achievement (Berkowitz et al., 2017). This could be due to more supportive relationships and sense of community, as well as a safe physical environment; for this reason, we investigate to what extent the school climate (measured through bullying) can interact with socioeconomic background and school in influencing achievements.

Furthermore, the role of student attitudes and motivations has been found to be a significant predictor of academic success, independent of socioeconomic status (Bellibaş, 2016). Among them, student confidence is one of the factors that are associated with increased academic achievements (Stankov, 2012), including in the TIMSS assessment itself (Mullis et al., 2020). However, findings suggest that the relationship may be reversed, with achievements being the drivers of a higher confidence in a given domain (Tripathy & Srivastava, 2012). We include this aspect by adding indicators relating to attitudes (such as student confidence or school emphasis on academic success) in our investigation. Another important aspect relates to the urban location of the school, which is usually associated with higher achievements as a result of increased socioeconomic background compared to rural areas (Betancur et al., 2024).

In addition to achievement and social relationships, bullying can also negatively affect the attitudes that students have toward school (Demanet & Van Houtte, 2012; Najam & Kashif, 2018). The social isolation and stigmatization that often accompany bullying can exacerbate feelings of disengagement from the school community, making it even more difficult for victims to succeed academically. However, research also suggests that interventions aimed at supporting student confidence can be effective in reducing bullying and its negative consequences (Beran & Shapiro, 2005). Therefore, it is important to evaluate to what extent bullying and student attitudes—such as confidence—can interact in their effect on academic achievements.

School-based policies that involve teacher interventions have been shown to mitigate the impact of bullying, though the effectiveness of these interventions often depends on the teacher's confidence and willingness to address the issue (Novick & Isaacs, 2010; Maynes & Mottonen, 2017). Moreover, Veenstra et al. (2014) emphasize the role of the classroom environment, suggesting that teachers can play a crucial role in preventing bullying. Overall, in our analysis we include variables relating to school-level policies and attitudes that relate to the availability of resources and climate, namely shortages and emphasis on academic success. The aim is to check whether they influence achievements both directly and through interaction with student bullying.

An aspect that could influence the emergence of bullying is the creation of within-school hierarchies. In this respect, social dominance theory (Sidanius & Pratto, 1999) could be used to investigate bullying dynamics in schools. Previous research has shown that bullying behaviours are associated with individual orientations towards social dominance (Reijntjes et al., 2013; Goodboy et al., 2016; Volk et al., 2021). This can also have an impact on school environment more generally, as well as on relationships between peers in school (Kiefer & Ryan, 2008; Hawley, 2015). Therefore, it is important to investigate if and how bullying can influence educational achievements, both directly and as an influencer of other variables.

3. DATA AND METHODOLOGY

This study uses data gathered from the 2019 edition of the TIMSS assessment, in particular from the student questionnaire, which includes a survey of competencies in mathematics and science, as well as inquiries surveying the attitudes of students themselves. Furthermore, we include indicators gathered from the principal's questionnaire, allowing us to add school-related indicators to our analysis. We included the data gathered for 4th grade students in the Balkan countries that took part in the assessment, namely Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Kosovo, Montenegro, North Macedonia, and Serbia.

The TIMSS survey administers a large number of items to participants, covering a broad range of topics, which are later used to build scales that are indicative of such topics. In our analysis, we used some of these scales to investigate how they interact with bullying in their association with academic achievements. Table A1 in the Appendix presents the measures included in our analysis, together with the associated items administered to students in the TIMSS questionnaires. It should be noted that these variables are based on reports by students and school principals, which could decrease their reliability, since they are not based on objective indicators or measurements. Moreover, the measure of bullying is based entirely on items relating to being a victim of bullying, which does not allow the perpetrators of bullying to be considered as well. This, in principle, could have an impact on the reliability of the findings, since the results could be biased due to the selection of the sample or the subjective beliefs or attitudes of the participants. While the sample selection bias is reduced through the use of sample weights (see below), it is important to stress that the results should be read bearing in mind the lack of the absolute objectivity of the measures.

In our analysis, we implemented mixed models and used educational achievements as the dependent variable, adding a number of indicators as independent variables. In particular, we included the scales of student bullying, availability of home resources, and student confidence in mathematics or science (separately for the two domains) as measured by the TIMSS assessment. As an additional control variable, we also included student gender in our models. From the principal's questionnaire, we included shortages in mathematics or science lessons (separately for the two domains), and emphasis on academic success. We also added school location as an additional control variable, coded as "Urban" for schools that are in densely populated areas, suburban, or medium-sized cities.

All the indicators have been standardized and centred on students, except for the dummy variables of gender and school location. The standardization of the dependent variables also allows us to compare the magnitude of the impact of each of the variables within and between educational domains. Moreover, the choice of the explanatory variables allows us to have two indicators of attitudes, namely student confidence and the school's emphasis on academic success, and two indicators of affluence, namely student availability of home resources and the school's resource shortages.

The data pooling is based on the assumption of the general homogeneity in the Balkan countries, due to regional characteristics, as well as on the aim of the research, which focuses on general regional trends. However, this also comes with the limitation that some sensitivity is lost at the country-level, as heterogeneity between countries still exists. To reduce the potential impact of this bias, we included country-fixed effects in the mixed models, thus acquiring results that are broadly representative of the regional trends, but that also take into account the possible differences found between the countries in the region. Moreover, it should also be stressed that the analysis is based on cross-sectional data, which in practice does not allow for definitive causal inferences, but only to infer associations between variables. While this still provides important

results to inform policy recommendations, the impossibility to infer causal relationships should be highlighted as the findings may not reflect direct effects but rather just correlations among indicators.

To analyse the data, we employed linear mixed-effects models (LMMs) to account for both fixed and random effects. The fixed effects included the student- and school-level indicators, while the random effects captured the variability among schools. The general form of the model is given by:

$$y_{ij} = 0 + k = 1pkx_{ijk} + u_i + ij$$

where y_{ij} represents the response variable for observation j in group i , 0 is the fixed intercept, k are the fixed-effect coefficients associated with the predictor variables x_{ijk} , u_i is the random effect for group i assumed to follow a normal distribution with mean 0 and variance u^2 , and ij is the residual error term with variance u^2 . Model fitting was performed using Stata software, and the significance of the fixed effects was assessed through likelihood ratio tests.

We implemented six mixed model specifications, including the survey weights of the TIMSS assessment, to obtain a measurement that is representative of the entire student population of the countries surveyed, which we considered a single pooled dataset but including country-fixed effects. In the mixed models, student-level weights (computed as the product of the student weight factor $WGTFAC3$ and the student weight adjustment factor $WGTADJ3$) are included as level-one weights in order to give the same weight to all participants regardless of the country, while school-level weights (computed as the product of the student weight factor $WGTFAC1$ and the student weight adjustment factor $WGTADJ1$) are included as level-two weights—school-level weights are rescaled to sum up to the school size in the specification of the mixed model.

To account for the impact of school- and student-level variables, we computed school averages of the variables measured at the student level (i.e., bullying, availability of home resources, and confidence), and included them among the school-level indicators. Furthermore, we computed within-school measures of these indicators as the gap between the individual level and the school average, and included them among the student-level indicators. The interactions included in the mixed models are computed using within-school bullying, and within-school variables when available (i.e., in the case of home resources and student confidence).

In all the mixed models, the dependent variable is student achievements (in mathematics or science), which are measured through plausible values in the TIMSS assessment. We ran the models using only the first plausible value, as this allows the analysis to be simplified. Although the imputation measurement error is not accounted for, it is usually negligible, so we can treat the results as statistically reliable (Jerrim et al., 2017). In model specification 1, we only include the indicators specified above. In each of model specifications 2–5, we include the interaction terms of the student-level indicator of bullying and the four variables that measure attitudes and affluence (namely student confidence, availability of home resources, school's emphasis on academic success, and resource shortages). In model specification 6, we include all the interaction terms together. We compute variability at the school level, given that it is the environment in which bullying may take place in the most impactful way.

4. RESULTS

This section presents the results of our mixed models. Table 1 shows the results for 4th grade students in mathematics, while Table 2 shows the results for 4th grade students in science. The results are consistent overall when comparing mathematics and science, indicating that the domain of learning does not appear to have a substantial influence over the significance of the relationships between the main variables. This suggests that the underlying factors affecting student achievement are relatively stable across different subject areas, reinforcing the idea that broader educational and environmental influences may play a more dominant role than domain-specific factors.

As could be predicted, student- and school-level indicators are associated with achievements in the most intuitive way: in particular, lower bullying, higher availability of home learning resources, and higher confidence are all associated with higher student achievements, both when considered at the school- and at the student-level. This confirms previous literature suggesting that a supportive and resource-rich environment fosters better academic performance. It also highlights the need for schools to implement anti-bullying programs and ensure adequate learning materials at both the school and home environments. Nonetheless, shortages do not present any significant coefficient, while emphasis on academic success is positively associated only with achievements in science.

It is also worth noting that female students achieve significantly lower scores in mathematics, but not in science. This finding aligns with previous research on gender disparities in STEM subjects, suggesting that societal or educational factors may contribute to these differences in mathematics performance. Further investigation into classroom dynamics, teacher expectations, and cultural influences may be needed to fully understand these patterns.

Interestingly, it can also be seen how being in an urban school is not associated with mathematics achievements, and is negatively associated with science scores. This result is somewhat unexpected, as urban schools could be assumed to provide better educational resources. One possible explanation is that urban environments introduce additional variables that may counterbalance any advantages in infrastructure or teaching quality. These results are particularly interesting, since it could instead be expected that significant gaps would emerge between students in urban and rural schools based on resource

shortages; however, the inclusion of further control variables and especially country-fixed effects could explain why these variables are not significant. This suggests that educational inequalities may be more nuanced than traditionally assumed, and that country-level policies or socio-economic factors might be influencing the patterns observed in student achievements.

Crucially, among the interactions, only student confidence retains significance both for mathematics and science and among model specifications. This finding underscores the importance of psychological and emotional factors in academic success. Confidence appears to be a stable and strong predictor of achievement, suggesting that interventions aimed at boosting student self-efficacy could have lasting positive effects across different learning domains. In mathematics, the availability of home learning resources and confidence present negative interactions with bullying—the first two variables are the only ones that are statistically significant and retain their significance when all the interactions are accounted for at the same time (model specification 6). In science, as noted, only confidence presents a significant interaction with bullying and maintains it when all the interactions are accounted for at the same time (model specification 6). This reinforces the idea that confidence is not only a direct predictor of achievement but also plays a buffering role against negative experiences such as bullying. Students with higher confidence may be more resilient to peer victimization, allowing them to maintain their academic performance despite challenges.

Table 1 *Mixed models of mathematics achievements*

	(1)	(2)	(3)	(4)	(5)	(6)
School-level variables						
Lower bullying	20.7***	20.7***	20.4***	20.6***	20.7***	20.4***
Home resources	43.1***	43.1***	43.1***	43.1***	43.1***	43.1***
Confidence in mathematics	11.4*	11.5*	11.6*	11.4*	11.4*	11.7*
Lower resource shortages	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Emphasis on success	3.8	3.8	3.8	3.9	3.8	3.8
Urban school	-6.3	-6.3	-6.3	-6.3	-6.3	-6.3
Student-level variables						
Lower bullying	2.4***	2.3**	2.0**	2.4***	2.3***	1.9**
Home resources	21.8***	21.9***	21.8***	21.8***	21.8***	21.9***
Confidence in mathematics	28.8***	28.8***	28.9***	28.8***	28.8***	28.9***
Gender (female)	-4.9***	-4.9***	-4.9***	-5.0***	-4.9***	-4.9***
Interactions of student-level bullying						
Student-level home resources		-2.9**				-2.0*
Student-level confidence in mathematics			-3.4***			-3.0***
Emphasis on success				-0.9		-0.8
Lower resource shortages					-1.1	-0.8
Constant	528.1***	528.1***	528.8***	528.1***	528.1***	528.6***
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
School-level variance	1027.5	1026.5	1028.2	1027.2	1027.3	1027.1
Student-level variance	3592.7	3589.6	3585.0	3592.1	3591.8	3582.5
No. of observations	31 799	31 799	31 799	31 799	31 799	31 799

Source: TIMSS 2019. *indicates $p < 0.05$, **indicates $p < 0.01$, ***indicates $p < 0.001$

Table 2 *Mixed models of science achievements*

	(1)	(2)	(3)	(4)	(5)	(6)
School-level variables						
Lower bullying	17.9**	17.9**	17.7**	17.8**	17.9**	17.7**
Home resources	52.4***	52.4***	52.4***	52.4***	52.4***	52.4***
Confidence in science	10.0*	10.0*	10.1*	10.0*	10.0*	10.1*
Lower resource shortages	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1
Emphasis on success	4.8*	4.8*	4.7*	4.8*	4.8*	4.7*
Urban school	-9.3*	-9.3*	-9.3*	-9.3*	-9.3*	-9.3*
Student-level variables						
Lower bullying	4.3***	4.2***	4.0***	4.2***	4.2***	3.9***
Home resources	24.7***	24.8***	24.7***	24.7***	24.7***	24.8***
Confidence in science	19.0***	19.0***	19.0***	18.9***	18.9***	18.9***
Gender (female)	0.0	0.0	0.1	0.0	0.0	0.1
Interactions of student-level bullying						
Student-level home resources		-1.3				-0.8
Student-level confidence in science			-2.1**			-1.9*
Emphasis on success				-1.1		-1.0
Lower resource shortages					-1.1	-0.9
Constant	531.7***	531.7***	532.0***	531.7***	531.7***	532.0***
Country-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
School-level variance	1087.0	1086.3	1084.6	1086.9	1086.9	1084.1
Student-level variance	4157.2	4156.7	4154.8	4156.4	4156.4	4153.3
No. of observations	31 641	31 641	31 641	31 641	31 641	31 641

Source: TIMSS 2019. *indicates $p < 0.05$, **indicates $p < 0.01$, ***indicates $p < 0.001$

The comparison of school- and student-level variances also show how most of the variance is found between students, i.e., within schools, as opposed to between schools. Yet, variance between schools accounts for around 20% of the total variance, thus still showing somewhat large disparities between schools, which could be attributed to different teaching methods, classroom environments, or school resources. This indicates that while student-level differences are the primary drivers of achievement gaps, school-level factors still play a meaningful role. Policymakers should consider strategies that address both individual student needs and broader school-wide improvements to maximize educational equity.

Moreover, it can be seen that indicators such as bullying and home resources show larger coefficients when considered at the school-level, rather than the student-level. However, confidence shows the opposite trend, highlighting the importance of student self-efficacy within the school—something that is also confirmed by the results of the interactions with bullying. This suggests that while material resources are more influential at the institutional level, personal psychological attributes, like confidence, are more impactful at the individual level. Schools should, therefore, adopt a dual approach that enhances both tangible resources and student psychological well-being.

The finding that the interaction terms of student variables are negative and statistically significant indicates how, everything else being equal, students who are more subjected to bullying from their peers (and who therefore have a lower bullying scale) receive a stronger benefit from increased availability of home learning resources and confidence in the domain of mathematics, and confidence in the domain of science, but not necessarily from an increased emphasis on academic success and lower shortages of resources. Interestingly, while all the interactions are negative in magnitude, only confidence maintains its

significance when all the terms are considered together. This suggests that confidence serves as the most robust protective factor against the negative effects of bullying. Unlike external factors that may provide indirect benefits, confidence appears to have a direct and significant impact on students' ability to withstand negative school climate experiences.

This suggests that while the overall environment of academic emphasis may play a role in mitigating the negative effects of bullying, the most crucial factors are those that directly influence the individual student's experience and self-perception. Specifically, the significant interaction between bullying and confidence in the domain of learning implies that students who face bullying but maintain higher confidence levels are better equipped to cope with its adverse effects. This could be due to their ability to internalize the value of education and maintain motivation despite peer victimization. Moreover, the availability of home learning resources appears to be a critical buffer for these students, providing them with the necessary tools to succeed academically, even when school becomes a hostile environment. This reinforces the need for targeted interventions that specifically support at-risk students. Programs that foster self-confidence and provide additional learning resources at home could be particularly effective in protecting vulnerable students from the negative impact of bullying.

On the other hand, the diminished significance of interactions relating to broader contextual factors, such as the overall emphasis on academic success and resource shortages, when controlling for student-level factors, highlights the less impacting nature of these influences. It may be that these broader school-level factors are important, but not as directly impactful as the student's immediate environment and personal resources. This distinction is crucial for educators and policymakers, as it suggests that while system-wide reforms are valuable, student-centred strategies may yield more immediate and tangible benefits. Investing in personalized support mechanisms, such as mentorship programs and home-based educational resources, could prove to be highly effective in closing achievement gaps. This finding underscores the importance of targeted interventions that enhance individual students' confidence and access to resources at home, especially for those who are most vulnerable to the negative effects of bullying. Such targeted efforts could be more effective in improving educational outcomes than broader, less individualized strategies.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

We investigated the relationship between student bullying and the socioeconomic background and attitudes in their association with educational achievements in mathematics and science, on a sample of the eight Balkan countries that took part in the 4th grade assessments of the 2019 edition of TIMSS. In particular, we implemented mixed models that aimed at investigating in which way school climate—i.e., bullying—could interact with economic measures of affluence, namely the availability of home learning resources and school resource shortages, and with measures of attitudes, namely student confidence and the school's emphasis on academic success. Our analysis aimed at providing large-scale evidence on the relationship between achievements, bullying and economic and psychological factors, as well as on whether the interaction between bullying, affluence and motivations can differ between mathematics and science also in light of the additional independent variables.

Our analysis provides evidence that the interaction between bullying and student confidence plays a significant role in student achievement. Specifically, students who are more subjected to bullying, i.e., those with lower scores on the bullying scale, derive a stronger benefit from increased availability of home learning resources and higher confidence in mathematics, and from higher confidence in science. These student-level factors are crucial in mitigating the negative impacts of bullying, while broader contextual factors, such as the school's emphasis on academic success and the availability of resources, play a less direct role. This highlights the importance of targeted interventions directly addressing the needs and experiences of bullied students.

Our results suggest several policy recommendations. Foremost is the need to reduce bullying across all grades, as this reduction is strongly associated with improved educational achievements. The coefficients of the mixed models indicate that the average bullying at the school level has a stronger impact on achievements than within-school bullying, which suggests that the phenomenon should be tackled organically at the school level, and not just by improving the relative condition of individual students. Given that bullying can also significantly affect students' well-being and confidence, addressing this issue could have a broad positive impact on other educational indicators as well. To this aim, it is important for school authorities to establish monitoring, as well as to provide opportunities for students to report instances of bullying.

Additionally, enhancing students' confidence in their academic abilities and ensuring their access to sufficient home learning resources can further improve their performance in mathematics and science. These targeted interventions are particularly effective for students who are more vulnerable to bullying, emphasizing the need for personalized support strategies. To this aim, teaching programs and curricula could be better targeted in order to allow students to be confident and self-effective in learning; moreover, additional support courses and programs can help the most struggling students in gaining confidence, which is something that has been found to also mitigate the impact of bullying on achievements. Importantly, the results show that the within-school effect of confidence on achievements is stronger than the school-level one, which indicates that interventions should focus on helping individual students in their self-efficacy and confidence, rather than implement measures for the school as a whole.

The current study also opens avenues for future research. Some relationships observed in our analysis, such as the differential impact of resource availability depending on the bullying context, warrant further investigation. It could be valuable to explore how specific aspects of home learning resources or student confidence contribute to the observed outcomes. Additionally, while our study emphasizes the importance of student-level factors, further research could investigate the broader school environment's role in moderating the effects of bullying. Understanding these dynamics in greater detail could help refine intervention strategies and better support all students, particularly those who are most at risk.

In particular, our results suggest that student confidence could be the most important factor that can help mitigate the negative impact of bullying on academic achievements. This claim is based on the finding that confidence retains a significant coefficient in its interaction with bullying on achievements both in mathematics and science, and that confidence as such has a stronger association with achievements in its level found within schools, rather than between schools. Nonetheless, the dynamics by which confidence in mathematics or science could benefit students who more often report bullying are not explained by our models. Future investigations could be aimed at clarifying this relationship.

Third, as this study relies upon data gathered before the outbreak of the COVID-19 pandemic, it is also crucial to assess if and to what extent the relationship between bullying, attitudes, affluence, and educational achievements has changed as a result of school closures. This is because the most economically disadvantaged students may have found more difficulties in keeping their learning consistent when studying remotely, and this may also have impacted how their attitudes are associated with their achievements. Additional research could be directed at investigating how the pandemic has influenced the relationship between bullying and achievements, as well as how other variables interact with bullying in influencing achievements. To this aim, data from TIMSS 2023 could be used, allowing for a comparison between samples of students of the same countries. This could also help overcome the limitation relating to the use of cross-sectional data, given that analysing data coming from multiple editions of TIMSS would allow a temporal factor to also be included in the data analyses.

DECLARATION OF INTERESTS STATEMENT

The author declares that there are no competing interests to declare.

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SUPPLEMENTARY MATERIAL

Supplementary data for this article can be found online at

[HTTPS://IBE.EDU.PL/IMAGES/EDUKACJA/NUMERY/2023_04/3_EDU_4_23_PAGLIARANI_ANEKS.PDF](https://ibe.edu.pl/images/edukacja/numery/2023_04/3_edu_4_23_pagliarani_aneks.pdf)

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Potencjał rozwoju umiejętności myślenia kreatywnego polskich 15-latków na podstawie analizy odpowiedzi uczniów w badaniu PISA 2022

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Streszczenie

Badanie myślenia kreatywnego przeprowadzone w ramach ostatniej edycji badania PISA 2022 było pierwszym na taką skalę pomiarem tej umiejętności wśród 15-latków w Polsce na tle ich rówieśników z innych krajów OECD biorących udział w badaniu. Umożliwiło ono między innymi pomiar umiejętności 15-letnich uczniów w trzech wymiarach kreatywnego myślenia badanych w PISA (tworzenie kreatywnych pomysłów, tworzenie różnorodnych pomysłów, ocenianie i ulepszanie pomysłów) oraz w czterech domenach (rozwiązywanie problemów społecznych, rozwiązywanie problemów naukowych, wypowiedź pisemna i prezentacja graficzna). Wyniki badania PISA 2022 wykazały, że myślenie kreatywne jest mocną stroną polskich 15-latków – uzyskali oni średnie wyniki powyżej średniej dla krajów OECD – zarówno ogółem, jak i w każdym z badanych wymiarów i każdej z domen. W niniejszym artykule postawiono pytanie, czy i ewentualnie w jakim obszarze (np. konkretny typ zadań) jest potencjał do dalszego rozwijania myślenia kreatywnego polskich uczniów. W artykule zaprezentowano wyniki analizy ilościowej na poziomie zadań i w ten sposób wytypowano cztery zadania, w których polscy uczniowie wypadli nieco słabiej (istotnie statystycznie) niż ich rówieśnicy z krajów OECD biorących udział w badaniu. Dwa z nich to zadania wymagające zaprezentowania dwóch różniących się od siebie pomysłów. Jedno zadanie wymagało przedstawienia dwóch scenariuszy na film, a drugie – dwóch projektów graficznych na przypinkę. Obydwa te zadania dotyczyły wymiaru tworzenia różnorodnych pomysłów. Problemem w przypadku tych zadań mogła nie być kreatywność (oryginalność), a tzw. płynność (tworzenie wielu różnych pomysłów), ale wyłącznie w zadaniach wymagających większego nakładu pracy i rzadziej używanych w polskiej praktyce edukacyjnej. Nie wykazano jednak zależności pomiędzy wykonaniem tych zadań a wynikami na skali wytrwałości. Dwa pozostałe zadania zidentyfikowane

jako nieco trudniejsze dla polskich uczniów dotyczyły z kolei domeny rozwiązywania problemów społecznych. Analiza odpowiedzi wykazała, że w przypadku obu tych zadań problemem mógł być brak szerszej wiedzy kontekstowej na temat poruszanego w nich problemu społecznego. W tekście podjęto dyskusję nad możliwymi wyjaśnieniami tych słabszych stron polskich uczniów zaobserwowanymi w ich ogólnie bardzo dobrych umiejętnościach myślenia kreatywnego oraz możliwościami wprowadzania zmian w polityce edukacyjnej w tym zakresie.

Słowa kluczowe: PISA, kreatywność, myślenie kreatywne, pomiar umiejętności myślenia kreatywnego, poziom umiejętności myślenia kreatywnego.

The Potential for Developing the Creative Thinking Skills of 15-year-olds in Poland Based on an Analysis of Students' Responses in the PISA 2022 Survey

Abstract

The creative thinking assessment conducted as part of the latest cycle of the PISA survey in 2022 was the first large-scale measurement of this skill among 15-year-olds in Poland, enabling them to be compared to their peers from OECD countries participating in the study. It allowed, among other things, 15-year-old students to be measured in three ideation processes of creative thinking skills assessed in PISA (generating creative ideas, generating diverse ideas, evaluating and improving ideas), and in four domain contexts (social problem solving, scientific problem solving, written expression, and visual expression). The results of the PISA 2022 assessment showed that creative thinking is a strength of Polish 15-year-olds – they scored above the OECD average both overall, and in each of the dimensions and domains tested. This article raises the question of whether, and if so, in which areas (e.g., specific task types), there is potential to further develop the creative thinking of Polish students. The article presents the results of a quantitative analysis at the item level and identifies four items in which Polish students performed a bit worse (the difference was statistically significant) than their peers from OECD countries participating in the study. Two of these items required the presentation of two different ideas. One item involved presenting two movie scenarios, and the other two graphic designs for a pin. Both items fall within the dimension of generating diverse ideas. The issue with these items may not have been creativity (originality), but rather fluency (generating many different ideas) and these problems only refer to items that require more work and are seldom practiced at school in Poland. However, no correlation was found between performance on these tasks and the results on the perseverance scale. The other two items identified as slightly more difficult for Polish students were related to the domain of solving social problems. The analysis of responses indicated that the problem with both items could have been the lack of broader contextual knowledge about the social issue raised in them. The article discusses possible explanations for these weaknesses observed in Polish students, despite their generally very good creative thinking skills, and the possibilities for introducing changes in educational policies in this aspect.

Keywords: PISA, creativity, creative thinking, creative thinking skills, creative thinking assessment.

1. PRZEGLĄD BADAŃ ZNACZENIA I POMIARU KREATYWNOSTCI

Terminy: „kreatywność” i „myślenie kreatywne” stały się w ostatnich latach bardzo popularne. Kreatywność jest często uznawana za jedną z kluczowych kompetencji XXI wieku (Robinson i Aronica 2016; Zhao, 2012). Wymieniona została w zaleceniu Rady Unii Europejskiej z dnia 22 maja 2018 r. dotyczącym kompetencji kluczowych w procesie uczenia się przez całe życie. Przedstawiciele krajów OECD opracowali dokument programowy pod nazwą „Kompas edukacyjny” (OECD Learning Compass, 2030), w którym zidentyfikowano trzy kompetencje transformatywne (ang. transformative competencies) – czyli takie, których potrzebują uczniowie, aby przyczyniali się do rozwoju świata, sami się rozwijali, a także kształtowali lepszą przyszłość. Za kompetencje transformatywne autorzy „Kompasu edukacyjnego” uznali: tworzenie nowej wartości, godzenie sprzeczności i rozwiązywanie dylematów, branie odpowiedzialności. Kreatywność wskazano jako niezbędną i integralną część kompetencji tworzenia nowej wartości.

Większość osób zajmujących się edukacją zwraca uwagę na to, że rozwój kreatywności uczniów jest kluczowy dla rozwoju współczesnych społeczeństw (Robinson, 2010; Robinson i Aronica, 2016). Dlatego w ostatnich latach kreatywność zyskuje coraz więcej miejsca w podstawach programowych i treściach nauczania (Wilson, 2005). Również wiele reform systemów

edukacji opiera się na założeniach, że kluczowe jest zarówno nauczanie w sposób kreatywny, jak i rozwijanie kreatywności uczniów (Burnard, 2006). Pomimo tych wskazań w zapisach strategii edukacyjnych, zauważono również, że w środowisku szkolnym i okołoszkolnym podejmuje się wciąż za mało działań służących promowaniu i rozwijaniu kreatywności uczniów (Kaufman i Baer, 2012; Beghetto, 2013; Besançon, Lubart i Barbot, 2013). Do wsparcia działań rozwijających kreatywność uczniów niezbędna jest również kreatywność nauczycieli (Meintjes i Grosser, 2010; Hojat, 2004; Zielińska et al., 2024).

Biorąc powyższe pod uwagę, badanie umiejętności myślenia kreatywnego jest jednym z kluczowych wyzwań stojących obecnie przed naukami społecznymi. Polscy badacze podejmują często wątki związane z: uwarunkowaniami pedagogicznymi twórczości (m.in. Schmidt, 2001, 2013, 2017; Galewska-Kustra, 2012; Przyborowska 2007, 2013; Zwiernik 1988; Karwowski 2009a), teoriami poznawczymi twórczości (Nęcka, 1995; Strzałecki, 1989; Groborz, Nęcka 2003) oraz osobowościowymi, lub szerzej, psychologicznymi uwarunkowaniami kreatywności (Drań-Ruszczak, 1981; Tokarz 1985, 2005; Popek, 2001; Bernacka 2004, 2017; Pufal-Struzik, 2006; Chybicka, 2004; Karwowski 2009a, 2009b, 2011; Karwowski (red.), 2009; Chruszczewski, 2013; Mendecka, 2003, 2009, 2015; Wróblewska, 2005, 2015; Cudowska, 2004, 2014, 2017; Chmielińska, 2016, 2017).

Istnieje również wiele badań dotyczących relacji między osiągnięciami szkolnymi a kreatywnością. Ich wyniki są zróżnicowane, w wielu z nich wykazano pozytywny związek między zdolnościami twórczymi a osiągnięciami szkolnymi, choć nie jest on zbyt silny i zależy od wieku badanych uczniów. Związek pomiędzy kreatywnością dzieci rozpoczynających naukę szkolną z ich osiągnięciami szkolnymi jest niski (Karwowski i Dziedziewicz, 2012). Podobnie niską korelację zaobserwowano w przypadku uczniów szkół podstawowych (Gajda, 2008; Uszyńska-Jarmoc, 2005). W szkołach ponadgimnazjalnych (Karwowski, 2005) oraz wyższych (Mitrofanow, 2013) siła związku pomiędzy kreatywnością uczniów a ich osiągnięciami szkolnymi jest nieco wyższa. Im bardziej twórczo uzdolnioną osobą jest uczeń, tym lepsze wyniki osiąga w szkole i testach osiągnięć szkolnych (Dobrowolowicz, 2002; Gajda, 2015), a zdolności twórcze wspierają osiągnięcia szkolne (Dolata i in., 2015; Gajda et al., 2017).

W dotychczasowych badaniach brakuje jednak danych empirycznych pozwalających na ocenę poziomu kreatywności polskich uczniów na tle uczniów z innych krajów, a taki pomiar i ocena są niezbędne w kształtowaniu polityki edukacyjnej, zwłaszcza w kontekście konieczności rozwijania (m.in. poprzez innowacyjność i kreatywność) potencjału konkurencyjnego Polski na poziomie globalnym. Badanie ósmej edycji Programu Międzynarodowej Oceny Umiejętności Uczniów (PISA 2022) było pierwszym tego typu i o takiej skali badaniem umożliwiającym międzynarodowe porównanie poziomu umiejętności myślenia kreatywnego 15-latków. W tej edycji badania PISA, obok trzech głównych dziedzin badania: umiejętności matematycznych, rozumienia czytanego tekstu oraz rozumowania w naukach przyrodniczych, przeprowadzono pomiar umiejętności myślenia kreatywnego (ang. creative thinking). Pomiaru umiejętności kreatywnych dokonano po raz pierwszy w historii programu PISA, a udział w tej części badania wzięły 64 kraje i regiony, w tym Polska¹.

Aby dokonać pomiaru myślenia kreatywnego, konieczne było zdefiniowanie samej kreatywności i myślenia kreatywnego. Wśród naukowców brak jest zgodności co do jednoznacznej definicji kreatywności. Wydaje się, że większość badaczy koncentruje swoją uwagę wokół dwóch aspektów kreatywności: rezultat procesu twórczego powinien wносить coś zupełnie nowego oraz dawać rozwiązanie problemu, który był podstawowym i najważniejszym do rozwiązania w konkretnym przypadku (Barron, 1955; Guilford, 1967). W dyskusji na temat definicji kreatywności w ostatnich latach zwraca się również uwagę na to, że pomysły uznawane za kreatywne powinny być wysokiej jakości (Sternberg, Kaufman i Pretz, 2013).

Gdy zauważono, jak dużą rolę kreatywność pełni i będzie pełnić w nowoczesnych społeczeństwach, zaczęto rozwijać narzędzia do pomiaru kreatywności. Od kilku dziesięcioleci badacze podejmują próby stworzenia narzędzi i testów, które w możliwie obiektywny sposób mogłyby mierzyć kreatywność lub kreatywne myślenie. Wśród często przywoływanych i popularnych narzędzi do mierzenia kreatywności wymienia się m.in.: baterię testów Torrance'a, test twórczego myślenia, test odległych skojarzeń RAT, rysunkowy test twórczego myślenia, kwestionariusz samooceny twórczej, czy baterię kwestionariuszy Morrisa Steina (Nęcka, 2012). Wszystkie z przywołanych narzędzi do pomiaru kreatywności są wystandaryzowane, lecz nie są narzędziami idealnymi. Niektóre badania pokazują, że testy mierzące kreatywność mają wysoką trafność i rzetelność. Przykładem może być analiza wyników badań kreatywności wśród uczniów szkół w Minnesocie przeprowadzona przez Jonathana Pluckera (zob. Karwowski, 2009). Jednak wśród badaczy nie ma zgody co do tego, które z testów są najodpowiedniejsze i jaki sposób pomiaru jest najlepszy. Mimo tego, że względu na znaczenie kreatywności, warto badać, mierzyć i analizować to zagadnienie, jak uczyniono to również w badaniu PISA.

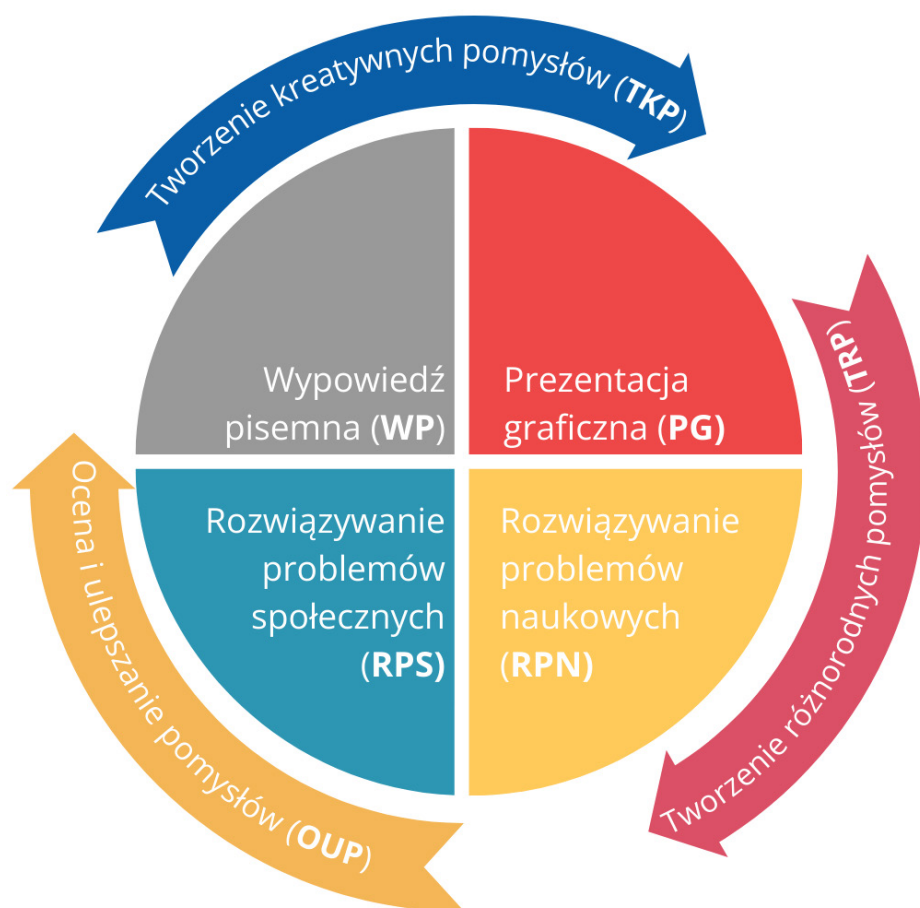
¹ Więcej informacji na temat badania (m.in. przebiegu badania, założeń metodologicznych, rodzajów zadań, sposobu oceniania i kodowania zarówno odpowiedzi uczniów, jak i wyników) znajduje się w raporcie krajowym z badania myślenia kreatywnego w PISA 2022 (Dobosz-Leszczynska, Kaźmierczak i Weremiuk, 2024).

2. METODOLOGIA BADANIA PISA 2022 W ZAKRESIE MYŚLENIA KREATYWNEGO

W badaniu PISA przyjęto następującą definicję myślenia kreatywnego: „Myślenie kreatywne to umiejętność tworzenia, oceny i ulepszania pomysłów na rozwiązanie problemu lub twórcze wyrażenie się, które może prowadzić do powstania nowej wiedzy, skutecznych i oryginalnych rozwiązań, produktów czy dzieł sztuki”. Ze względu na charakterystykę badanych (15-letni uczniowie) w badaniu nie oceniano rezultatów, czyli tworzenia wiedzy, uznania za dzieło sztuki czy sprawdzenia skuteczności rozwiązania problemu. Również ze względu na sam przebieg badania (badanie realizowane w szkole na komputerach indywidualnie przez poszczególnych uczniów, w określonym czasie, nie dłuższym niż godzina) mierzone w nim aspekty myślenia kreatywnego musiały zostać ograniczone.

W związku z powyższym w badaniu myślenia kreatywnego PISA ograniczono się do pomiaru czterech domen, tj. wypowiedzi pisemnej (WP) i prezentacji graficznej (PG) jako przejawów twórczego wyrażania oraz rozwiązywania problemów społecznych (RPS) i naukowych (RPN). W każdej z tych domen oceniano następujące wymiary, czyli umiejętności polegające na tworzeniu kreatywnych (TKP) lub różnorodnych pomysłów (TRP), jak również umiejętności ich oceny i ulepszania (OUP).

Rysunek 1 Domeny i wymiary myślenia kreatywnego mierzone w badaniu PISA 2022



Zakres umiejętności mierzonych w badaniu opisują założenia teoretyczne pomiaru zawarte w Assessment and Analytical Framework (OECD, 2023). Zadania PISA z zakresu wszystkich dziedzin sprawdzają, na ile młody, piętnastoletni człowiek jest przygotowany do dorosłego życia. Charakteryzują się określoną konstrukcją i często są zakorzenione w kontekście życia codziennego².

² Więcej na temat definicji kreatywności przyjętej w badaniu PISA 2022 oraz innych założeń teoretycznych badania myślenia kreatywnego znaleźć można w raporcie krajowym z badania myślenia kreatywnego PISA 2022 (Dobosz-Leszczyńska i in., 2024).

W badaniu myślenia kreatywnego wykorzystano 32 zadania. Każdy uczeń mierzył się z kilkoma z nich dotyczącymi różnych wymiarów i domen myślenia kreatywnego zdefiniowanych dla badania PISA 2022. Uczniowie mieli 60 minut na rozwiązanie zadań.

Badani udzielali krótkich lub dłuższych (od 5 do 15 minut) odpowiedzi pisemnych, a niektóre zadania wymagały od nich użycia interaktywnych narzędzi, takich jak narzędzia do projektowania wizualnego lub przeprowadzenia symulacji.

Uczniowie wykonywali zadania związane z codziennymi sytuacjami, które nie wymagały wiedzy lub umiejętności technicznych (aby zminimalizować rolę udziału wcześniejszego doświadczenia jako istotnego czynnika wpływającego na wyniki).

Zadania dotyczące kreatywnego myślenia wykorzystywane w badaniu PISA miały charakter otwarty, co oznacza, że istnieje w zasadzie nieskończenie wiele sposobów wykazania się myśleniem kreatywnym. Ocen odpowiedzi uczniowskich dokonywali koderzy, czyli osoby przeszkolone w zakresie oceny odpowiedzi uczniów na podstawie szczegółowych zasad punktacji – w ramach zdefiniowanych procedur kodowania i według klucza kodowego. Rozbudowane i wieloaspektowe klucze kodowe to jeden z najbardziej istotnych elementów zadań w programie PISA.

W przypadku pytań otwartych, które używane były w części badania dotyczącej kreatywnego myślenia, klucz kodowy zawiera:

1. możliwe kody dla danego zadania;
2. definicję każdej kategorii kodowej odpowiedzi, czasami z dodatkowymi uwagami odnośnie do sposobu interpretacji poszczególnych rodzajów odpowiedzi uczniów;
3. wypunktowane przykłady odpowiedzi dla każdego kodu, często z dodatkowymi objaśnieniami.

Za większość zadań w badaniu kreatywnego myślenia uczeń mógł otrzymać kody: 0, 1 (1 punkt – częściowa punktacja) lub 2 (2 punkty – pełna punktacja). W przypadku kilku zadań (z zakresu tworzenia dwóch różnych pomysłów) możliwe było otrzymanie wyłącznie kodów 0 lub 1.

3. WYNIKI BADANIA PISA 2022 W ZAKRESIE MYŚLENIA KREATYWNEGO

Wyniki badania PISA 2022 w zakresie kreatywnego myślenia (Dobosz-Leszczynska, Kaźmierczak, Weremiuk, 2024) wskazują, że polscy uczniowie wykazują się wyższym poziomem umiejętności myślenia kreatywnego niż średnia dla wszystkich krajów OECD biorących udział w tej części badania. Średni wynik polskich uczniów wyniósł 34 punkty (Dobosz-Leszczynska i in., 2024) i jest istotnie statystycznie wyższy od średniej dla krajów OECD (33 punkty).

Wynik osiągnięty przez polskich piętnastolatków należy do wysokich i plasuje Polskę wśród krajów o najlepszych wynikach na świecie – jest on istotnie statystycznie wyższy niż średnia dla krajów OECD we wszystkich trzech wymiarach i wszystkich czterech domenach badania.

4. CEL ANALIZY POGŁĘBIAJĄCEJ WYNIKI BADANIA PISA

Przytoczone wyniki jasno wskazują, że polscy 15-latkowie wykazują się wysokim poziomem umiejętności myślenia kreatywnego na tle uczniów z innych krajów OECD biorących udział w badaniu. Wypadają lepiej również w każdej z domen (wypowiedź pisemna, prezentacja graficzna, rozwiązywanie problemów społecznych i naukowych) i każdym badanym w PISA wymiarze (tworzenie kreatywnych pomysłów, tworzenie różnorodnych pomysłów, ocena i ulepszanie pomysłów).

Warto wobec tego postawić sobie pytanie, czy i ewentualnie gdzie jest potencjał do dalszego rozwijania myślenia kreatywnego polskich 15-latków. W związku z tym, że na poziomie wymiarów i domen polscy uczniowie osiągają wyniki powyżej średniej OECD, w niniejszej analizie pogłębiającej wyniki badania PISA postanowiliśmy zweryfikować poziom niższy niż domeny i wymiary, czyli poziom poszczególnych zadań. Postanowiono sprawdzić, czy występują typy zadań, w których polscy uczniowie wypadają nieco słabiej niż ich rówieśnicy z innych krajów, a tym samym – czy istnieje potencjał do dalszego wzmacniania i rozwijania ich umiejętności myślenia kreatywnego na poziomie systemowym.

Dotychczasowe doświadczenia zespołu badawczego PISA pokazują, że osoby oceniające i punktujące odpowiedzi uczniów w innych dziedzinach badania PISA (takich jak: umiejętność rozumienia czytanego tekstu, rozumowanie w naukach przyrodniczych czy umiejętności finansowe) wskazywały na nieco niższą umiejętność generowania kilku różnych rozwiązań, argumentowania z różnych perspektyw czy przyjmowania różnych punktów widzenia przez polskich 15-latków. Obserwacje takie poczyniono na przestrzeni kilku ostatnich edycji badania PISA. Nie były one jednak nigdy weryfikowane.

W związku z powyższym celem niniejszej analizy pogłębiającej było zweryfikowanie, czy ten sam aspekt (generowanie różnych odpowiedzi, pomysłów lub rozwiązań), będący jednocześnie jednym z czterech wymiarów mierzonych w badaniu myślenia kreatywnego w PISA 2022, stanowił rzeczywiście problem dla polskich uczniów w przypadku konkretnych zadań, a jeśli tak – to czy można wyróżnić jakiś typ zadań w tym wymiarze, w którym polscy uczniowie wypadali słabiej.

Hipotezą badawczą, którą chcieliśmy zweryfikować, było stwierdzenie, że pomimo ogólnego wysokiego poziomu umiejętności myślenia kreatywnego polskich uczniów, również w wymiarze generowania różnorodnych pomysłów, mogą oni częściej niż uczniowie z innych krajów mieć kłopoty z płynnością w myśleniu kreatywnym, zwłaszcza w przypadku zadań wymagających włożenia większego wysiłku w rozwiązanie lub napisania dłuższej odpowiedzi. Płynność jest rozumiana jako przedstawienie różnorodnych (minimum dwóch) pomysłów czy rozwiązań tego samego problemu.

5. PRZEBIEG BADANIA POGŁĘBIAJĄCEGO – ANALIZA ODPOWIEDZI UCZNIÓW NA POSZCZEGÓLNE ZADANIA

Aby zidentyfikować potencjalne zadania, w których polscy uczniowie osiągnęli słabsze wyniki, przeprowadzono analizę ilościową, w której odniesiono wyniki polskich uczniów w poszczególnych zadaniach³ do średnich wyników uczniów w krajach OECD. Dla każdej wartości punktowej możliwej do uzyskania w danym zadaniu (0 pkt, 1 pkt, 2 pkt) obliczono odsetek uczniów uzyskujących tę wartość w Polsce i średnio w krajach OECD, wraz z błędem standardowym uwzględniającym złożony schemat doboru próby. Zgodnie z założeniami takiej analizy porównawczej przy obliczaniu średniej OECD każdy z krajów uwzględniony został z taką samą wagą. Następnie wyliczono różnice pomiędzy odsetkiem dla Polski i średnim odsetkiem dla krajów OECD, wraz z wartością błędu standardowego, dzięki której określono istotność różnic. Do zidentyfikowania istotnych statystycznie różnic odsetków użyto trzech poziomów istotności: $p < 0,05$; $p < 0,01$; $p < 0,001$. W ten sposób udało się wychwycić te zadania, w których wyniki polskich uczniów różniły się od średniej dla pozostałych krajów OECD.

Następnie dla tych zadań przeprowadzono pogłębioną analizę jakościową odpowiedzi uczniów. Jako że celem analizy była identyfikacja słabszych stron, w toku prac analitycznych skupiono się na analizie odpowiedzi niepunktowanych (0 pkt). Odpowiedzi te podzielono na następujące kategorie:

- a)** brak odpowiedzi;
- b)** odpowiedź/odpowiedzi nieadekwatne;
- c)** odpowiedź/odpowiedzi powtarzające dane z zadania;
- d)** niedokończenie odpowiedzi;
- e)** brak wystarczającej liczby pomysłów lub rozwiązań wymaganych w zadaniu (w przypadku zadań z TRP);
- f)** odpowiedzi nieróżniące się wystarczająco od siebie (w przypadku zadań z TRP);
- g)** odpowiedzi niekreatywne.

Na podstawie tych kategorii starano się następnie zidentyfikować prawdopodobną przyczynę nieuzyskania punktów za daną odpowiedź. Wstępnie założono, że mogą one wynikać z:

- niezrozumienia zadania (w przypadku odpowiedzi typu a, b, c),
- zmęczenia, zniechęcenia czy braku czasu (w przypadku odpowiedzi typu d, e),
- braku kreatywności (oryginalności) odpowiedzi lub różnorodności i kreatywności (oryginalności) odpowiedzi (w przypadku odpowiedzi typu f, g).

6. WYNIKI BADANIA POGŁĘBIAJĄCEGO NA POZIOMIE POSZCZEGÓLNYCH ZADAŃ

Analiza wyników w poszczególnych zadaniach pozwoliła zidentyfikować kilka konkretnych zadań, w których odsetek polskich uczniów osiągających najniższe wyniki był wyższy niż średnia dla pozostałych krajów OECD biorących udział w badaniu.

Wśród zadań z wypowiedzi pisemnej (WP) znalazło się jedno zadanie, w którym odsetek polskich uczniów osiągających najwyższy wynik był istotnie statystycznie niższy niż średnia dla pozostałych krajów OECD (Tabela 1).

³ Zadania w językach narodowych są dostępne na stronie OECD:
<https://www.oecd.org/en/about/programmes/pisa/pisa-2022-creative-thinking-test-questions.html>

Tabela 1 Zadania z wypowiedzi pisemnej (Polska vs. OECD)

Nr zadania	Wymiar	0 pkt	1 pkt	2 pkt	Liczba uczniów rozwiązujących dane zadanie	
					Polska	OECD
DT240Q01C2	TKP	-1,78	-1,29	3,08	651	23 825
DT240Q02C	TRP	-2,83	-2,13	4,95**	706	24 373
DT300Q01C2	TKP	-2,89**	5,07**	-2,18	743	25 298
DT300Q02C	TRP	-6,69***	-6,49***	13,19***	725	25 400
DT350Q01C2	TKP	3,70*	-4,61*	0,91	741	26 057
DT350Q02C	TRP	0,98	-0,98	nd	714	25 148
DT350Q03C2	OUP	-9,36***	1,89	7,47***	690	24 694
DT570Q01C	TRP	4,24*	-4,24*	nd	684	25 158
DT570Q02C2	TKP	-7,20***	-1,47	8,66***	678	24 953
DT570Q03C2	OUP	-2,72	-5,11***	7,83***	660	24 275
DT370Q01C2	TKP	2,29	0,33	-2,62	732	25 174
DT360Q01C2	TKP	-0,11	-1,34	1,45	712	23 010

nd – nie dotyczy, w zadaniu maksymalnie można było uzyskać 1 pkt

TKP – tworzenie kreatywnych pomysłów

TRP – tworzenie różnorodnych pomysłów

OUP – ocena i ulepszanie pomysłów

W tabeli, dla każdego zadania i każdej możliwej wartości punktowej, przypisanej zadaniu w kluczu kodowym, przedstawiono różnicę pomiędzy odsetkiem uczniów w Polsce a średnim odsetkiem uczniów w krajach OECD. Wartość dodatnia oznacza, że odsetek dla Polski jest wyższy niż średni odsetek w krajach OECD. Istotne statystycznie różnice oznaczono w następujący sposób: * $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$.

Źródło: opracowanie własne na podstawie danych OECD PISA 2022

Było to zadanie polegające na wymyśleniu dwóch, różniących się jak najbardziej od siebie, pomysłów na scenariusz filmu przedstawiającego relację między człowiekiem o imieniu Ludwik i inteligentnym robotem Robertem. Jako że zadanie to zostało odtajnione przez międzynarodowy zespół badawczy, prezentujemy je poniżej.

Rysunek 2 Zadanie DT570Q01C w formie, w jakiej widzieli je na ekranie komputerów uczniowie biorący udział w badaniu

PISA

HISTORIA ROBOTA

Pytanie 1 / 3

Wpisz odpowiedzi na pytanie w poniższych polach tekstowych.

Zapisz 2 różne pomysły na scenariusz filmu przedstawiającego relację między człowiekiem o imieniu Ludwik i inteligentnym robotem Robertem. Nie musisz pisać całego scenariusza. Napisz tylko, o czym mógłby być dany film. Te dwa scenariusze powinny się od siebie jak najbardziej różnić.

Odpowiedz na to pytanie nie powinna Ci zająć więcej niż 7 minut, każdy scenariusz nie powinien składać się z więcej niż 8 zdań.

Pomysł na scenariusz 1

Pomysł na scenariusz 2

Robert

Ludwik

Źródło: <https://www.oecd.org/en/about/programmes/pisa/pisa-2022-creative-thinking-test-questions.html>

W tym zadaniu uczniowie mogli uzyskać 0 lub 1 pkt. Aby uzyskać pełną punktację, musieli zapisać dwa pomysły na scenariusz filmu, które spełniały następujące warunki, tj. były: zgodne z zadaniem (obydwa pomysły są zarysem lub sugestią spójnej historii i opisują możliwą fabułę filmu), na temat (obydwa pomysły na scenariusz odnoszą się do treści zadania, gdy można w każdym z nich odnaleźć co najmniej jedno bezpośrednie lub pośrednie nawiązanie do podanych szczegółów dotyczących bohaterów, tj. interakcja między Ludwikiem – człowiekiem i Robertem – inteligentnym robotem) i różniły się od siebie (mogły różnić się tematem, fabułą lub sposobem podejścia do tematu, np. różniącymi się: perspektywą, okolicznościami, relacjami między bohaterami, wyborami, cechami lub motywacjami bohaterów).

Analiza odpowiedzi, za które uczniowie nie otrzymali punktu, wykazała, że część z nich udzieliła tylko jednej odpowiedzi zamiast dwóch. W wielu przypadkach pierwsza (i jedyna) odpowiedź, czyli pomysł na scenariusz filmu, była bardzo rozbudowana, jak w tym przykładzie: „Akcja filmu toczyłaby się w 2076. Nasz bohater Ludwik, byłby starcem, który miał trójkę dzieci, a pomimo tego był samotny, bo jego pociechy były zajęte karierą za granicą. Został mu jedynie robot, którego sam skonstruował 5 lat temu. Ludwik uruchomił robota, któremu nadał imię Robert, był to robot inteligentny, był specjalistą od nauk ścisłych”. Te rozbudowane jedyne odpowiedzi bywały również dość oryginalne, jak ta: „Ludwik poznaje robota Roberta zaprzyjaźnia się z nim. Robot wprowadza naszego głównego bohatera w świat technologii. Pokazuje mu jak inteligentnie poradzić sobie z problemami życia codziennego. Robert nie może dać swojemu przyjacielowi chwili oddechu, wręcz go osacza. Pewnego dnia Ludwik uświadamia sobie, że nie może dalej ciągnąć tej toksycznej relacji i zrywa z nim kontakt. Robot nie mógł się pogodzić z utratą najlepszego przyjaciela dlatego Robert wybrał się do Ludwika i zastał go z nowym przyjacielem. Sfrustrowany robot wpadł w furję i zabił Ludwika”.

Wśród odpowiedzi niepunktowanych kolejną część stanowiły odpowiedzi z dwoma pomysłami, z których pierwszy pomysł na scenariusz filmu był adekwatny i na temat, również często rozbudowany i oryginalny, ale drugi już był nie na temat. Przykład takiego typu odpowiedzi:

1. „Historia mogłaby opierać się na tym, że Ludwik idąc do nowej szkoły miał problem ze znalezieniem dobrego kolegi, ponieważ jeździł na wózku i wszyscy się z niego śmiali. Do klasy zawitał także tajemniczy Robert, nikt o nim nic nie wiedział, lecz szybko wszyscy go polubili. Okazało się, że najlepiej rozmawiało mu się z Ludwikiem, który poczuł się dobrze z tym, że znalazł kolegę. Na koniec opowieści okazuje się jednak, że Robert to robot, który został zakupiony przez rodziców Ludwika, którzy bardzo martwili się o syna, ponieważ nie miał żadnych kolegów”.
2. „W 2100 roku pewien naukowiec wynalazł 100 robotów, którymi chciał zniszczyć świat. Lecz na przeszkodzie pojawili mu się kreatywni nastolatki przebrani za swoich ulubionych superbohaterów z bajki. Jak się okazało mieli większą wiedzę z dziedziny techniki i informatyki niż sam naukowiec i udało im się uratować cały świat”.

Trzecią część niepunktowanych odpowiedzi stanowiły te zawierające pomysły nie na temat lub pomysły powielające informacje z zadania.

Podobna sytuacja dotyczy zadań z prezentacji graficznej (PG) – jedynym zadaniem, w którym polscy 15-latkowie wypadli istotnie statystycznie poniżej średniej dla pozostałych krajów OECD było to, w którym konieczne było przygotowanie dwóch jak najbardziej różniących się od siebie pomysłów na przypinkę promocyjną⁵ (Tabela 2).

Tabela 2 *Zadania z prezentacji graficznej (Polska vs. OECD)*

Nr zadania	Wymiar	0 pkt	1 pkt	2 pkt	Liczba uczniów rozwiązujących dane zadanie	
					Polska	OECD
DT200Q01C2	TKP	-5,46***	-2,71	8,16***	721	25 341
DT200Q02C2	OUP	-5,78***	-2,75	8,53***	708	24 726
DT520Q02C	TRP	4,66*	-4,66*	nd	636	23 040
DT520Q03C2	OUP	-6,10***	4,27*	1,83	623	20 721

⁴ Zacytowane odpowiedzi pochodzą ze zbioru danych zebranych od polskich uczniów w czasie badania PISA 2022. Odpowiedzi uczniów zostały udostępnione autorkom przez polski zespół badawczy i zostały zacytowane w oryginalnej pisowni.

⁵ To zadanie nie zostało odtajnione, w związku z tym nie opisujemy go dokładnie ani nie prezentujemy w niniejszym artykule. Natomiast można zapoznać się z odtajnionym zadaniem z prezentacji graficznej, które wykorzystywało podobne narzędzie, tu: <https://www.oecd.org/en/about/programmes/pisa/pisa-2022-creative-thinking-test-questions.html>

nd – nie dotyczy, w zadaniu maksymalnie można było uzyskać 1 pkt

TKP – tworzenie kreatywnych pomysłów

TRP – tworzenie różnorodnych pomysłów

OUP – ocena i ulepszanie pomysłów

W tabeli, dla każdego zadania i każdej możliwej wartości punktowej, przypisanej zadaniu w kluczu kodowym, przedstawiono różnicę pomiędzy odsetkiem uczniów w Polsce a średnim odsetkiem uczniów w krajach OECD. Wartość dodatnia oznacza, że odsetek dla Polski jest wyższy niż średni odsetek w krajach OECD. Istotne statystycznie różnice oznaczono w następujący sposób: * $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$.

Źródło: opracowanie własne na podstawie danych OECD PISA 2022

Za zadanie to uczniowie również mogli uzyskać 0 lub 1 punkt. Pełna punktacja była przyznawana również po spełnieniu warunków opisanych dla poprzedniego zadania, tj. gdy projekty były: zgodne z zadaniem (przedstawiały przypinkę), na temat (podany w zadaniu) oraz różniły się od siebie.

Tu, podobnie, jak w przypadku poprzednio omawianego zadania na tworzenie różnorodnych pomysłów na scenariusz filmu, analiza odpowiedzi⁶ wskazuje, że uczniowie albo nie przedstawili dwóch projektów albo zaprezentowane pomysły nie różniły się wystarczająco od siebie.

Jeśli chodzi o zadania z zakresu rozwiązywania problemów naukowych (RPN), to polscy 15-latkowie wypadli we wszystkich z nich albo powyżej średniej albo w okolicach średniej dla pozostałych krajów OECD. Można więc założyć, że zadania tego typu są ich mocną stroną (Tabela 3).

Tabela 3 *Zadania z rozwiązywania problemów naukowych (Polska vs. OECD)*

Nr zadania	Wymiar	0 pkt	1 pkt	2 pkt	Liczba uczniów rozwiązujących dane zadanie	
					Polska	OECD
DT550Q01C	TRP	-8,40***	1,02	7,38**	660	22 451
DT550Q02C2	TKP	-5,66**	-5,47	11,13***	617	21 102
DT690Q01C	TRP	2,10	-2,10	nd	689	24 923
DT690Q02C2	OUP	-8,47***	-1,94	10,41***	636	23 551
DT700Q01C	TRP	0,37	1,45	-1,82	650	23 592
DT680Q01C2	OUP	0,10	-1,04	0,94	651	24 196

nd – nie dotyczy, w zadaniu maksymalnie można było uzyskać 1 pkt

TKP – tworzenie kreatywnych pomysłów

TRP – tworzenie różnorodnych pomysłów

OUP – ocena i ulepszanie pomysłów

W tabeli, dla każdego zadania i każdej możliwej wartości punktowej, przypisanej zadaniu w kluczu kodowym, przedstawiono różnicę pomiędzy odsetkiem uczniów w Polsce a średnim odsetkiem uczniów w krajach OECD. Wartość dodatnia oznacza, że odsetek dla Polski jest wyższy niż średni odsetek w krajach OECD. Istotne statystycznie różnice oznaczono w następujący sposób: * $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$.

Źródło: opracowanie własne na podstawie danych OECD PISA 2022

W przypadku rozwiązywania problemów społecznych (RPS), odsetki odpowiedzi polskich 15-latków różnią się statystycznie od średnich odsetków dla uczniów z krajów OECD biorących udział w badaniu jedynie w dwóch zadaniach (Tabela 4).

⁶ Brak przykładowych odpowiedzi uczniów w artykule wynika z braku odtajnienia tego zadania.

Nr zadania	Wymiar	0 pkt	1 pkt	2 pkt	Liczba uczniów rozwiązujących dane zadanie	
					Polska	OECD
DT400Q01C	TRP	-13,69***	0,91	12,78***	714	24 744
DT400Q02C2	TKP	-13,20***	-0,58	13,78***	700	24 636
DT400Q03C2	OUP	-16,43***	-3,01	19,44***	693	23 597
DT630Q01C2	OUP	-1,25	6,53***	-5,28**	692	24 486
DT500Q01C	TRP	-3,41*	2,14	1,27	732	25 357
DT500Q02C2	OUP	-19,51***	5,81**	13,71***	629	23 136
DT620Q01C2	TKP	-2,39	-4,93*	7,32***	675	22 436
DT610Q01C	TRP	-1,17	1,05	0,11	715	25 503
DT420Q01C	TRP	0,47	1,04	-1,52	715	25 038
DT420Q02C2	TKP	-2,04	6,78***	-4,74*	692	23 776

OUP – ocena i ulepszanie pomysłów

W tabeli, dla każdego zadania i każdej możliwej wartości punktowej, przypisanej zadaniu w kluczu kodowym, przedstawiono różnicę pomiędzy odsetkiem uczniów w Polsce a średnim odsetkiem uczniów w krajach OECD. Wartość dodatnia oznacza, że odsetek dla Polski jest wyższy niż średni odsetek w krajach OECD. Istotne statystycznie różnice oznaczono w następujący sposób: * $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$.

Źródło: opracowanie własne na podstawie danych OECD PISA 2022

W przypadku tych dwóch zadań nie jest to jednak różnica pomiędzy brakiem punktów a pełną punktacją. Odsetek odpowiedzi niepunktowanych jest dla Polski nadal niższy niż średni odsetek dla OECD. Taka sama sytuacja jednak dotyczy również odsetka odpowiedzi najwyżej punktowanych – jest on niższy dla Polski niż średni odsetek dla pozostałych krajów OECD, biorących udział w badaniu. W tym przypadku wyższy odsetek w Polsce w stosunku do średniego odsetka dla OECD zanotowano w przypadku odpowiedzi ocenionych na 1 punkt.

Pierwsze z tych zadań (nr DT630Q01C2) zostało odtajnione, w związku z czym prezentujemy je poniżej.

Rysunek 3 **Zadanie DT630Q01C2 w formie, w jakiej widzieli je na ekranie komputerów uczniowie biorący udział w badaniu**

PISA

Przejazdy grupowe

Pytanie 1 / 1

Wpisz odpowiedź na pytanie w poniższym polu tekstowym.

Należysz do zespołu poszukującego kreatywnych rozwiązań problemów, z którymi spotykają się społeczności na całym świecie.

Aby zachęcić ludzi do korzystania z przejazdów grupowych (wspólnej podróży kilku osób jednym samochodem) i tym samym zmniejszyć zanieczyszczenie powietrza oraz zredukować liczbę pojazdów na drogach, niektóre kraje proponują rabaty na paliwo i pokrycie kosztów przejazdu płatnymi odcinkami dróg dla osób korzystających ze wspólnych przejazdów. Zaproponuj **oryginalny** sposób, dzięki któremu możliwe będzie rozszerzenie i udoskonalenie inicjatywy przejazdów grupowych.

W poniższym polu tekstowym zapisz swój pomysł na udoskonalenie.

Pomysł na udoskonalenie

PRZEJAZDY GRUPOWE

Źródło: <https://www.oecd.org/en/about/programmes/pisa/pisa-2022-creative-thinking-test-questions.html>

W tym zadaniu uczniowie mogli uzyskać 0, 1 lub 2 punkty. Odpowiedź ucznia, za którą można było uzyskać 1 lub 2 punkty musiała zawierać pomysł, który był, po pierwsze, adekwatny, tj.: zgodny z zadaniem (odpowiedź musiała być spójnym pomysłem na udoskonalenie promocji przejazdów grupowych samochodami, uzupełnionym o nowe elementy w stosunku do przykładowych z zadania, czyli rabatów na paliwo lub pokrycie kosztów przejazdów płatnymi drogami dla osób korzystających ze wspólnych przejazdów) i na temat (w odpowiedzi można było odnaleźć co najmniej jedno bezpośrednie lub pośrednie nawiązanie do istniejącej inicjatywy promującej przejazdy grupowe w kontekście zmniejszenia zanieczyszczenia powietrza i zredukowania liczby pojazdów na drogach). W kolejnym kroku koderzy oceniali kreatywność przedstawionego przez ucznia pomysłu. Aby uzyskać pełną punktację (2 pkt), pomysł ucznia musiał nawiązywać do jednego z tematów określonych jako niekonwencjonalny w kluczu kodowym. Jeśli uczeń nawiązał do tematu określonego w kluczu kodowym jako konwencjonalny i nie przedstawił go w innowacyjny sposób, otrzymywał za zadanie częściową punktację (1 punkt). Tematy konwencjonalne to tematy częściej występujące, bardziej popularne, a tym samym – uznane za mniej oryginalne. Decyzja, które tematy zostały uznane za konwencjonalne, a które za niekonwencjonalne, została podjęta na podstawie danych zgromadzonych najpierw w pre-pilotażu, a później – w pilotażu zadań w badaniu PISA 2022.

Odpowiedzi niepunktowane wśród polskich uczniów najczęściej dotyczyły transportu publicznego, co wskazuje na niezrozumienie zadania. Natomiast wśród najczęstszych odpowiedzi za 1 punkt znalazły się rozwiązania określone w kluczu kodowym jako konwencjonalne, tj. polegające na: prowadzeniu kampanii społecznych lub ułatwieniu koordynacji i planowania przejazdów grupowych (np. poprzez cyfrowe aplikacje dotyczące przejazdów grupowych).

Drugie zadanie z zakresu rozwiązywania problemów społecznych, w którym średni odsetek odpowiedzi za 2 punkty w Polsce był niższy od średniego odsetka dla krajów OECD, zaś odsetek odpowiedzi za 1 punkt wyższy od średniego odsetka dla OECD, polegało na wymyśleniu sposobów na redukcję ilości śmieci w oceanach (zadanie nr DT420Q02C2)⁷.

Analiza odpowiedzi uczniów wskazuje, że najczęściej proponowali oni rozwiązanie polegające na recyklingu odpadów, co w kluczu kodowym było oceniane na 1 pkt jako odpowiedź częściej się powtarzająca, a tym samym – nieco mniej oryginalna.

7. PODSUMOWANIE I DYSKUSJA WYNIKÓW

Jak pokazały wyniki analizy na poziomie poszczególnych zadań, jedynie w czterech (spośród 32) zadaniach średni odsetek polskich uczniów plasuje ich poniżej średniego odsetka dla krajów OECD w przypadku odpowiedzi najwyższej punktowanych. Tylko dwa z tych zadań dotyczą wymiaru tworzenia różnorodnych pomysłów. Dwa pozostałe znajdują się z kolei w domenie rozwiązywania problemów społecznych. W związku z powyższym analiza i dyskusja tych wyników zostanie przedstawiona w dwóch odrębnych wątkach dotyczących: tworzenia różnorodnych pomysłów i rozwiązywania problemów społecznych.

Hipotezą badawczą postawioną w niniejszej analizie pogłębionej, było stwierdzenie, że polscy uczniowie mogą wypadać gorzej w przypadku zadań z tworzenia różnorodnych pomysłów (czyli tzw. płynności), które wymagają włożenia większego wysiłku lub dłuższych odpowiedzi.

Tę początkową hipotezę uprawdopodobniały wyniki badania kwestionariuszowego PISA 2022. Jedną z cech należących do obszaru kompetencji społeczno-emocjonalnych mierzonych w badaniu PISA 2022, która może korelować z wynikami w zakresie myślenia kreatywnego, jest wytrwałość⁸. Polscy uczniowie, jeśli chodzi o wynik przeciętny na skali wytrwałości, są znacznie poniżej średniej wyliczonej dla krajów OECD oraz krajów spoza OECD biorących udział w badaniu PISA 2022. Co więcej, polscy uczniowie znaleźli się również na ostatnim miejscu w uszeregowaniu krajów ze względu na wartości średnie tej skali. W związku z powyższym sprawdzono, czy rozwiązanie (lub nie) tych dwóch zadań z tworzenia różnorodnych pomysłów, w których polscy uczniowie wypadli nieco słabiej, różnicuje ich pod względem średniej na skali wytrwałości. Okazało się, że różnica jest nieistotna statystycznie.

Sprawdzono również charakterystykę zadań z zakresu tworzenia różnorodnych pomysłów. Takich zadań było w badaniu PISA 2022 w sumie 12, a każde z nich różniło się przede wszystkim typem zadania i nakładem pracy niezbędnym do jego rozwiązania (Tabela 5).

⁷ To zadanie nie zostało odtajnione, w związku z tym nie opisujemy go dokładnie ani nie prezentujemy w niniejszym artykule.

⁸ Wytrwałość rozumiana jest w badaniu kwestionariuszowym PISA 2022 jako praca nad zadaniami lub wykonywanie pewnych działań, dopóki nie zostaną one ukończone (mierzona m.in. za pomocą następujących stwierdzeń: „Pracuję nad zadaniem, dopóki go nie skończę”; „Wkładam dodatkowy wysiłek, gdy praca staje się trudna”; „Kończę zadania, które zaczęłam/zaczęłam, nawet gdy stają się nudne”; „Jestem bardziej wytrwała/wytrwały niż większość osób, które znam”; „Wykonuję zadania nawet wtedy, gdy stają się trudniejsze niż się spodziewałam/spodziewałam”; „Zawsze kończę to, co zaczynam”; „Przestaję pracować, gdy praca staje się zbyt trudna”; „Poddaję się po popełnieniu błędów”; „Przestaję odrabiać pracę domową, jeśli jest za długa”; „Łatwo się poddaję”).

Tabela 5 Podział zadań z wymiaru tworzenia różnorodnych pomysłów ze względu na szacowany nakład pracy i typ zadania

Domena	Szacowany czas na odpowiedź (wg treści zadania)	Typ zadania
Wypowiedź pisemna	7 min	2 pomysły na opowiadanie
Wypowiedź pisemna	nie podano	3 tytuły ilustracji
Wypowiedź pisemna	7 min	2 pomysły na scenariusz filmu
Wypowiedź pisemna	nie podano	3 różne tytuły na komiks
Prezentacja graficzna	5 minut	2 pomysły na promocyjną przypinkę
Rozwiązywanie problemów społecznych	5 minut	3 rozwiązania wskazanego problemu (wystarczyło po 1 zdaniu na każde rozwiązanie)
Rozwiązywanie problemów społecznych	5 minut	3 rozwiązania wskazanego problemu (wystarczyło po 1 zdaniu na każde rozwiązanie)
Rozwiązywanie problemów społecznych	5 minut	3 rozwiązania wskazanego problemu (wystarczyło po 1 zdaniu na każde rozwiązanie)
Rozwiązywanie problemów społecznych	5 minut	3 rozwiązania wskazanego problemu (wystarczyło po 1 zdaniu na każde rozwiązanie)
Rozwiązywanie problemów naukowych	5 minut	2 rozwiązania wskazanego problemu (wystarczyło po 1 zdaniu na każde rozwiązanie)
Rozwiązywanie problemów naukowych	5 minut	3 rozwiązania wskazanego problemu (wystarczyło po 1 zdaniu na każde rozwiązanie)
Rozwiązywanie problemów naukowych	nie podano	Stworzenie 3 kategorii, grup i przykładów – w sumie wystarczyło podać min. 15 słów

Źródło: opracowanie własne na podstawie zadań OECD PISA 2022.

W tabeli zaznaczono na szaro dwa zadania, w których polscy uczniowie wypadli nieco słabiej na tle średniej dla OECD.

Zgodnie z szacunkami zespołu przygotowującego zadania do badania większość zadań z zakresu TRP nie powinna zająć uczniom dłużej niż 5 lub 7 minut. Zadania, w których polscy uczniowie wypadli nieco słabiej, nie różniły się więc znacząco od innych zadań w zakresie nakładu pracy niezbędnej do ich rozwiązania.

Nie wykazano więc związku pomiędzy samooceną uczniów na skali wytrwałości ani wyróżniania się tych zadań pod względem nakładu pracy wymaganego od uczniów. Można jedynie zaryzykować kolejną hipotezę, że polscy uczniowie mogą wypadać nieco słabiej w przypadku zadań spełniających wszystkie wymienione niżej warunki, tj.:

- wymagających sporego nakładu pracy;
- takich, z którymi spotykają się rzadziej w szkole (jak np. scenariusz filmu);
- takich, w których trzeba przedstawić kilka rozwiązań, co może nie wydawać się uczniom do końca celowe (np. scenariusz filmu).

Zweryfikowaniu tej kolejnej hipotezy mogłyby służyć dalsze badania kognitywne z wykorzystaniem tych właśnie zadań z myślenia kreatywnego z PISA 2022. Nieco słabsze wyniki w zakresie akurat tych dwóch zadań mogły również wynikać z przyczyn losowych, takich jak dystrybucja poszczególnych zadań wśród badanych uczniów.

Drugi wątek, który można wyodrębnić dzięki tej analizie, to wątek zadań z zakresu rozwiązywania problemów społecznych. W tej domenie znów jedynie w dwóch zadaniach odsetek polskich uczniów, którzy uzyskali najwyższą punktację,

również był nieco niższy niż średni odsetek dla krajów OECD. W przypadku obu analizowanych zadań, przyczyn niższego wyniku można upatrywać w braku lub mniejszej widoczności rozwiązań postawionego w danym zadaniu problemu, określonych w kluczu kodowym jako niekonwencjonalne, a więc mniej popularne i tym samym – bardziej kreatywne.

W Polsce aplikacje do wspólnych przejazdów są obecne i używane, nie ma natomiast zbyt wielu rozwiązań administracyjnych w tym zakresie, jak np. wydzielone pasy autostrad dla samochodów czy niższe koszty użytkowania pojazdów z większą liczbą pasażerów lub zamykanie autostrad dla pojazdów z jednym pasażerem. Wydaje się, że w przypadku aplikacji do współdzielonego transportu Polacy szukają raczej oszczędności dla domowego budżetu lub korzystają z przejazdów współdzielonych z konieczności, np. ze względu na kwestię wykluczenia komunikacyjnego, brak własnego środka transportu lub po prostu chcą jechać taniej i szybciej niż przykładowo pociągiem. Kwestie ochrony środowiska i niższej emisji dwutlenku węgla, pomimo że podkreślane w reklamach platform do wyszukiwania przejazdów, mogą mieć dla użytkowników znaczenie drugoplanowe. Ta niższa świadomość oraz mniejsza popularność rozwiązań administracyjnych mogły mieć wpływ na mniejszą oryginalność (według międzynarodowego klucza kodowego) proponowanych rozwiązań. Być może wpływ na taki, a nie inny wynik polskich uczniów, ma również brak osobistych doświadczeń związanych z koniecznością przejazdów grupowych. Polscy piętnastolatki prawdopodobnie nie spotykają się w swoim życiu z żadnymi ograniczeniami w ruchu pojazdów i koniecznością korzystania z przejazdów współdzielonych z powodów ekologicznych bądź związanych ze zbyt dużym zatłoczeniem dróg. Tajwan jest przykładem kraju, w którym stosowane jest rozwiązanie typu zamykanie autostrad dla samochodów z mniejszą liczbą osób niż 3 w określonych dniach i godzinach. W takich krajach uczniowie bezpośrednio stykają się z koniecznością przejazdów współdzielonych w tego typu sytuacjach. Tak więc można założyć, że na wynik mają w przypadku tego zadania wpływ nie kwestie związane z kreatywnością, a raczej obecność w życiu codziennym uczniów praktykowanych w tym zakresie rozwiązań.

W przypadku drugiego zadania sytuacja jest analogiczna. Rozwiązania polegające na recyklingu odpadów, określone w międzynarodowym kluczu kodowym jako konwencjonalne, są bardziej widoczne dla przeciętnego 15-latka, który segreguje w tym celu śmieci w domu. Natomiast rozwiązania polegające na zapobieganiu powstawania plastikowych odpadów czy przygotowaniu ich do ponownego użycia (a tym samym – ostatecznego zmniejszania ich ilości w oceanach, co było przedmiotem zadania) są w Polsce na razie przedmiotem dyskursu specjalistów i biznesu. W debacie publicznej kwestie te nie są jeszcze bardzo popularne. Z tego względu polscy uczniowie mogli wypaść w tym zadaniu nieco słabiej niż ich rówieśnicy, gdyż wskazywali rozwiązania (głównie recykling), które w kluczu kodowym zostały określone jako te mniej oryginalne (1 punkt zamiast 2). Tak więc i w tym zadaniu, to raczej nie kreatywność uczniów, a ich styczność z danymi rozwiązaniami, była przyczyną ich słabszego wyniku.

Tak czy inaczej, analizując wyniki myślenia kreatywnego w badaniu PISA 2022 należy zachować ostrożność, interpretując wnioski z niego płynące, między innymi ze względu na to, że tego rodzaju pomiar przeprowadzono w badaniu PISA po raz pierwszy. Warto również zwrócić uwagę na fakt, że pomiar umiejętności myślenia kreatywnego jest z natury trudniejszy do zaprojektowania i przeprowadzenia niż pomiar umiejętności w głównych dziedzinach badania PISA. Odpowiedzi uczniów w zakresie myślenia kreatywnego są zaś trudniejsze do obiektywnej oceny niż w głównych dziedzinach badania.

Warto jednak prowadzić tę dyskusję, pogłębiać analizy oraz badania i prowadzić kolejne w tym zakresie, jak również wprowadzać więcej zagadnień związanych z kreatywnością do wymagań ustawowych oraz praktyki edukacyjnej.

8. MOŻLIWE KIERUNKI DZIAŁAŃ DLA POLITYKI EDUKACYJNEJ

Polscy piętnastolatki osiągnęli wysoki wynik w zakresie myślenia kreatywnego w PISA 2022, również we wszystkich domenach i wymiarach zdefiniowanych w założeniach teoretycznych badania.

Jedynie w czterech (spośród 32) zadaniach wynik polskich uczniów plasuje ich poniżej średniej dla krajów OECD. Z analizy tych zadań i odpowiedzi uczniów wynika, że mogą być dwa aspekty polityki edukacyjnej, na które można zwrócić uwagę, aby jeszcze zwiększyć potencjał kreatywny polskich nastolatków.

Po pierwsze, można przyrzeć się wytycznym (np. na poziomie podstawy programowej) i praktykom edukacyjnym dotyczącym projektów wymagających od uczniów tworzenia wielu różniących się od siebie pomysłów lub rozwiązań tego samego zadania, zwłaszcza w przypadku zadań wymagających sporego nakładu pracy (np. zadania pisemne czy graficzne). Wydaje się, że tego typu zadania są typowym sposobem działania w życiu zawodowym (np. konieczność przedstawienia dwóch lub trzech propozycji ofertowych czy graficznych klientowi). Warto w przypadku tego typu zadań dbać również o wyraźne pokazanie uczniom celowości prezentowania kilku rozwiązań.

Po drugie, można przeanalizować również wymagania (np. na poziomie podstawy programowej) i praktykę edukacyjną pod kątem zawartości w dokumentach programowych i szkolnych zagadnień związanych ze współczesnymi problemami społecznymi (globalnymi). Warto tego typu zagadnienia omawiać na wszystkich przedmiotach, wykorzystując np. jeden wybrany problem społeczny jako tzw. temat horyzontalny omawiany z różnych perspektyw na wszystkich lub wielu przedmiotach w wyznaczonym czasie. Warto w takim przypadku szukać również przykładów rozwiązań z innych krajów, co pozwoli na szersze rozumienie problemu i potencjalnych możliwości jego rozwiązania.

W ten sposób możliwe jest dalsze wzmacnianie potencjału w zakresie myślenia kreatywnego polskich 15-latków.

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Socioeconomic Disparities in Career Expectations and Readiness Among Polish Adolescents: Insights from PISA 2022 Data

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Abstract

This study investigates how career and educational expectations align with school tracks in Poland's secondary schooling, using PISA 2022 data. We examine students in general, technical, and sectoral schools, analyzing how alignment is shaped by socioeconomic status (SES), parental involvement, academic achievement, and career information-seeking. Structural equation modeling shows that SES and parental engagement improve alignment, especially in vocational tracks, where institutional support is weaker. Math performance is also key, particularly in technical schools. In contrast, career guidance and information-seeking activities have limited effects, possibly due to variation in activity types. Many 3-year sectoral vocational students aspire to careers requiring higher education, leading to notable misalignment. The findings call for track-sensitive career support to reduce inequality and support informed decision-making.

Keywords: **Career guidance, career expectations, career readiness, PISA.**

Spółeczno-ekonomiczne zróżnicowanie oczekiwań zawodowych i gotowości do podejmowania kariery polskich nastolatków: Wnioski z badania PISA 2022

Streszczenie

Artykuł opisuje zgodność między oczekiwaniami edukacyjnymi i zawodowymi a typem szkoły w zróżnicowanym systemie ponadpodstawowym w Polsce, wykorzystując dane PISA 2022. Analizujemy uczniów liceów ogólnokształcących, techników i szkół branżowych I stopnia, skupiając się na roli statusu społeczno-ekonomicznego (SES), zaangażowania rodziców, wyników z matematyki i aktywności związanych z doradztwem zawodowym. Modelowanie równań strukturalnych pokazuje, że SES i wsparcie rodziców wspierają zgodność oczekiwań z typem szkoły, szczególnie w technikach i szkołach branżowych. Wyniki

z matematyki mają znaczenie głównie w technikach. Działania z zakresu doradztwa i innych form poszukiwania informacji o możliwościach rozwoju kariery, mają ograniczony wpływ, a wielu uczniów szkoły branżowej I stopnia planuje studia wyższe, co prowadzi do niezgodności. Wyniki wskazują na potrzebę ścieżkowo zróżnicowanego doradztwa zawodowego.

Słowa kluczowe: **Poradnictwo zawodowe, oczekiwania zawodowe, gotowość zawodowa, PISA.**

1. INTRODUCTION

Imagine a 15-year-old graduate just finishing primary school. She's bright, curious, and dreams of becoming a doctor—but she's just enrolled in a vocational school because her parents, unsure about future costs, encouraged a "practical" path. Her current track makes it unlikely she'll ever pursue medicine. Such cases are not uncommon.

In Poland, students must choose between general (LO), technical (TECH), or vocational (BS I) secondary schools at the end of primary school—decisions that often shape access to higher education and future labor market outcomes. While some mismatch between aspirations and realities is developmentally acceptable, growing evidence suggests that early misalignment can systematically disadvantage students from lower socioeconomic backgrounds (Schneider & Stevenson, 1999; Buchmann & Park, 2009). These students often receive less guidance, make less informed choices, and face barriers in adjusting their plans later.

This study examines how socioeconomic disparities shape the alignment between students' career expectations and the educational pathways they pursue. Drawing on nationally representative data from PISA 2022, we define misalignment as the gap between what students expect to do in the future and what their current school track realistically prepares them for. Misalignment has been linked to lower academic engagement, underemployment, and broader social inequality.

Our study focuses on Poland's stratified and moderately early tracking education system, where institutional design, family background, and career support services intersect. While prior research has documented alignment patterns in Western countries, there is limited evidence from Central and Eastern Europe, where different policy environments and social dynamics shape student decision-making. We contribute to this literature by analyzing how alignment patterns vary across school tracks and are shaped by educational programs/type of school, socioeconomic status (SES), parental involvement, and career information-seeking activities. Our central research questions are: How does the school track shape alignment between students' educational trajectories and career expectations? In what ways does socioeconomic background—especially parental involvement—affect this alignment? Does active career exploration improve alignment and are these effects dependent on the school track?

Using a structural equation modeling approach, we provide timely evidence from a nationally representative cohort of students entering secondary education. Our results show that while institutional placement is a strong predictor of alignment, family resources and academic performance play critical roles, especially in vocational and technical tracks where structural support is weaker. In contrast, career guidance shows a limited impact, likely due to the fragmented or uneven quality of these activities. These findings have both national and international relevance. They point to the need for track-sensitive, equity-oriented career support, particularly for students from disadvantaged backgrounds, who are most vulnerable to misalignment early in their educational journeys.

The following sections review theoretical perspectives on alignment and tracking, describe the Polish context, and present our analytical strategy. We then discuss our findings and conclude with implications for policy and practice aimed at reducing inequality and improving student decision-making.

2. LITERATURE REVIEW

In stratified education systems, adolescents' educational tracks often diverge from their future occupational aspirations in ways that can adversely affect both individual trajectories and broader social mobility. This section reviews key theoretical and empirical work on (1) the definition and significance of alignment, (2) the role of socioeconomic status (SES) in shaping aligned expectations, (3) the impact of institutional tracking, (4) the potential of career guidance interventions, and (5) prevailing research gaps, with a particular emphasis on the Polish context.

2.1 Defining Alignment and Its Importance

In the sociology of education, alignment typically denotes the congruence between students' educational plans and the level of education required for their intended occupations (Ahearn, 2021; Kim et al., 2019; Schneider & Stevenson, 1999). Aligned expectations—where a student's educational pathway corresponds to the qualifications needed for their aspirational occupation—have been linked to higher academic engagement, greater persistence in education, and improved labor market

outcomes (Beal & Crockett, 2010; Mello, 2008). By contrast, misalignment (under- or over-alignment) often entails suboptimal decisions, potentially leading to lower rates of college enrollment, underemployment, and reduced earnings (Schmitt-Wilson & Faas, 2016; Quintini, 2011). Although some degree of uncertainty is both common and developmentally appropriate in adolescence, repeated findings indicate that students who sustain misaligned or unclear expectations face increased risks of dropping out or ending up in precarious employment (Ahearn, 2021; Kim et al., 2019).

2.2 Socioeconomic Status (SES) and Alignment

Socioeconomic status (SES) is one of the strongest influences on whether students' educational paths align with their career expectations. To understand how SES shapes these decisions, we draw on three key theoretical perspectives: status attainment theory, cultural capital, and rational choice theory.

Theories of status attainment have long emphasized that young people do not make these decisions alone. Instead, their choices are shaped by "significant others"—parents, teachers, and peers—who pass on not just advice, but also access to information, networks, and cultural knowledge (Sewell et al., 1969; Morgan, 2005). In high-SES families, this influence often works in students' favor. These parents tend to possess what Bourdieu (1986) called cultural capital: insider knowledge about how institutions work, what kinds of careers require which qualifications, and how to navigate the path from school to university to professional life. Their children are often guided towards ambitions that match the requirements of those careers—what researchers call "aligned expectations" (Schneider & Stevenson, 1999). By contrast, students from lower SES backgrounds often lack access to these resources. Some families may be unfamiliar with higher education pathways, whereas others may view long-term schooling as financially risky (Armstrong & Hamilton, 2013). According to the rational choice theory, these students often prioritize immediate job prospects over further education, especially when the costs of continuing seem high and the benefits are uncertain (Breen & Goldthorpe, 1997; Hanson, 1994). The result is a pattern that many studies have observed: disadvantaged students are more likely to be "under-aligned"—aspiring to careers that require more education than their current track offers—or to set more limited goals from the outset. In either case, structural inequality is reproduced through the education system itself (Ackermann & Benz, 2023; Buchmann & Park, 2009; Valdés, 2022).

2.3 Educational Tracking

Tracking systems—how and when students are sorted into academic or vocational pathways—play a central role in shaping career alignment. Of relevance is how the age of first selection, system flexibility, and socioeconomic background intersect to influence students' options. These systems vary widely in Europe. In countries such as Austria and Germany, tracking begins as early as 10 years of age. In Czechia and Slovakia, it starts around 11. In contrast, countries such as Poland, France, and Spain delay tracking until age 15, while Nordic countries such as Denmark, Finland, and Sweden avoid formal tracking altogether, offering a common general education pathway until age 16. However, when tracking occurs early or when transitions between tracks are difficult, students' educational options can become locked in. Students in vocational tracks who later aspire to tertiary-level careers often face roadblocks: they may lack access to college-preparatory coursework or the credentials required for university entry (Ackermann & Benz, 2023; Morgan et al., 2013). These constraints are often felt most acutely by lower-SES students, who also report fewer interactions with career guidance counselors and limited access to planning resources (Holland 2015; Ahearn 2021). As a result, tracking can reinforce inequality rather than reduce it. Schneider and Stevenson (1999) capture this dilemma in their description of how tracking can "decouple" students' aspirations from their educational reality, especially when vocational pathways fail to clearly map onto higher education or long-term careers.

2.4 Career information seeking

Career guidance is often seen as a tool for helping students align their aspirations with realistic educational and labor market pathways. In theory, guidance programs provide tailored information about job requirements, labor market trends, and the academic steps needed to reach particular careers (Covacevich et al., 2021a; Freelin & Staff, 2020). These interventions can reduce both under- and over-alignment by helping students understand what credentials are actually needed for their goals. Importantly, guidance can play a compensatory role, particularly for students in vocational tracks or from lower-SES backgrounds who may have fewer family or social network resources to draw on (Morgan et al., 2012; Sabates et al., 2011). However, research has shown that not all students benefit equally. Students from higher SES families or academic tracks often have the means to act on new information. Thus, they are more likely to translate guidance into concrete plans. In contrast, disadvantaged students may still face uncertainty, institutional barriers, or limited options even after receiving support (Ahearn, 2021; Cedefop, 2018). In other words, career guidance is only a part of the solution. Its effectiveness depends heavily on the starting position of the student within the system. Interventions that assume equal access or readiness can unintentionally widen existing disparities (Kim et al. 2019). Understanding this dynamic is essential for evaluating how—and for whom—guidance works.

2.5 Research on Misalignment and Measurement

When researchers discuss students' career goals and how well they align with their educational paths, they often distinguish between two key concepts: misalignment and mismatch. These terms are related, but refer to different stages of the education-to-work journey.

Misalignment occurs during adolescence. It refers to a gap between a student's career aspirations and the level of education typically required to achieve that goal. In contrast, mismatch describes what happens later in adulthood, when someone's actual educational credentials do not align with the demands of their current job (Chowdhury et al., 2024). Schneider and Stevenson (1999) are among the most widely used approaches for measuring misalignment. They compared students' self-reported educational expectations to standard occupational requirements, such as those defined in frameworks like the O*NET database, to identify who was "over-aligned" (expecting more education than needed) or "under-aligned" (expecting less than needed).

Some studies have also used a third category, uncertainty. Some adolescents do not know what they want to do or what level of education they need (Ahearn, 2021; Greve et al., 2021). While this kind of uncertainty can be a normal part of development, research shows that when it persists, it may be linked to lower academic achievement and weaker outcomes in the labor market (Staff et al., 2010; Yates et al., 2010).

In early tracking education systems, in which students are placed in academic or vocational tracks early, researchers often measure alignment by asking a simple but important question: does the student's current school track realistically lead to the kind of job they hope to have? (Sabates et al., 2011). For example, a student in a vocational program who wants to become a doctor may be under-aligned because their current path does not support that level of qualification. Obviously, some students can eventually become doctors; however, this requires gaining additional formal education qualifications. On the flip side, an academic-track student who plans to work in a job that does not require a university degree might be considered over-aligned (Kim et al., 2019; Yates et al., 2011). Understanding these patterns—and who is most likely to experience these risks—can help identify where support is needed most.

3. RESEARCH GAPS AND HYPOTHESES

While scholars have made substantial progress in understanding the misalignment between students' educational paths and career expectations, several important questions remain, particularly regarding when and how misalignment emerges and how institutional structures shape it.

First, most studies examine misalignment at later stages of the educational journey, such as during the final years of high school or adulthood. This leaves a critical gap in our understanding of how expectation gaps form earlier, just as students begin secondary school and navigate new academic environments. Second, the research has been geographically concentrated. Much of our knowledge comes from the U.S., the U.K., or select Western European countries. Few studies have examined how misalignment operates in Central and Eastern Europe, where tracking may interact with institutional and socioeconomic dynamics. Third, the effects of career guidance remain unclear. While guidance is often viewed as a tool to improve alignment, recent research suggests that its impact may vary depending on students' socioeconomic background and school context. High-SES students tend to benefit more, while others may lack the resources or institutional support to act on new information. Finally, many existing studies treat school systems as uniform. Yet students experience guidance, support, and structural barriers differently depending on the educational track they are placed in. Greater attention to this institutional heterogeneity is needed to understand when and for whom misalignment emerges—and how it might be addressed.

To respond to these gaps, our study tests three hypotheses that explore how socioeconomic status, school tracking, and career exploration influence the alignment between students' aspirations and their educational trajectories. Unlike prior research, we explicitly examine how these relationships vary across institutional pathways in Poland.

H1: School Track and Alignment

Students in general secondary schools (LO) will exhibit higher alignment than those in vocational tracks (TECH and BS I), reflecting differences in program orientation, academic preparation, and access to future educational opportunities (Buchmann & Park, 2009; Ackermann & Benz, 2023).

This hypothesis considers how track-specific structures shape student choices and constraints.

H2: Socioeconomic Status and Parental Involvement

Higher SES and stronger parental engagement will be associated with greater alignment across tracks, consistent with theories of status attainment and rational decision-making (Sewell et al., 1969; Breen & Goldthorpe, 1997).

We examine whether family resources help students pursue more realistic academic and career goals.

H3: Career Exploration and Guidance

Engagement in career-related information seeking will positively affect alignment, with stronger effects expected among sectoral school (purely vocational) students.

This hypothesis tests whether guidance can help close alignment gaps for students facing institutional and informational disadvantages.

By focusing on Poland this study highlights how alignment patterns differ not just by student background, but also by institutional context. In doing so, it contributes to a more nuanced understanding of educational inequality—one that is attentive to the heterogeneous effects of structure, support, and choice across tracks.

3.1 Institutional context of Poland's educational system

To understand how alignment between career expectations and educational pathways takes shape, it's essential to consider the institutional environment in which students make these decisions. In this study, this means looking closely at the design of Poland's secondary education system—how it structures opportunity, tracks students, and supports (or limits) their ability to revise their plans.

Students in Poland make track-based decisions relatively early. After completing eight years of primary school, 14- and 15-year-olds must choose between a four-year general secondary program (LO), which prepares them for university, or vocational options such as five-year technical programs (TECH) and shorter three- or two-year sectoral schools (BS I and BS II)¹. These decisions shape not only educational prospects but also long-term labor market trajectories, and require access to clear, timely information about schools, jobs, and future trends (Cedefop & Educational Research Institute [IBE], 2023). Most students opt for the general or technical tracks—over 80% in 2022/2023—both of which can lead to higher education. Sectoral programs, chosen by about 12% of students, combine vocational training with limited general education and typically lead directly to employment (Cedefop & IBE, 2023).

The post-graduation landscape reflects these institutional divisions. Over 80% of LO graduates enrol in university within two years, compared to 47–52% of TECH graduates, many of whom combine study and work. In contrast, most BS I graduates enter the labor market immediately, though 15–20% take adult education or additional qualification courses to change paths (IBE, 2024). These outcomes are tracked through administrative data sources including Poland's Social Insurance Institution (ZUS) and the higher education POL-on database. Labor market indicators further illustrate these mismatches. According to PIAAC 2023, Poland has an over-qualification rate of 13.5% (well below the OECD average of 23%) and an under-qualification rate of 3.7%, with approximately 34% of graduates working outside their field of study (OECD, 2024).

To help students navigate these choices, Polish schools are required to offer career guidance at every level. Since a 2019 regulation by the Ministry of National Education (Journal of Laws of 2019, Item 325), schools have implemented activities ranging from preschool job visits to structured guidance in secondary school. Seventh- and eighth-grade students receive at least 10 hours of guidance per year, and secondary school programs must provide an additional 10 hours total. These services are typically delivered by teachers, counselors, or external partners such as labor offices (IBE, 2024). In theory, this system is designed to adapt to local needs; career fairs, class discussions, and parent engagement are all encouraged, but in practice, implementation varies widely. And while the policy framework is ambitious, evidence of impact is limited. Despite widespread access to guidance, we still know relatively little about whether these interventions help students make informed, realistic choices about their futures (IBE, 2024).

4. DATA AND METHODS

4.1 Data

This study uses data from the 2022 cycle of the Programme for International Student Assessment (PISA), administered by the OECD. PISA assesses the competencies of 15-year-old students in reading, mathematics, and science and collects extensive background information on students, their families, and schools.

Our analytic sample includes 4,916 ninth-grade students in Poland, drawn from a nationally representative sample of schools. We excluded students who were still in primary education or already enrolled in the 10th grade at the time of the survey. The PISA sampling procedure follows a two-stage stratified design. Schools are first sampled with probabilities proportional to size, followed by random sampling of students within selected schools.

Data were collected using computer-based cognitive assessments and background questionnaires. Our analysis uses student background data, mathematics plausible values, and derived indicators relevant to students' educational and occupational expectations.

5. VARIABLES AND MEASUREMENT

5.1 Dependent Variables: Alignment Measures

We employ two measures of alignment to capture the extent to which students' educational and occupational expectations correspond to their current school track. School Track is a categorical variable distinguishing three Polish secondary pathways:

¹ More specifically, the Polish system includes pre-primary, 8-year primary, 4-5 years of secondary, and 1-2.5 years of postsecondary education. Secondary options are: 4-year general secondary (LO, ISCED 344), 5-year technical vocational (TECH, ISCED 354), 3-year sectoral vocational (BS I, ISCED 353), and 2-year sectoral vocational (BS II, ISCED 354). Vocational programs taught in technical and sectoral schools cover over 200 professions, with 60% of students in apprenticeships (Cedefop & Educational Research Institute [IBE], 2023).

4-year general secondary (LO), 5-year technical vocational (TECH) and 3-year sectoral vocational (BS I) schools, of which only TECH and LO give direct access to tertiary education (after passing qualifying exams), while BS I is designed to lead directly to the labour market. In certain model specifications, track serves as a mediating variable (to evaluate how it influences alignment), whereas in others it is used as a stratifying factor for subgroup comparisons. We define alignment by comparing students' educational and occupational expectations to the normative outcomes typically associated with their current school track. We used the PISA questions that ask about educational and occupational expectations for this².

For educational alignment, we use the International Standard Classification of Education (ISCED) framework. We consider LO students aligned if they expect to attain tertiary education (ISCED Levels 5–8), TECH students if they expect at least post-secondary non-tertiary or professional tertiary education (ISCED Level 4+), and BS I students if they anticipate no more than secondary vocational education (ISCED Level 3.3 or 3.4). The distribution of expectations and assumed alignment are presented in Figure 1A.

Occupational alignment is based on the International Standard Classification of Occupations (ISCO). LO and TECH students are considered aligned if they expect to enter high-skilled or professional roles (ISCO groups 0–5), whereas BS I students are aligned if they anticipate mid- or lower-skilled occupations (ISCO groups 4–9). Students without a clear idea about their future occupation are coded as misaligned, following PISA coding and practices used by Greve et al. (2011). While an “uncertain” category was considered, this approach simplified the modelling process and maintained analytical clarity. This is illustrated in Figure 1B.

Taken together, these variables serve as early indicators of vertical mismatch risk in students' future educational and labour market trajectories. To illustrate how alignment is operationalized across school types, the figures below present the distribution of educational and occupational expectations by ISCED level and ISCO groups. Shading indicates alignment, based on the criteria defined above.

Figure 1A *Educational expectations by school type and ISCED level with marked alignment assumptions*

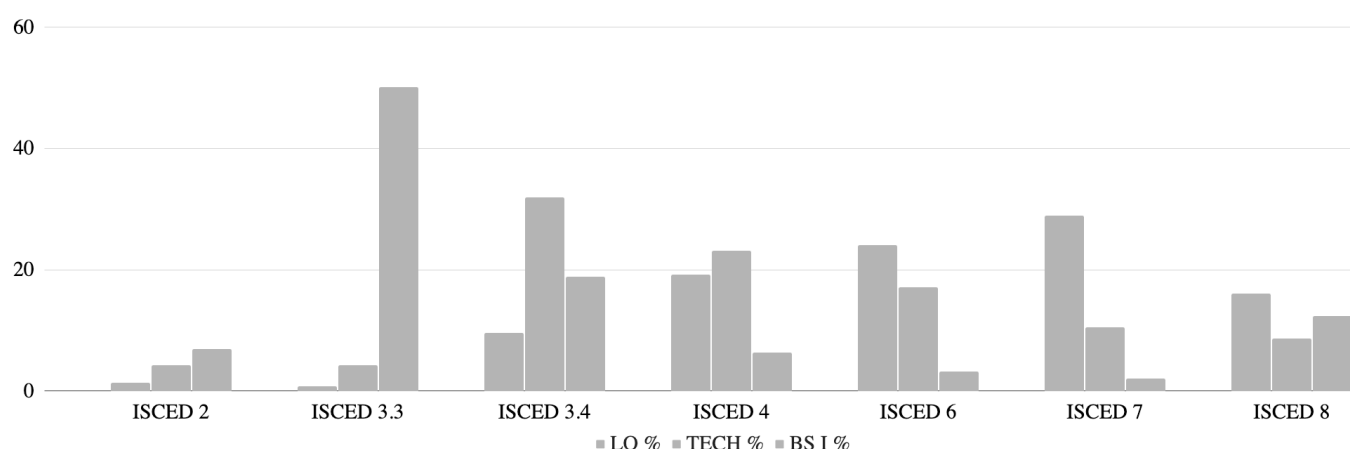
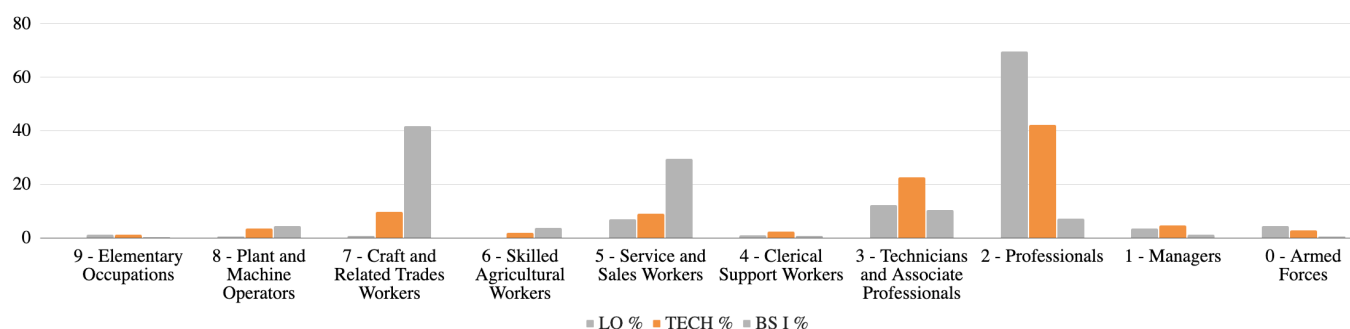


Figure 1B *Occupational alignment by school type and ISCED level with marked alignment assumptions*



² Students were asked about their expected educational attainment – marking the list of possible educational levels they expect to complete. For occupational expectations, students were asked about what kind of job they expect to have when they are about 30 years old and answers were human-coded based the ISCO-08 classification system.

5.2 Predictors

We include a range of background and school-related factors that may influence alignment outcomes.

Socioeconomic Status (ESCS). A standardized OECD index combining parental education, parental occupation, and household possessions, with higher values indicating more socioeconomic advantage. The index is based on three components with equal weights: highest parental occupation status (HISEI), highest education of parents in years, and home possessions (see OECD, 2024; 406–408 for technical details).

Mathematics Performance. Operationalized through ten plausible values for math literacy in PISA. Multiple imputation is used to incorporate these plausible values into the analyses (technical details on the computations of the scores can be found in OECD, 2024). In our analyses we use centered and standardized values. We focus our analysis exclusively on PISA mathematics scores as a proxy for general skills. While reading and science literacy scores are available they are highly correlated with math performance. By focusing on math we avoid redundancy and multicollinearity issues.

Gender. A binary indicator (1 = female) to capture gender differences.

5.3 Mediators

We focus on two mediators a mediating factor between SES, performance and gender and alignment outcomes.

Career Guidance Engagement (INFO). INFO reflects students' proactive behavior in exploring future educational and occupational paths. It is constructed from five survey items that ask students how frequently they have attended job fairs or career days, spoken with a school career counselor, participated in job shadowing or internships, searched online for career or education information, and consulted teachers about career plans. An Item Response Theory (IRT) Generalized Graded Response Model (GGRM) is applied to these items, yielding a standardized latent trait, where higher scores indicate more frequent engagement in career exploration³.

Parental Interest and Involvement (PINT). PINT captures parents' engagement with their children's educational progress and career planning. It draws on six questionnaire items assessing how often parents discuss school performance ("talk about educational plans", "express interest in schoolwork", "encourage academic achievement", "offer help with academic difficulties", and "inquire about future goals". As with INFO, responses are modelled using a GGRM to generate a continuous standardized score, where higher values represent greater parental involvement.

The table below shows descriptive statistics of all the variables used with the breakdown by track/type of school.

Table 1 *Descriptive statistics (overall and by school)*

Variable	Full Sample	LO	TECH	BS I
EDU_ALI	0.86	0.90 (0.30)	0.93 (0.25)	0.48 (0.50)
OCC_ALI	0.73	0.79 (0.41)	0.68 (0.47)	0.67 (0.47)
ESCS	-0.12 (0.88)	0.23 (0.81)	-0.32 (0.82)	-0.81(0.70)
PINT	-0.00 (0.82)	0.11 (0.76)	-0.05 (0.84)	-0.31 (0.90)
INFO	0.00 (0.82)	-0.02 (0.77)	0.01 (0.87)	0.05 (0.91)
MATH	0.00 (1.0)	51.73 (8.07)	47.59 (7.91)	39.11 (6.40)
FEMALE	0.47	0.60 (0.49)	0.35 (0.48)	0.32 (0.47)
TYP_SZK: LO	0.49	–	–	–
TYP_SZK: TECH	0.33	–	–	–
TYP_SZK: BS I	0.18	–	–	–

Reported statistics are weighted estimates with imputed missing values. Missingness ranged from ESCS (2.3%), INFO (15.2%), PINT (12.3%), and OCC_ALI (22.8% primarily due to students not reporting occupational expectations). PISA original scores were divided by 10, to ease the computations (original averages are 3 digit numbers).

Source: Own computations based on PISA 2022 data for Poland (9th grade only)

³ Item Response Theory (IRT) measures hidden traits, such as interest, by analyzing survey answers. Using the Generalized Graded Response Model[†], we account for response intensity (e.g., "never" vs "often") to convert multiple questions into one precise score per student. This approach is particularly valuable for scales with missing-by-design features, such as the PISA information seeking behavior questions, which employed a within-construct matrix sampling design (see OECD, 2024 for details of the design).

6. ANALYTICAL STRATEGY

6.1 Model

Our analytical approach theorizes how students' alignment is shaped by background factors, institutional placements, and mediators. We estimate two complementary path models, each corresponding to one of the two DAGs presented in Figure 2A and Figure 2B.

Figure 2A **Model 1: Pooled Mediation Model**

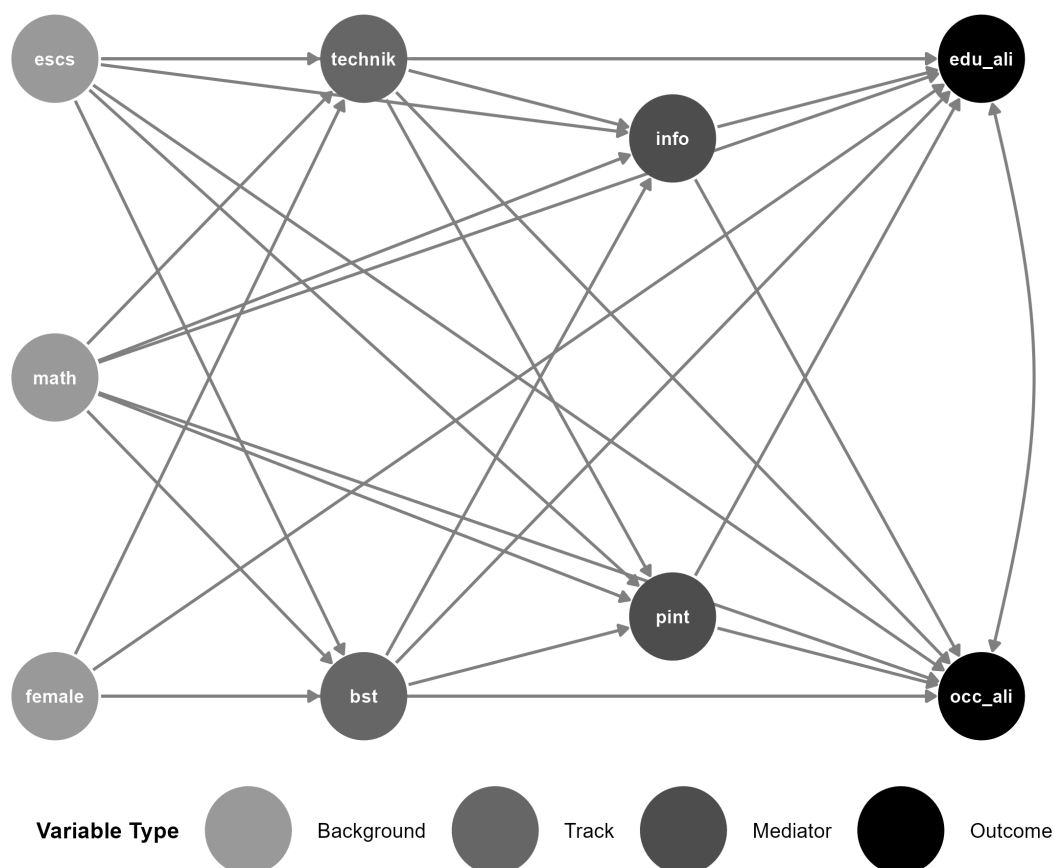
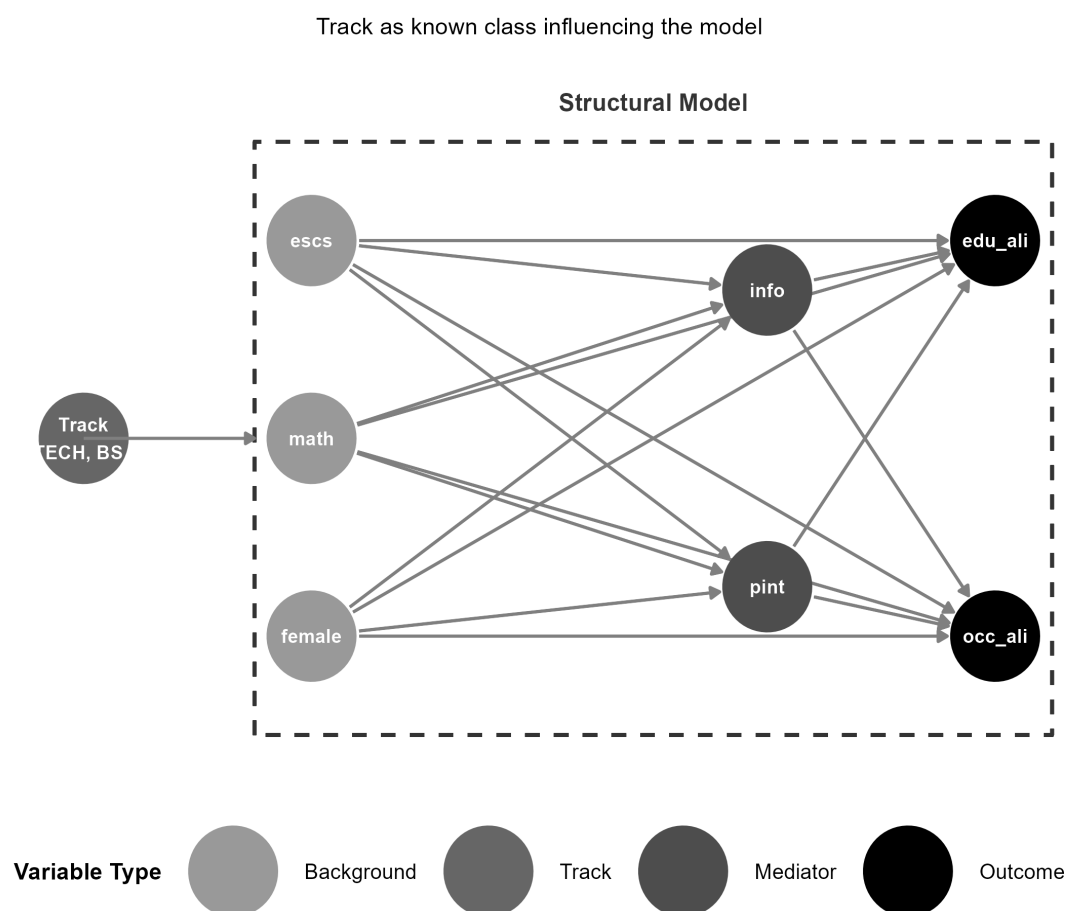


Figure 2B **Model 2: Mixture known class model**



6.2 Model 1: A Unified Look at How Background and School Track Shape Alignment

Model 1 (see Figure 2A for visual presentation) takes all the students together and explores how their family background, academic performance, and the type of school they attend influence whether their educational and career plans align with their current path⁴. Here, we think of the school track as a stepping stone: it's shaped by things like a student's socioeconomic status (SES), math skills, and gender, and in turn, it affects how well their plans line up with reality. We also look at two key supports—career guidance activities (such as job fairs or counsellor talks) and parental involvement (such as chats about school or future goals)—to see how they connect background to alignment. The outcomes we're interested in are whether students' education plans (EDU_ALI) and career goals (OCC_ALI) align with their current school track. We also check the presence of any overlap between these two that we cannot see directly but which may still affect the results⁵.

This approach helps us figure out how a student's school track—chosen based on their background and grades—opens up (or limits) access to information and support, which then shapes how realistic their plans are. We assume here that the school track comes first and influences their expectations. However, we also recognize that sometimes students' dreams and goals might influence the track in which they end up. For example, a student with big ambitions and pushy parents might aim for

⁴ In technical terms, Model 1 is a structural equation model (SEM) where school track is a mediator regressed on socioeconomic status (ESCS), mathematics plausible values, and gender. Mediators INFO (career guidance engagement) and PINT (parental involvement) are regressed on ESCS, math, gender, and track. The outcome variables EDU_ALI and OCC_ALI are regressed on all prior variables, with residual covariance estimated between them to account for unobserved shared factors. Paths decompose the total effects into direct and indirect components.

⁵ From a causal inference standpoint, treating track as an antecedent assumes that alignment follows placement. However, expectations may precede and influence track choice, driven by student agency (e.g., self-concept, motivation) and parental influence, reflecting socioeconomic structures (e.g., parental education, occupational status, cultural capital). This suggests alignment may be endogenous, complicating causal claims.

a general secondary school (LO), while another might feel pressured for vocational training (BS I) due to family circumstances. So, their expectations aren't just a result of their track—they can also steer them towards it, shaped by their confidence, drive, and family support, which often tie back to wealth, education, or social know-how. While this model keeps the track fixed to study its effects, we know it's part of a bigger picture where personal choices and family background play a role in both the track and how well everything lines up.

6.3 Model 2: Zooming Into Differences Across School Types

Model 2 (see Figure 2B) switches things up by looking at each school type—general (LO), technical (TECH), and sectoral (BS I)—separately. Instead of treating the school track as a middle step, we explore how SES, math scores, and gender affect parental involvement and career guidance within each track, and how those shape alignment. Every connection is calculated only for that school type, allowing us to see if the same factors work differently depending on where the student is. For example, does career guidance help students in the vocationally oriented BS I track more than those in other types of schools? Unlike Model 1, we don't link everything through the track itself—this avoids assuming the track is just a simple result of background and prevents mixing up the story⁶.

This setup gives us a clearer, more reliable way to see how background and student traits affect alignment, respecting that a student's track might partly come from their own goals or family push. It lets us spot differences—like whether guidance really helps BS I students line up their plans, or if LO students are already set thanks to extra support at home. We were unable to track the overlap between educational and career alignment here because of some limitations in the calculations, but it still paints a detailed picture of how each school type creates its own world of opportunities and challenges. This complements Model 1 by showing not only the average story but also how each track changes the game.

7. HYPOTHESES

Together, these models tested the three core hypotheses.

H1: School tracking affects alignment outcomes through its influence on access to information.

H2: Socioeconomic status influences alignment indirectly via parental interest and involvement.

H3: Career information-seeking behavior improves alignment between education and career aspirations.

The two path models were designed to address the three hypotheses from complementary perspectives. Model 1 provides a unified mediation framework to test H1, H2, and H3 by estimating how background characteristics shape alignment indirectly through school track, parental involvement (PINT), and career exploration behavior (INFO). This model enables the decomposition of total effects and assesses how institutional placement structures access alignment-relevant resources, in line with H1, while also capturing indirect pathways from SES via PINT (H2), and from INFO to alignment outcomes (H3). By contrast, Model 2 addresses potential endogeneity in Model 1 by treating track as a stratifying variable and estimating all paths within the tracks. This allows us to test whether the mechanisms hypothesized in H2 and H3 differ across institutional contexts, offering a more nuanced understanding of the alignment processes across the tracks. Together, these models offer both a general picture of mediated pathways and a context-sensitive account of how alignment unfolds within different educational tracks.

8. RESULTS

To understand how educational and occupational alignment is shaped by individual and institutional factors, we estimated two statistical models using PISA 2022 data. The first (Model 1) analyzes the full sample, treating school track as a mediating variable. The second (Model 2) examines each track—general (LO), technical (TECH), and sectoral vocational (BS I)—as a separate case, allowing us to compare how alignment functions in each institutional context.

Both models report standardized coefficients, which show how strongly each factor—such as socioeconomic background, academic performance, or parental involvement—is associated with students' alignment outcomes. The estimates reflect the effect of each variable while holding others constant. The tables include both direct and indirect effects. Table 2 presents

⁶ Model 2 uses a known-class mixture approach, estimating paths (ESCS, math, gender → PINT, INFO → EDU_ALI, OCC_ALI) within each track (LO, TECH, BS I), with coefficients varying by class. Unlike multi-group SEM, it avoids regressing on track to prevent collider bias—where conditioning on a variable affected by predictors distorts relationships. Therefore it is superior to subgroup analyses or analyses involving interaction terms. Covariance between EDU_ALI and OCC_ALI is omitted due to estimation constraints.

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the results of Model 2, a known-class structural equation model that estimates how predictors of alignment operate within each school track: general (LO), technical (TECH), and sectoral vocational (BS I). This model uses observed class membership to stratify the sample, allowing specific parameters to vary across tracks, while keeping the overall model structure consistent.

As explained in the methods section, while the model estimates track-specific effects, it treats the structural model as shared across the groups. This means that we can observe how key relationships (e.g., between SES and alignment) vary by track, without assuming each track has a fundamentally different causal structure.

Table 2 *Structural Equation Model Results – Model 1 (Standardized Effects)*

Predictor	Direct Effect on EDU_ALI	Indirect Effect on EDU_ALI	Total Effect on EDU_ALI	Direct Effect on OCC_ALI	Indirect Effect on OCC_ALI	Total Effect on OCC_ALI
ESCS	0.11 (0.02) ***	0.01 (0.01)	0.12 (0.02) ***	0.03 (0.02)	0.02 (0.00) ***	0.05 (0.02) *
MATH	0.20 (0.02) ***	0.10 (0.01) ***	0.30 (0.02) ***	0.067 (0.02) *	0.00 (0.012)	0.07 (0.02) **
FEMALE	0.09 (0.02) ***	–0.022 (0.01)	0.07 (0.02) **	0.14 (0.03) ***	0.01 (0.00) **	0.16 (0.02) ***
PINT	0.13 (0.02) ***	—	0.13 (0.02) ***	0.07 (0.01) ***	—	0.07 (0.01) ***
INFO	0.03 (0.02)	—	0.03 (0.02)	0.01 (0.02)	—	0.01 (0.02)
TECH (track)	0.32 (0.02) ***	—	0.32 (0.02) ***	–0.08 (0.02) **	—	–0.08 (0.02) **
BS I (track)	–0.30 (0.02) ***	—	–0.30 (0.02) ***	0.003 (0.03)	—	0.00 (0.03)

Standardized coefficients (STDYX) from a pooled structural equation model based on multiply imputed PISA 2022 data. EDU_ALI = educational alignment; OCC_ALI = occupational alignment; ESCS = economic, social, and cultural status; PINT = parental involvement; INFO = career information-seeking. Standard errors are in parentheses. Direct effects represent the estimated relationship between the predictor and outcome, holding other variables constant. Indirect effects capture mediation through PINT and/or INFO. Total effects are the sum of direct and indirect effects. Analyses account for complex survey design and weights.

p < .05. p < .01. p < .001.

Source: Own computations based on PISA 2022 data for Poland (9th grade only)

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Table 3 *Model 2 Results: Structural Equation Model Results – Model 2 (Known-Class SEM by Track)*

Class 1 – TECH Track						
Predictor	Direct Effect on EDU_ALI	Indirect Effect	Total Effect on EDU_ALI	Direct Effect on OCC_ALI	Indirect Effect	Total Effect on OCC_ALI
ESCS	0.15 (0.03) ***	0.020 (0.00) **	0.17 (0.03) ***	–0.03 (0.02)	0.01 (0.00) **	–0.02 (0.02)
MATH	0.09 (0.04) *	–0.00 (0.00)	0.09 (0.04) *	–0.00 (0.03)	–0.00 (0.00)	–0.00 (0.03)
FEMALE	0.05 (0.04)	–0.00 (0.00)	0.04 (0.04)	0.11 (0.03) **	–0.00 (0.00)	0.11 (0.03) **
PINT	0.15 (0.03) ***	—	0.15 (0.03) ***	0.09 (0.03) **	—	0.09 (0.03) **
INFO	0.08 (0.04)	—	0.08 (0.04)	0.05 (0.03)	—	0.05 (0.03)
Class 2 – BS I Track						
Predictor	Direct Effect on EDU_ALI	Indirect Effect	Total Effect on EDU_ALI	Direct Effect on OCC_ALI	Indirect Effect	Total Effect on OCC_ALI
ESCS	0.10 (0.05) *	0.01 (0.00) *	0.12 (0.05) *	0.09 (0.03) **	0.00 (0.00)	0.09 (0.03) **
MATH	0.21 (0.05) ***	0.00 (0.00)	0.21 (0.05) ***	0.11 (0.03) **	0.00 (0.00)	0.11 (0.03) **
FEMALE	0.06 (0.06)	0.00 (0.00)	0.06 (0.05)	0.19 (0.03) ***	0.003 (0.003)	0.19 (0.03) ***
PINT	0.11 (0.04) **	—	0.11 (0.04) **	0.02 (0.02)	—	0.02 (0.02)
INFO	0.06 (0.04)	—	0.06 (0.04)	–0.02 (0.03)	—	–0.02 (0.03)
Class 3 – LO Track						
Predictor	Direct Effect on EDU_ALI	Indirect Effect	Total Effect on EDU_ALI	Direct Effect on OCC_ALI	Indirect Effect	Total Effect on OCC_ALI
ESCS	–0.11 (0.06)	–0.00 (0.01)	–0.11 (0.06) *	–0.12 (0.08)	0.00 (0.00)	–0.12 (0.08)
MATH	0.19 (0.06) **	0.03 (0.01) *	0.22 (0.06) ***	–0.06 (0.06)	0.00 (0.01)	–0.055 (0.06)
FEMALE	0.02 (0.05)	0.01 (0.01)	0.04 (0.05)	–0.14 (0.08)	0.00 (0.00)	–0.13 (0.08)
PINT	0.19 (0.05) ***	—	0.19 (0.05) ***	0.08 (0.04)	—	0.08 (0.09)
INFO	–0.07 (0.05)	—	–0.07 (0.05)	0.04 (0.05)	—	0.04 (0.05)

Standardized coefficients (STDYX) from a pooled structural equation model based on multiply imputed PISA 2022 data. EDU_ALI = educational alignment; OCC_ALI = occupational alignment; ESCS = economic, social, and cultural status; PINT = parental involvement; INFO = career information-seeking. Standard errors are in parentheses. Direct effects represent the estimated relationship between the predictor and outcome, holding other variables constant. Indirect effects capture mediation through PINT and/or INFO. Total effects are the sum of direct and indirect effects. Analyses account for complex survey design and weights.

p < .05. p < .01. p < .001.

Source: Own computations based on PISA 2022 data for Poland (9th grade only)

Below we organize the interpretation of results around the three core hypotheses.

8.1 Alignment Patterns by Track (Descriptive Overview, H1)

Our first hypothesis predicted that school track would play a central role in shaping alignment. As we have already seen in Figures 1 and 2 of the data and methods section, alignment varies sharply by school type. Students in general secondary schools (LO) report the highest rates of alignment—90.2% in terms of expected educational attainment, and 79.1% for expected occupations. In contrast, sectoral school (BS I) students showed a much lower educational alignment (48.6%) and somewhat lower occupational alignment (67.3%). Technical school (TECH) students fell in between, with high educational alignment (93.3%) and middling occupational alignment (68.1%).

Expectations follow track-specific patterns: most LO students anticipate tertiary-level education and professional jobs; BS I students are more likely to expect vocational training and service or trade roles; and TECH students show a mix of post-secondary aspirations and technician-level occupations. However, misalignment existed in all groups. A subset of BS I students expect to enter professional careers that typically require a university degree—suggesting “over-alignment”—while some LO or TECH students anticipate entering lower-skilled jobs, signaling “under-alignment”.

While the descriptive results offer a snapshot of broad alignment patterns across tracks, they do not account for other factors that may shape expectations—such as socioeconomic background, academic ability, or parental support. The statistical models that follow help isolate these influences and reveal how alignment operates once these confounding variables are considered. Both models confirm important differences by track. In the pooled model, students in TECH schools were more likely to be educationally aligned than those in LO ($\beta = 0.32$), though they were less aligned with their expected occupations ($\beta = -0.084$). Students in BS I were substantially less aligned in terms of education ($\beta = -0.301$), while their occupational alignment did not differ from LO after controlling for other factors.

Model 2 deepens this picture by isolating track-specific patterns. In BS I, socioeconomic background and math achievement were both strong predictors of alignment, suggesting that students in less academically selective tracks rely more on their personal and family resources to chart their futures. In LO, surprisingly, the effect of SES on alignment was negative. This may reflect what researchers call a ceiling effect: many students in LO may already expect to attend university, so the additional SES advantage offers little extra predictive value—or may even reflect over-ambition relative to the track’s actual structure.

These results affirm Hypothesis 1 and support the broader theoretical claim that institutional placement creates structural opportunities and constraints. But alignment is not automatic. In more vocational settings, students must lean more heavily on support systems—especially academic ability and family resources—to bridge the gap between aspirations and available pathways.

8.2 Socioeconomic Background and Parental Involvement (H2)

Our second hypothesis focused on whether socioeconomic background improves alignment, particularly when mediated through parental involvement. This reflects theories of status attainment, which emphasize the transmission of resources, knowledge, and encouragement from families to children as a pathway to educational success.

Model 1 confirms this pattern. Socioeconomic status (ESCS) is positively associated with educational alignment ($\beta = 0.111$) and to a lesser extent with occupational alignment ($\beta = 0.032$). However, much of this influence operates indirectly through parental engagement (PINT). Students who reported more frequent discussions with their parents about school, aspirations, or academic progress were more likely to show alignment in both educational and occupational domains. Model 2 highlights how this relationship differs by school track. In both TECH and BS I, higher-SES families are more involved—and this involvement is strongly linked to better alignment. These results suggest that in vocational or semi-academic tracks, parental engagement serves as a compensatory mechanism, helping students navigate pathways that may lack strong institutional guidance or flexibility.

In LO, by contrast, ESCS does not significantly predict parental involvement. This may indicate that once students enter academically selective tracks, parental support becomes more evenly distributed, or that school norms and structures play a greater role in shaping students’ decisions. Math achievement also contributes to alignment, particularly in BS I and TECH. This reinforces the idea that individual academic strength, combined with family support, can help buffer students from the constraints of more rigid tracks—and potentially expand their perceived opportunities.

These findings provide strong support for Hypothesis 2. Socioeconomic background promotes alignment, especially when filtered through parental engagement. But the strength and character of this pathway vary by institutional context, further emphasizing the importance of designing support systems that are responsive to track-specific realities.

8.3 The Role of Career Guidance and Information-Seeking (H3)

Our third hypothesis explored whether career guidance and information-seeking behaviors help students align their educational paths with career expectations. This variable (INFO) includes diverse activities—from attending job fairs and speaking with counsellors to browsing career websites or doing online research. However, these activities vary widely in quality and depth, and their effects are not always easy to capture in a single composite measure. In particular, aggregating exploratory behaviors (like browsing) with more structured activities (like job shadowing) may reduce the precision of this indicator, potentially obscuring more targeted effects. This may help explain the relatively modest effects observed in our models.

Descriptively, students in LO were most likely to report online research, while BS I students engaged more often in experiential activities such as job fairs or internships. Yet despite higher participation, TECH students were the least aligned, raising important questions about the effectiveness and targeting of guidance efforts.

In Model 1, the direct effect of INFO on either form of alignment was minimal and statistically insignificant. Only small indirect effects were observed, suggesting that information-seeking—at least as measured here—does not strongly shape student expectations when considered across the full sample. Model 2 reveals a more differentiated story. In TECH, INFO was positively associated with both educational and occupational alignment, suggesting that guidance may be more useful when paired with semi-academic, career-oriented curricula. In BS I, effects were weak or even slightly negative. This may reflect a mismatch between the guidance provided and the actual opportunities available to students in this track. In LO, INFO had a negative direct association with educational alignment ($\beta = -0.070$), which may indicate that information-seeking sometimes reflects confusion, doubt, or planning uncertainty rather than effective exploration.

These results offer only partial support for Hypothesis 3. While career guidance has the potential to support alignment—especially in TECH—its impact appears limited by both the institutional context and the heterogeneity of the guidance experiences themselves. Simply increasing guidance activities may not be sufficient. Instead, what matters is whether these experiences are timely, relevant, and embedded in pathways students actually have access to.

9. DISCUSSION AND CONCLUSIONS

This study examined how institutional placement, socioeconomic background, parental involvement, and career information-seeking shape the alignment between educational pathways and occupational expectations among Polish secondary students. Using data from PISA 2022 and two complementary modeling strategies—a pooled mediation model (Model 1) and a track-specific known-class model (Model 2)—we provide a layered view of how alignment functions within a tracked educational system.

9.1 Track Matters: Structural Constraints and Opportunities (H1)

Across both models, school track emerged as the most powerful predictor of alignment. Students in general secondary schools (LO) showed the highest rates of alignment, while misalignment was most pronounced in sectoral vocational programs (BS I). Technical school (TECH) students fell in between.

Model 1 revealed that BS I placement predicted lower alignment even after controlling for background and achievement. Model 2 added nuance by showing that the effects of background vary within tracks. In LO, for instance, the limited influence of SES may reflect ceiling effects: high-SES students may already be highly aligned or pursuing ambitious but track-inconsistent goals. These findings support H1 and emphasize that institutional placement structures students' opportunities but does not fully determine them. Individual and family resources remain critical.

9.2 The Role of Socioeconomic Resources and Parental Support (H2)

SES was a consistent but context-dependent predictor. In the pooled model, SES was positively associated with educational alignment, with modest effects on occupational alignment. Model 2 showed stronger effects in TECH and BS I, where navigating constraints appears to rely more heavily on family resources.

Parental involvement (PINT) emerged as a key mechanism in both models. Frequent engagement—conversations about school, aspirations, and academic progress—was linked to better alignment. In LO, involvement levels were relatively stable across SES groups. In other tracks, however, SES shaped not only the amount of parental support but also its effectiveness in supporting alignment.

These results affirm H2 and reinforce the status attainment theory: when formal guidance is weak or inconsistent, family involvement becomes a vital compensatory force, especially in less academically oriented tracks.

9.3 Career Guidance: Limited but Uneven Impact (H3)

The effects of career information-seeking (INFO) were mixed and track-dependent. Model 1 showed no significant direct effects, though small indirect effects—especially on educational alignment—were present.

Model 2 revealed that INFO was positively associated with alignment in TECH, where students may be better positioned to act on guidance. In BS I, however, INFO had weak or even negative associations, suggesting that guidance alone cannot overcome structural limitations. In LO, the negative association may reflect a reactive use of guidance by students facing uncertainty.

Overall, H3 is only partially supported. Career guidance has potential, but its effectiveness is shaped by the track in which it is delivered and by the broader resources students bring with them.

9.4 Implications for Policy and Practice

These findings point to the need for track-sensitive interventions. Based on our results, In LO, personalized counselling may help students—especially high-SES ones—refine overly ambitious plans and ensure realistic trajectories. In TECH, structured

post-secondary bridges and academic planning can enhance the value of guidance and increase alignment. In BS I, where many students aspire to tertiary careers despite limited structural pathways, expanded guidance, stronger family-school partnerships, and flexible transition options are essential. Across all tracks, parental involvement remains a powerful, underused lever. Schools can strengthen partnerships with families through mentoring, planning sessions, and communication tools that bring families into the decision-making process.

9.5 Limitations and Directions for Future Research

This study captures alignment as a snapshot, though student aspirations evolve over time. The survey data has potential biases (e.g., self-reported data reliability, missingness that may relate to students' motivation, etc.). Moreover, because PISA data are cross-sectional, causal inference is limited. School track is not randomly assigned and that opens the door to bias. Although we take into account math performance, SES and gender, there might be other factors at play. We also don't have information on how alignment changes or how guidance and parental support unfold over time. While our models account for track placement, we cannot fully isolate the influence of prior achievement or motivational traits that shape both track selection and career expectations.

Future studies should explore:

- Longitudinal designs that track students from track selection onward;
- Qualitative research on how students—especially in vocational programs—form, revise, and act on their goals;
- Broader psychological predictors of alignment, including self-efficacy and goal certainty.

Although this study focuses on Poland, our findings offer broader insight into how institutional design shapes alignment. In systems with similar structures, the same policies may work differently depending on when tracking occurs, how flexible transitions are, and how guidance is delivered. Our results show that institutional features produce not only inequalities between students but also differences within them, depending on their placement.

To summarize, alignment is not just about ambition or school type. It reflects a dynamic interplay of institutional structures, available support, and student agency. Reducing misalignment—especially for students facing structural disadvantages—requires context-sensitive strategies that recognize this complexity: expanding guidance system, engaging families, and building more flexible, inclusive pathways into the future.

Data access statement: PISA 2022 data, accompanied by detailed technical documentation, can be accessed on the OECD PISA website. Detailed information about the methods used can be obtained from the authors.

SUPPLEMENTARY MATERIAL

Supplementary data for this article can be found online at

[HTTPS://IBE.EDU.PL/IMAGES/EDUKACJA/NUMERY/2023_04/5_EDU_4_23_SITEK_ANEKS.PDF](https://ibe.edu.pl/images/edukacja/numery/2023_04/5_edu_4_23_sitek_aneks.pdf)

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Environmental attitudes and behaviours of youth in Poland and their determinants based on ICCS 2022 data

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Abstract

This article presents an analysis of the environmental attitudes and behaviours of Polish 8th-grade students as well as their intentions regarding engaging in pro-environmental actions in the future, examining their associations with gender, socio-economic status (SES), and civic knowledge. Drawing on data from the International Civic and Citizenship Education Study (ICCS 2022), the analysis explores students' concerns about environmental threats, their views on environmental protection, reported pro-environmental behaviours including consumer behaviours, and students' expected future engagement in environmental activities. While most students perceive environmental issues as a significant threat to the future of the world, climate change is less frequently identified as a major problem compared to other environmental threats. Additionally, significant differences in perceptions are observed depending on students' socio-economic status and level of civic knowledge. The analysis indicates that girls demonstrate more pro-environmental attitudes and are more likely to report engaging in pro-environmental practices than boys, and demonstrate greater willingness to engage in environmental efforts in the future. The relationship between SES and environmental attitudes and behaviours is more complex—significant differences are mainly observed in attitudes and only in certain behaviours, for example they do not appear in consumer practices or students' declarations regarding future environmental engagement. A higher level of civic knowledge is generally associated with greater care for the environment and more frequent declarations of engaging in pro-environmental behaviours, though some contradictions emerge, particularly regarding economic priorities and consumer choices. The article emphasises the importance of fostering a sense of responsibility for the environment among children and youth, rather than relying on fear-based approaches. It also highlights the need for educational initiatives in the environmental area, particularly those targeting boys and addressing disparities between students from different socio-economic backgrounds.

Keywords: **Environmental attitudes, environmental behaviours, ICCS 2022.**

Postawy i zachowania prośrodowiskowe młodzieży w Polsce oraz ich uwarunkowania na podstawie danych ICCS 2022

Streszczenie

W artykule przedstawiono analizę postaw i zachowań prośrodowiskowych polskich ósmoklasistów, a także intencji związanych z podejmowaniem działań na rzecz środowiska w przyszłości, badając ich zależności z płcią, statusem społeczno-ekonomicznym (SES) oraz wiedzą obywatelską. Na podstawie danych z Międzynarodowego Badania Kompetencji Obywatelskich ICCS 2022 analizowane były obawy uczniów dotyczące zagrożeń dla świata, ich poglądy na temat działań na rzecz środowiska,

deklarowane zachowania prośrodowiskowe, w tym praktyki konsumenckie, oraz wskazywana gotowość do przyszłego zaangażowania na rzecz środowiska. Choć większość uczniów postrzega problemy środowiskowe jako istotne zagrożenie dla przyszłości świata, zmiany klimatu są rzadziej wskazywane jako ważny problem w porównaniu z innymi kwestiami środowiskowymi, jednocześnie występują w tym zakresie istotne różnice w zależności od statusu społeczno-ekonomicznego i poziomu wiedzy obywatelskiej uczniów. Analiza wskazuje, że dziewczęta wykazują bardziej prośrodowiskowe postawy, częściej deklarują wprowadzanie prośrodowiskowych praktyk niż chłopcy i wykazują się większą gotowością zaangażowania na rzecz środowiska w przyszłości. Relacja między statusem społeczno-ekonomicznym a postawami i zachowaniami prośrodowiskowymi jest bardziej złożona – istotne różnice obserwuje się głównie w postawach i tylko w części zachowań, nie występują one np. w praktykach konsumenckich ani w deklaracjach dotyczących przyszłego zaangażowania na rzecz środowiska. Wyższy poziom wiedzy obywatelskiej zazwyczaj wiąże się z większą troską o środowisko i częstszym deklarowaniem podejmowania zachowań prośrodowiskowych, choć pojawiają się tu pewne sprzeczności, zwłaszcza w odniesieniu do priorytetów ekonomicznych i wyborów konsumenckich. Artykuł podkreśla znaczenie kształtowania poczucia odpowiedzialności za środowisko wśród dzieci i młodzieży zamiast podejść bazujących na lęku. Wskazuje także na konieczność wsparcia działań edukacyjnych w obszarze środowiskowym w szczególności skierowanych do chłopców a także pozwalających na zniwelowanie różnic pomiędzy uczniami z różnych środowisk społeczno-ekonomicznych.

Słowa kluczowe: Postawy środowiskowe, zachowania środowiskowe, ICCS 2022.

1. INTRODUCTION

In the context of current environmental challenges and climate change, there is a growing interest among researchers in understanding the determinants of environmental attitudes and behaviours. Various studies indicate that knowledge alone is insufficient to drive changes in environmental behaviour, highlighting the crucial role of attitudes (e.g., Reynolds & Komakhidze, 2022). In particular, there is an increasing need for a deeper understanding of the factors influencing environmental attitudes and behaviours among children and youth (Busse & Menzel, 2014; Liu & Green, 2024). Numerous studies have explored the relationship between pro-environmental behaviours and attitudes, with many showing statistically significant but weak to moderate correlations between these two domains (see Liu & Green, 2024). While cognitive factors are sometimes included in these analyses, they remain a less explored area in this context.

Sustainability and environmental issues have gained increased attention in recent cycles of large-scale international educational assessments. For instance, in the IEA's Trends in International Mathematics and Science Study (TIMSS) 2023, a dedicated component on environmental attitudes and behaviours was introduced (Reynolds & Komakhidze, 2022), a special focus was placed on sustainability in the IEA's International Civic and Citizenship Education Study (ICCS) 2016 and 2022 (Schulz et al., 2023), and recent PISA cycles have expanded their attention to these topics as well. These international studies provide unique opportunities to analyse various aspects of students' environmental attitudes and behaviours but also their relationships with cognitive skills, in a comparative, cross-national context.

Drawing on data from the latest edition of ICCS conducted in 2022 (Schulz et al., 2023), this article explores the relationships between environmental attitudes, environment-related behaviours, intentions regarding engaging in pro-environmental actions in the future, and factors such as gender, socio-economic background, and level of civic knowledge among Polish 8th grade students. It also examines the relationships between attitudes, behaviours and intentions towards future pro-environmental engagement.

The article addresses a significant gap in the analysis of environmental attitudes and behaviours of Polish youth focusing on an age group crucial for fostering pro-environmental perspectives. It explores the following questions:

1. What are the environmental attitudes, behaviours and intentions towards the future pro-environmental engagement of Polish youth, and is there consistency across the different examined indicators used in the scales?
2. Can coherent patterns be identified between attitudes, behaviours and intentions towards future pro-environmental engagement in relation to gender, socio-economic status, and students' civic knowledge?
3. What kinds of relationships can be observed between environmental attitudes, behaviours and the youth's declared willingness to engage in pro-environmental actions in the future?

2. THE LITERATURE CONTEXT

The literature indicates that individual background characteristics—such as gender, age, education level, income, and socio-economic status—are linked to environmental attitudes and behaviours (e.g., Schahn & Holzer, 1990; Burger, 2005; Franzen & Vogl, 2012). In addition to these demographic factors, numerous other determinants of environmental attitudes and behaviours have been identified, including basic value orientations and levels of trust (e.g., Inglehart, 1990; de Groot & Steg, 2008; Meyer & Liebe, 2010; Franzen & Vogl, 2012), as well as environmental knowledge (e.g., Zimmermann, 1996).

Some of these patterns have also been observed in studies conducted with children and youth. Among the frequently analysed and identified factors influencing environmental attitudes and behaviours in younger populations are: direct experiences with nature (e.g., Eagles & Demare, 1999), family behaviours and peers (e.g., Grønhøj & Thøgersen, 2012; Jia & Yu, 2021; Collado, Evans, & Sorrel, 2017), certain values and a sense of personal responsibility (e.g., Thielking & Moore, 2001; Soares & Nascimento, 2024), as well as environmental knowledge and education, particularly various educational programmes (e.g., Collado, Rosa, & Corraliza, 2020).

In the Polish context, numerous studies in recent years have focused on youth involvement in initiatives such as Fridays for the Future and the Youth Climate Strike and the role and organisation of those movements. However, analyses of the environmental attitudes of children and younger adolescents based on data collected from large, representative samples remain limited.

One of the few exceptions is the Youth (*Młodzież*) study, regularly conducted by the Public Opinion Research Center (CBOS) among students in the final years of secondary school, typically aged 17–19. These studies indicate that approximately two-thirds (69%) of high school students perceive climate change as a threat, while only a small minority deny its existence. Notably, a significant proportion of young people (24%) reported that they have no opinion on the matter (Kawalec, 2022). Climate change is more frequently perceived as a problem by youth from large cities, while students from rural areas are less likely to express concern. Differences are also observed based on school type: students from general secondary schools are more likely to recognize climate change as a threat (77%) compared to those attending vocational schools (first-stage sectoral schools – 40%). Political views also play a significant role in shaping perceptions of climate change. Students identifying with left-wing views are more likely to be concerned about climate change (88%) compared to those with right-wing views (68%) (Kawalec, 2022).

The ICCS 2022 data analysed in this article allow for a closer examination of the attitudes and behaviours of 8th graders representing a slightly younger age group: approximately 14-year-old students. As some studies suggest, this is a crucial age for the development of environmental behaviours and attitudes, which begin to take shape around the age of 7, increase until 10, stabilize until 14, and then gradually decline (Otto et al., 2019). Notably, while environmental behaviour is thought to develop from childhood through early adolescence and start consolidating around age 10, environmental attitudes remain more fluid, continuing to evolve at least into early adulthood (Otto et al., 2019).

3. DATA AND METHODS

This article uses data from the latest edition of the International Civic and Citizenship Education Study (ICCS 2022), organised by the International Association for the Evaluation of Educational Achievement (IEA). ICCS aims to assess the extent to which young people are prepared to participate in social life and take on the responsibilities of being citizens in a democratic society. It is the largest international study examining students' knowledge and understanding of concepts and issues relating to civics and citizenship, as well as their attitudes and civic engagement.

ICCS 2022 was conducted in 22 countries and two German states (North Rhine-Westphalia and Schleswig-Holstein). The analyses in this article cover data gathered from the 8th grade students in Poland (N=4434). The study in Poland was conducted between March 14 and April 29, 2022, and was organised by the Educational Research Institute. The study was based on random samples and gathered data are representative to all 8th grade students in the country. The sampling process was two-tiered: in the first stage, schools were randomly selected, in the second, one or two classes in each school. All students from each sampled class were invited to participate in the study. Detailed information about sampling and the organisation of the study can be found in the ICCS 2022 technical report (Schulz, Friedman, Fraillon, 2024).

Environmental issues and sustainability were among the focus areas in ICCS 2022, considered as key elements of modern citizenship. ICCS 2022 International Student Questionnaire and European Student Questionnaire¹ covered several scales, which included items measuring student's attitudes to environmental protection and students pro-environmental behaviours. Furthermore, this area was also included in the civic knowledge and understanding test.

¹ The International Student Questionnaire was used in all countries participating in the study, the European Questionnaire only in the European ones.

Table A1 in the Annex provides the list of scales and items used in the analyses. They cover various aspects of students' attitudes, behaviours and intentions: a) students' concerns about environmental threats to the world's future, b) students' views on responsibility and actions regarding environmental protection, c) declarations on students' pro-environmental behaviours including consumer behaviours and the undertaking, limiting, or abandoning of certain activities, as well as d) students' reports concerning expected participation in pro-environmental activities in the future.

The associations between selected items and (a) students' gender, (b) their families' socio-economic status (SES), and (c) their level of civic knowledge were analysed. For the SES analysis, the National Index of Students' Socio-economic Background (S_NISB) was used. This index, derived from students' reports, incorporates three components: the highest occupational status of parents, the highest educational level of parents, and the number of books at home (see Schulz, Friedman, & Fraillon, 2024).

To enable clear and better interpretable comparisons and to account for potential non-linear relationships and outliers, the S_NISB was recoded into quartiles, dividing students into four groups based on their families' socio-economic status. Civic knowledge was measured using the ICCS 2022 Civic Knowledge Proficiency Scale (see Schulz et al., 2023; Schulz, Friedman, & Fraillon, 2024).

Analyses of relationships between environmental attitudes, behaviours and intentions as well as gender, SES, and civic knowledge were first conducted for the composite scales using multivariate regressions. In the second step, analyses at the item level were conducted. This dual-level structure, with both scale-level and item-level analyses, enables more nuanced interpretations.

To examine the general relationships between gender, socio-economic status (SES), civic knowledge, and pro-environmental outcomes, two regression models for each of the five scales were estimated. Full model results are presented in the appendix (Tables A2–A6) and serve as the basis for the interpretation in the main text. A two-step modelling strategy was used: Model 1 includes gender and SES (s_nisb) along with their interaction, Model 2 adds civic knowledge (standardized using z-scores) and interaction terms with SES and gender. This structure helps to assess the direct effects of gender and SES, as well as the potential mediating or moderating role of civic knowledge. Interaction terms and a quadratic SES term was also included to test for non-linear patterns and conditional effects, reflecting theoretical expectations that civic knowledge and SES may interact in shaping pro-environmental behaviours. The civic knowledge variable was standardized to facilitate interpretation.

In the second step, the relationships at the item level were analysed. This approach enabled a more nuanced view on relationship patterns and was used in order to better grasp the complexity of the phenomenon by detecting items that exhibit distinguishing characteristics. However, when examining direct relationships between attitudes and behaviours, composite scales were used.

Descriptive data and the results of more complex analyses that illustrated differences by gender, SES and students' civic knowledge are presented in the article. The reported figures were obtained through a series of statistical analyses accounting for the complex sampling design and plausible values in the ICCS 2022 study. Differences in percentages between groups (gender and socio-economic quartiles) were calculated using survey-weighted proportions, followed by statistical tests for differences. Civic knowledge differences were estimated using mean comparisons and regression models incorporating plausible values. The regressions controlled for covariates: socio-economic status and gender, with adjusted predictions (marginal effects at mean values of other covariates) to assess the differential impact of environmental concerns on civic knowledge. The standard errors were derived using Jackknife Repeated Replication to ensure robust variance.

4. RESULTS

4.1 Students' concerns about environmental threats to the world's future

Students completing the ICCS questionnaire were asked to respond to 11 statements, four of which were environment-related, indicating the extent to which they believe specific issues pose a threat to the world's future. Among the five issues most frequently identified by students as posing a significant threat to the world's future, four were environment-related, with pollution and water shortages eliciting the highest levels of concern (Wasilewska et al., 2023). Table 1 presents the distribution of students' responses. Almost all Polish 8th grade students perceive the four environment-related issues as significant threats, either to a large extent or to a moderate extent. The highest level of concern was recorded for pollution, with a substantial majority (81.9%) of Polish 8th graders indicating they were concerned 'to a large extent', followed by water shortages (79.5%). Slightly lower percentages were noted for the extinction of species and loss of biodiversity (67.8%), and climate change (65.1%).

Table 1 *Polish 8th grade students' concerns about environmental threats to the world's future*

Issue	1. To a large extent	2. To a moderate extent	3. To a small extent	4. Not at all
IS4G28A Pollution	81.9%	15.2%	2.2%	0.6%
IS4G28D Climate change	65.1%	26.5%	7.0%	1.4%
IS4G28J Extinction of species, loss of biodiversity	67.8%	23.3%	7.3%	1.6%
IS4G28K Water shortages	79.5%	13.2%	5.3%	2.0%

Source: own elaboration based on ICCS 2022 data

Polish students rank among the highest in identifying pollution, water shortages, as well as the extinction of species, loss of biodiversity as major threats to the future of the world. However, for climate change, these percentages are relatively lower compared to other countries (Wasilewska et al., 2023). This generally shows a lower awareness of the problem of climate change among students in Poland. However, it may also reflect the view on climate change as an ideological or world-view based dispute. As already mentioned, studies among slightly older age groups in Poland showed that the declared level of concern about climate change differs depending on students' political views (Kawalec, 2022).

The regression models for students' concern about threats to the global environment scale (*s_envcon*), which has a national mean of 50.93 (*SD* = 8.49), show consistent differences by gender, with girls scoring around 1.7 to 2.2 points higher than boys. In Model 1, students from higher SES backgrounds tend to report slightly higher levels of concern, though this association weakens once civic knowledge is included in Model 2. Standardized civic knowledge shows a meaningful association with environmental concern: a one standard deviation increase corresponds to an increase of approximately 1.75 scale points. The interaction term suggests that this association may be less pronounced for students with higher SES, although the effect is modest. The increase in explained variance between models (from $R^2 = 0.04$ to $R^2 = 0.10$) indicates that civic knowledge adds relevant explanatory value, though most of the variation in concern remains unexplained by the model.

Table 2. presents item-level differences in students' concerns about environmental threats by gender, SES, and civic knowledge. When comparing students' declarations across groups, climate change exhibits the largest and statistically significant differences between students from different socio-economic backgrounds. Students from higher SES families (4th quartile) are substantially more likely to perceive climate change as a threat to a large extent (76.2%) compared to those with lower SES families (1st quartile) (52.4%). Similar relationships with SES are observed in relation to water shortages. These two items at the same time show the smallest differences in answers between girls and boys.

In contrast, pollution and loss of biodiversity displayed a different pattern. There is no significant difference in concern between students from the highest and lowest SES quartiles. However, gender differences are apparent, with girls consistently reporting significantly higher levels of concern than boys.

Civic knowledge was strongly associated with concern levels across all four environmental issues. Students who perceived specific issues as significant threats to the future of the world consistently demonstrated significantly higher civic knowledge scores, also after controlling for SES and gender. The largest differences in civic knowledge between high- and low-concern groups were observed for climate change (64.4 scale points), followed by pollution (57.4 points) and water shortages (53.9 points).

Table 2 *Students' concerns about environmental threats to the world's future—differences by gender, SES, and civic knowledge*

	Difference in percentages between girls and boys (percentage points), SE	Difference in percentages between SES IV–I quartile (percentage points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE
IS4G28A Pollution	3.37 (0.81)***	0.16 (1.16)	57.41 (10.98)***	46.44 (9.13)***
IS4G28D Climate change	3.26 (1.21)*	6.28 (2.05)***	64.39 (5.66)***	49.72 (5.04)***
IS4G28J Extinction of species, loss of biodiversity	6.31 (1.32)***	3.3 (2.02)	39.79 (6.06)***	31.9 (5.43)***
IS4G28K Water shortages	2.55 (1.34)	4.8 (1.53)***	53.9 (6.52)***	43.51 (6.02)***

Source: own elaboration based on ICCS 2022 data

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, stating the issue poses a threat “to a large extent” or “to a moderate extent”; Differences in civic knowledge between students stating that particular issue pose a threat “to a large extent” or “to a moderate extent” and those stating that it doesn’t pose a threat (“not at all”) or only “to a small extent”.

4.2 Students views on responsibility and actions regarding environmental protection

Students participating in ICCS 2022 were also asked for their views on five statements concerning approaches to responsibility and actions regarding environmental protection. As presented in Table 3, almost all 8th grade students in Poland agreed that countries need to work together to preserve the world’s natural resources, with 94.7% either strongly agreeing or agreeing. Additionally, 70.6% supported the idea that Poland should contribute to protecting the environment in other countries. However, the smaller share of students (61.8%) believe that governments should focus more on protecting the environment than on supporting economic growth. Overall, students largely agree that countries should collaborate and take action to protect the global environment, though their views differ regarding how much of a priority this issue should be or the extent of the costs the country should bear as a result. Students were also asked about the role of individuals in environmental protection. The vast majority of 8th graders in Poland believe that responsibility for environmental protection also lies with individuals: 89.2% agree with the statement that all human beings should take responsibility for preserving the natural world, and 89.3% that every citizen needs to contribute to reducing pollution (see also Wasilewska, 2023).

Table 3 Polish 8th grade students' views on responsibility and actions regarding environmental protection

There are different views about what we should do to protect the environment. How much do you agree or disagree with the following statements?	1. Strongly agree	2. Agree	3. Disagree	4. Strongly disagree
IS4G26A Governments should focus more on protecting the environment than on supporting economic growth	11.5%	50.3%	34.8%	3.4%
IS4G26B Every citizen needs to contribute to the reduction of pollution	33,3%	56,0%	9,6%	1,1%
IS4G26C Poland should contribute to protecting the environment in other countries	18,6%	52,0%	25,9%	3,5%
IS4G26D All human beings should take responsibility for preserving the natural world	40.2%	49.0%	9.1%	1.7%
IS4G26E Countries need to work together to preserve the world's natural resources	50.3%	44.4%	4.1%	1.1%

Source: own elaboration based on ICCS 2022 data

Polish 8th graders, compared to students in other countries, exhibit high support for cooperation among countries to preserve natural resources. However, they stand out for having the lowest level of support for the statement that governments should focus more on environmental protection than on supporting economic growth (Wasilewska, 2023). This reflects a notable tension between environmental protection and economic priorities, with nearly 40% of Polish students favouring economic growth over environmental measures.

The scale-level regressions for the scale measuring students' positive attitudes toward environmental protection (s_attenv) with a national mean of 47.41 and $SD = 8.31$, shows that differences by gender and SES are visible but moderate in size. On average, girls score around 1.8 to 2 points higher than boys, suggesting a slightly more pro-environmental stance. Students from higher SES backgrounds also tend to express more supportive attitudes toward environmental protection, with an average difference of just over half a scale point when accounting for civic knowledge. A one standard deviation increase in civic knowledge is associated with a modest increase of about 0.44 points on the scale, indicating a relatively small contribution of knowledge to students' general environmental attitudes. The model explains a limited share of the variance ($R^2 = 0.03-0.04$), suggesting that while these factors relate to attitudes, much of the variation is likely shaped by other influences not captured in the model.

Item level results provide a more nuanced picture. The statement: "governments should focus more on protecting the environment than on supporting economic growth" merits special attention when it comes to differences among students based on gender, SES and level of civic knowledge (see Table 4). It shows a negative and statistically significant difference in civic knowledge between those who agree with this statement and those who don't, and is the only item where higher support for the statement is associated with lower civic knowledge scores, suggesting that students with higher civic knowledge levels may place more emphasis on economic issues relative to environmental priorities. Only positive relationships are observed for the other items: a higher level of civic knowledge is associated with stronger agreement with particular statements representing a more pro-environmental attitude. This is observed also after accounting for SES and gender. Among all items, the largest difference in civic knowledge is observed in the case of support for the collaboration of countries to preserve the world's natural resources (77.3 scale points difference), which is the item with which almost all students agree.

When it comes to gender, girls consistently show greater support for the analysed statements, reflecting stronger pro-environmental attitudes. Statistically significant differences between girls and boys are observed across all statements, with the smallest differences found in the general item on international cooperation.

Regarding socio-economic status, the data indicate that higher SES is generally associated with stronger support for pro-environmental attitudes. However, while a statistically significant and notable difference is found for the item emphasising a country's role in contributing to environmental protection globally, the differences for other items are smaller. Some are not statistically significant, including the statement suggesting that governments should prioritise environmental protection over economic growth (difference between SES IV–I quartiles: -0.65 percentage points).

Table 4 *Students' views on responsibility and actions regarding environmental protection—differences by gender, SES, and civic knowledge*

	Difference in percentages between girls and boys (percentage points), SE	Difference in percentages between SES IV–I quartile (percentage points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE
IS4G26A Governments should focus more on protecting the environment than on supporting economic growth	8.75 (2.71)***	-0.65 (3.38)	-13.82 (3.23)***	-16.18 (2.93)***
IS4G26B Every citizen needs to contribute to the reduction of pollution	5.66 (1.54)***	5.32 (2.04)*	32.34 (5.88)***	22.11 (5.39)***
IS4G26C Poland should contribute to protecting the environment in other countries	11.74 (2.36)***	9.1 (3.05)***	20.97 (3.47)***	12.18 (3.16)***
IS4G26D All human beings should take responsibility for preserving the natural world	8.15 (1.5)***	2.49 (2.43)	28.4 (5.7)***	20.45 (5.14)***
IS4G26E Countries need to work together to preserve the world's natural resources	3.2 (1.14)**	4.4 (1.9)*	77.27 (7.49)***	62.01 (6.89)***

Source: own elaboration based on ICCS 2022 data

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, declaring that they “strongly agree” or “agree” with the following statements; Differences in civic knowledge between students who “strongly agree” or “agree” and those who “disagree” or “strongly disagree”.

4.3 Students' reports on their sustainable behaviours

Another key aspect analysed in the study was the frequency of students' engagement in sustainable behaviours. 8th graders were asked to indicate how often in the 12 months before the study have they been engaged in specific actions important for the environment and sustainability. Table 5 presents the distribution of students' responses. Among the activities listed, Polish students most frequently reported reducing electricity use—nearly half (47.3%) stated that they did this often, while an additional third (33.2%) reported doing it sometimes. The next most common activities included reducing food waste, saving water, repairing items, and reusing old items. A majority of students reported engaging in these activities “often” or “someti-

mes”, although they were less common compared to electricity-saving behaviours. Less frequent behaviours included limiting the use of plastic items and avoiding products with plastic packaging. For example, only 25.8% of students reported “often” limiting their use of disposable plastic items, and 15.8% reported “often” avoiding buying products with plastic packaging. The least common behaviour was purchasing used clothing instead of new.

When compared to their peers in other European countries, Polish students reported engaging in these pro-environmental behaviours relatively frequently, placing Poland among the countries with the highest percentages of students reporting such actions. However, exceptions include limiting the use of plastic items, avoiding products in plastic packaging, and purchasing used clothing, which were less common among Polish students compared to their European peers (Wasilewska, 2023).

Table 5 *Polish 8th grade students’ reports on their sustainable behaviour*

During the last twelve months, how often have you done each of the actions listed below?	1. Often	2. Sometimes	3. Rarely	4. Never
ES4G11A Purchase used instead of new clothing	15,4%	24,3%	28,2%	32,1%
ES4G11B Reduce water use (e.g. when brushing your teeth, having a shower, washing dishes)	32,8%	38,9%	21,1%	7,2%
ES4G11C Reduce the use of electricity (e.g. switching off the lights when leaving a room, turning down the heat when it is not too cold)	47,3%	33,2%	14,7%	4,8%
ES4G11D Avoid buying products with plastic packaging (e.g. school supplies, groceries)	15,8%	34,7%	34,8%	14,7%
ES4G11E Reuse old items in good condition instead of buying new ones	34,2%	39,8%	19,7%	6,3%
ES4G11F Limit the use of plastic items (e.g. disposable plastic glasses, water bottles, plastic shopping bags)	25,8%	34,7%	28,3%	11,2%
ES4G11G Reduce food waste (e.g. avoiding buying more food than necessary, eating leftovers)	38,4%	39,1%	17,0%	5,5%
ES4G11H Repair rather than replacing items you have (e.g. fix your bike instead of buying a new one, mending a backpack instead of buying a new one)	35,8%	39,6%	19,4%	5,2%

Source: own elaboration based on ICCS 2022 data

It is important to emphasize that this question does not account for the motivations behind the given actions. Many of these behaviours may not stem (either at all or predominantly) from pro-environmental considerations, but rather from economic motivations, including rules or habits introduced at home and rooted in financial issues. This makes it challenging to interpret the above results in the context of pro-environmental attitudes. The fact that the most common actions are those closely tied to financial savings supports the view that economic factors may play a significant role in the analysed behaviours of Polish students. The most frequent activities declared among Polish 8th graders: reducing electricity use, water consumption, or food waste can result in financial savings. In contrast, behaviours that are less economically motivated and may even involve additional costs, such as limiting the use of plastic items or avoiding products in plastic packaging, are much less frequent. The issue of purchasing used clothing is particularly difficult to interpret in this context. While it could reflect pro-environmental awareness in some cases, it might also be linked to economic necessity or cultural norms, or even trends in fashion, making it harder to assess its connection to sustainability-oriented attitudes.

The regression results for the students' reports on their sustainable behaviours scale (*e_susbeh*), with a national mean of 51.56 and a standard deviation of 8.40, show a notable gender gap. Girls score over 4 points higher than boys, which corresponds to nearly half a standard deviation, suggesting a meaningful difference in reported everyday actions beneficial to the environment. Differences by SES are present but modest, and become smaller when civic knowledge is included in the model. A one standard deviation increase in civic knowledge is associated with less than a 1-point increase on the scale. The model explains a moderate share of variance (R^2 increasing from 0.09 to 0.11), with gender remaining the strongest predictor of sustainable behaviours.

The results at the item level are presented in Table 6. For almost all statements, the data show that students from higher SES families (4th quartile) are significantly more likely to report "often" or "sometimes" engaging in most behaviours compared to those from lower SES families (1st quartile). However, no significant relationship with SES was observed for purchasing used clothing instead of new or repairing items. The largest SES-based differences were noted for limiting the use of plastic items (15.9 percentage points) and avoiding products with plastic packaging (15.8 percentage points), both of which are less financially motivated behaviours. This helps explain the modest overall SES effect in the regression: while some sustainable behaviours show SES-related differences, others—especially those economically motivated—do not. Gender differences were prominent, with girls significantly more likely than boys to report engaging in most of the analysed behaviours. The only exception was repairing items instead of replacing them, where no statistically significant difference was observed. The largest gender-based differences were seen in purchasing used clothing (ES4G11A—26.6 percentage points) and limiting the use of plastic items (21.7 percentage points).

Table 6 Students' reports on their sustainable behaviours – differences by gender, SES, and civic knowledge

	Difference in percentages between girls and boys (percentage points), SE	Difference in percentages between SES IV–I quartile (percentage points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE
ES4G11A Purchase used instead of new clothing	26.64 (2.54)***	-0.98 (3.75)	7.78 (3.16)**	3.66 (3.02)
ES4G11B Reduce water use (e.g. when brushing your teeth, having a shower, washing dishes)	13.33 (2.43)***	7.93 (2.85)**	27.14 (3.42)***	18.99 (3.15)***
ES4G11C Reduce the use of electricity (e.g. switching off the lights when leaving a room, turning down the heat when it is not too cold)	7.09 (2.02)***	12.89 (2.39)***	43.57 (4.13)***	30.39 (3.86)***
ES4G11D Avoid buying products with plastic packaging (e.g. school supplies, groceries)	18.1 (2.22)***	15.76 (4.02)***	12.99 (3.14)***	1.26 (2.92)
ES4G11E Reuse old items in good condition instead of buying new ones	9.52 (2.36)***	8.87 (2.78)***	34.83 (3.63)***	26.67 (3.33)***
ES4G11F Limit the use of plastic items (e.g. disposable plastic glasses, water bottles, plastic shopping bags)	21.74 (2.48)***	15.95 (3.23)***	23.23 (3.19)***	9.87 (3.03)***
ES4G11G Reduce food waste (e.g. avoiding buying more food than necessary, eating leftovers)	9.35 (2.17)***	11.3 (3.16)***	34.43 (3.66)***	23.76 (3.35)***
ES4G11H Repair rather than replacing items you have (e.g. fix your bike instead of buying a new one, mending a backpack instead of buying a new one)	0.66 (2.1)	0.31 (3.08)	15.42 (3.75)***	16.17 (3.33)***

Source: own elaboration based on ICCS 2022 data

* p<0.05, ** p<0.01, *** p<0.001.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, declaring that they did something “often” or “sometimes”; Differences in civic knowledge between students declaring that they did something “often” or “sometimes” and those declaring they “never” or “rarely” did it.

4.4 Students' reports on consumer behaviours

An additional question addressed students' consumer behaviours. Students were asked to indicate how often, over the year before the study, they had either requested their parents/guardians to buy or avoid purchasing specific products, or how often they had done so themselves. The question covered different aspects of critical consumption, with three items relating to environmental issues, which are presented in Table 7 together with the distribution of students' responses.

Overall, the data indicate that while many Polish eighth-grade students occasionally engage in pro-environmental consumer behaviours, consistent involvement remains relatively low. Buying environment-friendly products—an activity which can be understood very broadly—was the most common action, followed by—less frequently—purchasing recyclable goods. Refusing to buy products whose production had a negative environmental impact was the least common behaviour, with only a small percentage of students engaging in it regularly, and a significant share rarely or never.

In comparison to their peers from other European countries participating in the ICCS 2022 study, Polish students were relatively less likely to report refusing to buy goods with a negative environmental impact or purchasing only goods that can be recycled. Poland was among the countries with lower percentages of such responses, below the European average. However, in the case of buying environmentally friendly products, Polish 8th graders' responses were comparable to the average and slightly above the European average (see Damiani et al., 2024).

Table 7 Polish 8th grade students' reports on consumer behaviours

During the last twelve months, how often have you done or have you asked your parents or guardians to do the following things?	1. Often	2. Sometimes	3. Rarely	4. Never
ES4G10B Refuse to buy goods whose production has a negative impact on the environment	13,5%	30,8%	27,8%	27,9%
ES4G10D Buy only goods that can be recycled afterwards	14,5%	30,7%	28,9%	25,9%
ES4G10E Buy environment-friendly products	26,7%	37,8%	19,1%	16,4%

Source: own elaboration based on ICCS 2022 data

Students' reports on the consumerism behaviours scale (*e_ethcon*), with a national mean of 47.99 and a standard deviation of 9.69, also show a clear gender difference. Girls report engaging in environmentally conscious consumer behaviours approximately 4.7 points more than boys, which represents about half a standard deviation, indicating a meaningful difference in reported practices. The association with SES is weaker but becomes more pronounced after accounting for civic knowledge, suggesting that higher-SES students may be more likely to engage in these behaviours when knowledge is considered. Interestingly, the relationship between civic knowledge and consumer behaviours is negative in this model, with a one standard deviation increase in knowledge corresponding to a decrease of about 1.9 points. This counterintuitive pattern may reflect the complexity of consumer decisions, which can be shaped by both values and access, and not solely by civic awareness. The model explains a moderate portion of variance (R^2 increasing from 0.06 to 0.08), with gender remaining the strongest predictor.

The item-level analysis helps contextualise and explain the regression results. Table 8 presents differences in students' reports on environment-related consumer behaviours by gender, SES, and civic knowledge. Significant differences at the item-level were noted between girls and boys, with girls significantly more likely than boys to engage in pro-environmental consumer behaviours. The particular large differences between the declarations of girls and boys were observed in relation to refusing to buy goods whose production negatively impacts the environment (20.9 percentage points), and buying environmentally friendly products (20.6 percentage points).

Interestingly, differences based on socio-economic status were smaller and generally weak or not statistically significant. Comparisons between students from the highest (4th quartile) and lowest (1st quartile) SES groups revealed minimal differences in pro-environmental consumer behaviours.

Civic knowledge differences revealed mixed associations with these behaviours. At the scale level, students with higher civic knowledge report less frequent engagement in certain consumer actions. At the item-level in the case of refusing to buy goods with negative environmental impact and buying only recyclable goods, no significant difference in civic knowledge was

observed between students who reported engaging in these actions “often” or “sometimes” and those who did so “rarely” or “never”. However, buying environmentally friendly products showed a positive, though weak, association with civic knowledge. After adjusting for SES and gender, the relationship between civic knowledge and the first two behaviours became consistently negative, while for buying environmentally friendly products, the adjusted association was no longer statistically significant. These findings suggest that higher civic knowledge does not always correspond to greater engagement in pro-environmental consumer behaviours. In fact, students with higher civic knowledge levels were less likely to report participating in certain pro-environmental consumer behaviours and/or have a more critical or sceptical approach towards some actions like e.g., greenwashing or oversimplified environmental messaging, which could be associated with “environmentally friendly” products.

Table 8 *Students’ reports on environment-related consumer behaviours – differences by gender, SES, and civic knowledge*

	Difference in percentages between girls and boys (percentage points), SE	Difference in percentages between SES IV–I quartile (percentage points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE
ES4G10B Refuse to buy goods whose production has a negative impact on the environment	20.87 (2.16)***	7.59 (4.22)	-2.77 (3.16)	-12.02 (2.93)***
ES4G10D Buy only goods that can be recycled afterwards	15.9 (2.5)***	7.61 (3.81)*	-0.65 (3.17)	-7.71 (2.9)**
ES4G10E Buy environment-friendly products	20.61 (2.32)***	6.63 (3.67)	6.46 (3.36)*	-2.85 (3.13)

Source: own elaboration based on ICCS 2022 data

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, declaring that they did something “often” or “sometimes”; Differences in civic knowledge between students declaring that they did something “often” or “sometimes” and those declaring they “never” or “rarely” did it.

4.5 Students’ expected participation in pro-environmental activities in the future

Students were also asked about possible future participation in various civic activities, some of which were related to environmental issues. Table 9 presents the distribution of their responses. 8th graders were supposed to declare whether they think they will “certainly” or “probably” engage in those activities or not.

Polish 8th grade students differ in their willingness to engage in different types of activities. The majority (83.9%) declared that they would certainly or probably be willing to tell someone to stop damaging the environment. Lower levels of willingness were reported for encouraging others to make personal efforts and refusing to buy products harmful to the environment, although still around $\frac{3}{4}$ of students indicated that they would certainly or probably take these actions. The lowest levels of willingness was observed for participating in organised protests, with 60.6% of 8th graders considering this action. This suggests that students are less inclined toward public forms of activism.

Table 9 Polish 8th grade students' reports on expected participation in pro-environmental activities in the future

There are many different ways how citizens may express their opinions about important issues in society. Would you take part in any of the following activities to express your opinion in the future?	1. I would certainly do this	2. I would probably do this	3. I would probably not do this	4. I would certainly not do this
IS4G31G Refuse to buy products that are harmful for the environment	26,5%	46,8%	20,0%	6,7%
IS4G31H Tell someone to stop causing damage to the environment	35,9%	48,0%	12,6%	3,5%
IS4G31I Participate in an organized protest to demand more action to protect our environment	19,2%	41,4%	31,6%	7,7%
IS4G31J Encourage other people to make personal efforts to help the environment (e.g. through saving water)	28,2%	49,4%	17,8%	4,6%

Source: own elaboration based on ICCS 2022 data

The scale measuring students' expected participation in pro-environmental activities (*s_envact*) has a national mean of 51.36 and a standard deviation of 8.81. The results reveal a substantial gender difference: girls score nearly 4.7 to 4.9 points higher than boys, which corresponds to just over half a standard deviation. This suggests that girls are notably more likely to anticipate engaging in civic actions for the environment in the future. SES has a small positive association with expected participation in Model 1, which diminishes after including civic knowledge. The overall effect of civic knowledge is minimal, with a slight negative interaction, suggesting that its influence may decrease among students with higher SES. The model explains a modest portion of variance (R^2 increasing from 0.08 to 0.09), reinforcing the pattern seen across outcomes—gender is the most consistent predictor, while SES and knowledge show weaker, context-dependent associations.

These results are reflected in the item-level analyses. Table 10 presents differences in students' reports on expected participation in pro-environmental activities in the future by gender, SES, and civic knowledge. Similar patterns to those observed in other areas emerge in the differences between girls and boys, with girls consistently more likely than boys to express a willingness to participate in all four forms of action. The largest difference—23.2 percentage points—is connected to participation in organised protests, indicating that girls are far more likely than boys to express interest in collective activism. However, other behaviours also showed substantial differences. Gender is a strong predictor of pro-environmental engagement, with girls consistently demonstrating greater proactivity than boys across all types of behaviours. Interestingly, when it comes to predictions about future engagement, no significant differences were noted between students based on their socio-economic status. The differences between students from the highest and lowest SES quartiles are very small and not statistically significant.

A comparison of civic knowledge between students who indicated they would "certainly" or "probably" take part in specific actions and those who declared they would "certainly not" or "probably not" participate suggests a relationship between civic knowledge and the willingness to engage, but this relationship is not consistent across all types of activities.

The strongest positive associations with civic knowledge were observed in refusing to buy harmful products (18.9 scale points) and encouraging others to make personal efforts (18.5 scale points). These associations remained significant even after controlling for SES and gender. However, no significant differences were observed for participating in organised protests and telling someone to stop damaging the environment. Interestingly, after adjusting for SES and gender, a weak negative association between civic knowledge and the willingness to participate in protests was noted, although it was not statistically significant. The findings may indicate that higher civic knowledge is more strongly linked to individual, less confrontational behaviours, but not necessarily with collective, more demanding actions like protests.

Table 10 *Students' reports on expected participation in pro-environmental activities in the future—differences by gender, SES, and civic knowledge*

	Difference in percentages between girls and boys (percentage points), SE	Difference in percentages between SES IV–I quartile (percentage points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points), SE	Difference in civic knowledge (ICCS 2022 Civic knowledge proficiency scale points) for the mean value of SES and gender, SE
IS4G31G Refuse to buy products that are harmful for the environment	19.5 (2.35)***	4.38 (3.34)	18.91 (3.52)***	11.15 (3.32)***
IS4G31H Tell someone to stop causing damage to the environment	11.29 (1.75)***	0.1 (1.96)	6.66 (4.53)	1.2 (4.07)
IS4G31I Participate in an organized protest to demand more action to protect our environment	23.16 (2.48)***	2.3 (3.12)	1.35 (3.2)	-5.31 (2.98)
IS4G31J Encourage other people to make personal efforts to help the environment (e.g. through saving water)	18.55 (2.07)***	3.52 (3.02)	18.5 (3.86)***	10.91 (3.63)***

Source: own elaboration based on ICCS 2022 data

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Note: Differences in percentages between students a) girls and boys b) SES IV–I quartile, declaring that they would “certainly” or “probably” take part in particular activities; Differences in civic knowledge between students declaring that they would “certainly” or “probably” take part and those declaring they would “certainly” or “probably” not do this.

4.6 Relationships between attitudes and behaviours

One of the key questions among researchers studying pro-environmental behaviours and attitudes is the relationship between these two domains, particularly in the context of identifying the determinants of pro-environmental behaviours. In this analysis, relationships between specific analysed aspects were examined, including: a) students' concerns about environmental threats b) students' views regarding environmental protection, c) reports on students' sustainable behaviours and d) consumer behaviours as well as d) students' expected participation in environment-related activities in the future.

Five scales were used for the analysis, four of which consist exclusively of items relating to the analysed aspects, while one (*e_ethcon*) also includes other consumer behaviours relevant to sustainable development, extending beyond environmental issues (see Table A1 in the Annex). The results of the correlation analyses are presented in Table 11. They revealed positive relationships between all scales. However, the strength of these relationships varies.

Table 11 *Correlations between students' concerns about environmental threats, students' views regarding environmental protection, reports on students' sustainable behaviours and consumer behaviours as well as students' expected participation in environment-related activities in the future*

	s_envcon – students' concern about threats to the global environment	s_attenv – positive attitudes toward environmental protection	e_susbeh students' reports on their sustainable behaviours	e_ethcon – students' reports on political consumerism behaviours	s_envact – students' expected participation in activities to protect the environment
s_envcon	1.00	0.35 (0.02)	0.25 (0.03)	0.17 (0.02)	0.32 (0.02)
s_attenv		1.00	0.33 (0.03)	0.29 (0.02)	0.47 (0.03)
e_susbeh			1.00	0.49 (0.02)	0.43 (0.02)
e_ethcon				1.00	0.45 (0.02)
s_envact					1.00

Source: own elaboration based on ICCS 2022 data

Note: Standard errors in parentheses. All correlations are significant at the 0.001 level. Correlations were estimated using a structural equation model and accounting for the complex sampling design. The model's standardised covariances correspond to the Pearson correlation coefficients.

The strongest correlation, though still moderate, was observed between two scales for pro-environmental behaviours: *e_ethcon* (consumer behaviours) and *e_susbeh* (sustainable behaviours), with $r = 0.49$. This indicates that students who engage in one form of pro-environmental behaviour are more likely to engage in others, highlighting the interconnectedness of environmentally conscious actions. A similarly strong, moderate correlation ($r = 0.47$) was found between support for environmental protection (*s_attenv*) and future expected participation in environment-related activities (*s_envact*). This relationship suggests that students with more positive attitudes toward environmental protection—those who, in this scale, are more likely to view environmental protection as the responsibility of both governments and individuals—are also more likely to declare their intention to take this responsibility and engage in pro-environmental activities in the future.

Slightly weaker but still moderate correlations were observed between future expected participation in pro-environmental activities (*s_envact*) and current behaviours: sustainable behaviours (*e_susbeh*, $r = 0.43$) and consumer behaviours (*e_ethcon*, $r = 0.45$). These findings suggest that present pro-environmental behaviours are moderately related to students' expectations of future engagement.

Notably, weak but statistically significant correlations were recorded between concerns about environmental threats (*s_envcon*) and both consumer behaviours (*e_ethcon*, $r = 0.17$) and sustainable behaviours (*e_susbeh*, $r = 0.25$). Additionally, the correlation between environmental concerns (*s_envcon*) and future expected participation (*s_envact*) was also weak ($r = 0.32$). This implies that concerns about environmental threats do not directly translate into either current or planned pro-environmental behaviours. These relatively weak correlations highlight that strategies relying solely on fear or concern about environmental threats may not effectively drive pro-environmental actions. Instead, fostering a sense of responsibility—both at the individual and national levels—may play a more significant role. Of course, it is important to remember that these analyses reflect associations, not causal relationships.

5. DISCUSSION AND CONCLUSIONS

This analysis highlights the complex interplay between environmental attitudes, behaviours, and factors such as gender, socio-economic status (SES), and civic knowledge among Polish 8th-grade students. The complementary use of scale-level regression and item-level analyses offers distinct insights into students' environmental attitudes and behaviours. By combining aggregate and disaggregated analyses, this study not only confirms known predictors of pro-environmental behaviours: such as gender and SES, but also identifies counterintuitive and context-specific patterns, particularly regarding civic knowledge and economic priorities. While regression models based on aggregated scales reveal broad patterns relating to gender, socio-economic status (SES), and civic knowledge, item-level analyses uncover nuanced variations that composite measures may obscure. The findings underscore that pro-environmental behaviours are heterogeneous and shaped by distinct

psychological, economic, and social mechanisms. The dual analytical approach is therefore essential: regressions provide generalizable insights, while item-level analyses illuminate exceptions and subtleties, enabling more precise interpretation and better-targeted recommendations.

The examination of specific items within the scales and the relationships between scales reveals a number of general patterns connecting pro-environmental attitudes and behaviours with gender, socio-economic status, and cognitive factors—level of civic knowledge. The findings confirm that, in Poland, girls exhibit significantly more pro-environmental attitudes than boys. Girls are also more frequently engaged in pro-environmental activities and are more likely to report that they expect they will participate in civic activities on behalf of the environment in the future. Gender differences are consistent across both analytical approaches, and are observed across all scales, and almost all items, with only two items showing no statistically significant differences. However, item-level analyses highlight larger gender disparities in specific behaviours (e.g., limiting the use of plastic items, purchasing second-hand items) than are visible in the aggregated scores. This highlights the importance of promoting pro-environmental engagement among boys during primary education. Similar patterns have been seen across many studies and countries showing that in general, females are often more engaged in environmental issues, and this is usually explained by differences in socialisation (Zelezny et al. 2000).

The relationships involving students' socio-economic background are more complex. Overall, students with higher SES demonstrate more pro-environmental attitudes and behaviours. SES effects vary by analytical level. Regression models suggest a modest SES influence, particularly once civic knowledge is accounted for. However, for some items within both the attitudes and behaviours scales, the differences between students from the highest (4th quartile) and lowest (1st quartile) SES groups are not statistically significant. Furthermore, while students from higher SES groups more frequently report engaging in most actions in the case of sustainable behaviours, significant differences are observed for only one consumer behaviours item, and even then it is rather small. Similarly, no significant SES-based differences were found in students' declarations regarding their expected participation in pro-environmental civic activities in the future. These findings suggest that the relationships between socio-economic status and pro-environmental attitudes and behaviours, particularly those relating to consumption patterns, are highly complex and shaped by financial motivations and financial capabilities. Other studies also highlight the complexity of the relationship between pro-environmental attitudes, behaviours, and socio-economic status, revealing variations across different social classes. Some research suggests that individuals from middle-class backgrounds tend to exhibit higher levels of pro-environmental behaviour compared to those from lower or upper classes (Chen et al., 2023). Additionally, subjective perceptions of social status play a crucial role in shaping environmental engagement (Kirsten et al., 2024).

Civic knowledge adds another layer of complexity. Generally, higher civic knowledge among students is associated with more pro-environmental attitudes and more frequent engagement in pro-environmental behaviours, both current and anticipated. However, this relationship is not consistent across all items. The role of civic knowledge diverges most notably between analyses at the scale and item level. While scale-level regressions depict civic knowledge as a weak-to-moderate positive predictor—except for consumer behaviours (*e_ethcon*), where a negative association appears—item-level analyses offers additional insight. For some items, the correlations are not statistically significant, and for others, a negative relationship emerges.

Given the associations described above, it is particularly interesting to take a closer look at the items that diverge somewhat from the primary patterns and are particularly distinctive.

One notable area is concern about climate change. As previously mentioned, Polish 8th grade students are relatively less likely than their peers in other countries to view climate change as a significant threat to the world's future, in contrast to other environmental threats where Polish students rank among the most concerned. Climate change also shows the largest differences in perception based on SES and civic knowledge, with these relationships persisting even after controlling for SES. This highlights that awareness about climate change is a field where educational efforts are especially required to address these disparities.

Another noteworthy item is one from the positive attitudes toward environmental protection scale: "Governments should focus more on protecting the environment than on supporting economic growth". This item has one of the lowest levels of agreement among Polish students, and for this statement, Poland ranks lowest among all countries participating in the study. Furthermore, this item shows a negative correlation with civic knowledge, which becomes even stronger after controlling for SES and gender. This finding suggests that many Polish 14-year-olds, including those with higher civic knowledge, prioritize economic growth over environmental measures.

Negative relationships with civic knowledge were also observed for certain pro-environmental consumer behaviours, such as refusing to buy goods whose production harms the environment or buying only goods that can be recycled. Furthermore, the analysis of items connected with expected participation in pro-environmental civic activities showed that civic knowledge is linked to preferences for certain forms of civic engagement, while not being associated with others. These results contradict the common assumption that knowledge drives pro-environmental behaviours. However, in the case of these items, the relationships are difficult to interpret, and various other factors may play a role, such as economic or cultural considerations.

Among the different scales, students' expected participation in pro-environmental activities (*s_envact*) had the strongest correlation with support for environmental protection (*s_attenv*). This indicates that students with more positive attitudes toward environmental protection—those who view it as a responsibility of governments and individuals—are also more likely

to express intentions to take this responsibility and engage in pro-environmental activities in the future. This finding is consistent with previous studies that highlight perceived personal responsibility as a strong predictor of pro-environmental behaviour among youth (Thielking & Moore, 2001).

At the same time, the relatively weaker correlation of expected participation in pro-environmental activities (*s_envact*) and concerns about environmental threats (*s_envcon*) emphasise that strategies relying solely on fear or concern are unlikely to be effective. Instead, fostering a sense of responsibility at both the individual and national levels appears to play a more significant role.

SUPPLEMENTARY MATERIAL

Supplementary data for this article can be found online at

[HTTPS://IBE.EDU.PL/IMAGES/EDUKACJA/NUMERY/2023_04/6_EDU_4_23_WASILEWSKA_ANEKSMF1_BG.PDF](https://ibe.edu.pl/images/edukacja/numery/2023_04/6_EDU_4_23_WASILEWSKA_ANEKSMF1_BG.PDF)

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School climate as a predictor of teacher job satisfaction and occupational well-being: TALIS 2018 evidence from Central and Eastern Europe

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Abstract

Building on evidence that contextual factors shape teacher outcomes, this study analysed TALIS 2018 data from six Central and Eastern European countries to compare the relative influence of school climate and socioeconomic status (SES) on teacher job satisfaction and occupational well-being. Multigroup structural equation models revealed that school climate—particularly distributed leadership, measured by stakeholders' (staff, students, and parents) participation in decision-making—explained substantially more variance in both satisfaction and well-being than an aggregate school SES measure. Positive teacher–student relationships also contributed to higher satisfaction, whereas elevated work-related stress—most strongly predicted by a negative disciplinary climate and, unexpectedly, by weaker stakeholder participation—served as the primary detractor. Although higher SES schools showed a modest direct boost in teacher satisfaction, SES was unrelated to stress levels or climate quality. Cross-country comparisons indicated that the strength of these associations, especially for distributed leadership, varied markedly by national context. These findings suggest that participatory governance, strengthening classroom relationships, and targeting disciplinary supports may enhance teacher well-being.

Keywords: School climate, teacher job satisfaction, TALIS 2018, school socioeconomic status, structural equation modelling.

Klimat szkoły jako czynnik przewidujący satysfakcję zawodową i dobrostan zawodowy nauczycieli: Analiza danych z badania TALIS 2018 z Europy Środkowo-Wschodniej

Streszczenie

W oparciu o wyniki badań wskazujące na związek między czynnikami kontekstowymi a funkcjonowaniem zawodowym nauczycieli przeanalizowano dane z badania TALIS 2018 z sześciu krajów Europy Środkowej i Wschodniej w celu porównania względnego wpływu klimatu szkoły i statusu społeczno-ekonomicznego (SES) szkoły na satysfakcję z pracy i dobrostan zawodowy nauczycieli. Wielogrupowe modele równań strukturalnych wykazały, że klimat szkoły – w szczególności rozproszone przywództwo, mierzone udziałem interesariuszy (pracowników szkoły, uczniów i rodziców) w podejmowaniu decyzji w szkole – wyjaśniał znacznie większą wariancję zarówno satysfakcji z pracy, jak i dobrostanu zawodowego nauczycieli niż zagregowana miara SES szkoły. Pozytywne relacje nauczyciel – uczeń również były związane z wyższą satysfakcją zawodową nauczycieli. Jednocześnie podwyższony stres związany z pracą – najsilniej przewidywany przez elementy klimatu szkoły związane z utrzymaniem dyscypliny w klasie oraz, nieoczekiwanie, przez niższy udział interesariuszy w podejmowaniu decyzji w szkole – okazał się głównym czynnikiem obniżającym satysfakcję zawodową nauczycieli. Mimo że nauczyciele pracujący w szkołach o wyższym statusie społeczno-ekonomicznym wykazywali nieznacznie wyższy poziom satysfakcji zawodowej, SES szkoły nie był powiązany z poziomem stresu ani jakością klimatu w szkole. Porównania między krajami wykazały, że siła tych związków, zwłaszcza w przypadku rozproszonego przywództwa, różniła się znacznie w zależności od kontekstu krajowego. Wyniki te sugerują, że zarządzanie partycypacyjne, wzmacnianie relacji w klasie i wsparcie w zarządzaniu zachowaniem uczniów mogą pozytywnie wpływać na dobrostan zawodowy nauczycieli.

Słowa kluczowe: Klimat szkoły, satysfakcja zawodowa nauczycieli, TALIS 2018, status społeczno-ekonomiczny szkoły, modelowanie równań strukturalnych.

1. INTRODUCTION

Teacher shortages are one of the most urgent issues that educational systems are facing; the problem affects a variety of countries, regardless of economic resources or geographical location (UNESCO and International Task Force on Teachers for Education 2030, 2024). In Europe, the scale of teacher shortages is projected only to worsen in the coming years (Organisation for Economic Cooperation and Development [OECD], 2020). These shortages disrupt educational systems by impacting students' learning environments and quality of education. Schools face financial costs to recruit new teachers (Levy et al., 2012; Ronfeldt et al., 2013) while also dealing with cancelled lessons, larger classes, and increased teacher workloads (European Commission/EACEA/Eurydice, 2021). The latest PISA report (OECD, 2024) highlights the widespread severity of this issue. From 2018 to 2022, the proportion of students in schools where the principal indicated that instruction was hindered by insufficient teaching personnel rose in 58 educational systems. These increases surpassed 30 percentage points in 10 countries, with many nations seeing the proportion of schools facing teaching staff shortages doubling or tripling.

These statistics highlight the need to investigate teacher attrition, a key cause of teacher shortages, with low teacher job satisfaction being a major determinant (Borman & Dowling, 2008; Ingersol, 2001; Nguyen et al., 2019; Wyatt & O'Neill, 2021). A study by Federičová (2021) indicated that the main driver for approximately half of the teachers leaving the profession was a lack of satisfaction with their school. To a large extent, this occupational dissatisfaction can originate in various elements of the environment in which teachers work, and only to a limited extent with dissatisfying salaries (Borman & Dowling, 2008).

The situation of teachers in schools with a higher concentration of socioeconomically disadvantaged students merits particular attention since these schools are at a higher risk of teacher turnover (teachers moving to other schools) and attrition (teachers leaving the profession) than other schools (Ingersoll, 2001). In a longer perspective, this leads to an uneven distribution of qualified teachers (OECD, 2024; Qin & Bowen, 2019), as disadvantaged schools face considerable difficulties attracting and retaining qualified teachers (Glassow et al., 2023).

Therefore, understanding which school-level factors most influence teacher job satisfaction and occupational well-being is critical to improving retention and mitigating chronic shortages. Drawing on TALIS 2018 data from six countries in the under-researched region of Central and Eastern Europe, this study compares the relative impact of key school-climate dimensions—especially distributed leadership (stakeholder participation in decision-making) and teacher–student relationships—and

school socioeconomic status (SES), an environmental determinant of social climate (Toropova et al., 2020). By providing context-specific evidence on how these elements drive teacher outcomes in diverse post-socialist settings (Veletić et al., 2024), we highlight the contextual dynamics of teacher experiences in these educational systems.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Teacher job satisfaction

Teacher job satisfaction is a pivotal concept in understanding teacher retention and well-being, which are critical for maintaining educational quality. Job satisfaction is the degree of contentment a person has with their job, while dissatisfaction is the degree of discontentment (Spector, 1997). By extension, TALIS 2018 defines teacher job satisfaction as 'the sense of fulfilment and gratification that teachers experience through their work as a teacher' (Ainley & Carstens, 2018, p. 43). Since job satisfaction is a multifaceted concept, a teacher's overall satisfaction is influenced by their feelings towards various distinct aspects or components of their work. Understanding these different facets is crucial because various factors, such as those relating to school climate and student composition, may impact them differently. This section reviews key theoretical perspectives on teacher job satisfaction and synthesises empirical findings regarding its components and their relationship with contextual factors, setting the stage for the present study's analysis.

Research shows that teachers' personal qualities and mindset influence job satisfaction. Studies reveal two key insights: First, teachers who feel more confident in their teaching abilities tend to be more satisfied with their jobs (Skaalvik & Skaalvik, 2017). Second, a positive school environment can boost teachers' confidence, which then leads to greater job satisfaction (Aldridge & Fraser, 2016).

As for situational factors associated with teacher job satisfaction, evidence shows that working conditions are a major predictor of teacher job satisfaction regarding their current school as well as their profession in general. Prominent positive environmental contributors are collaboration with colleagues, teacher-student relations, school climate (Zakariya, 2020), and leadership practices (Sun & Xia, 2018). Distributed leadership, where teachers have a say in decision-making processes, enhances their feelings of empowerment and engagement (Torres, 2019). A positive disciplinary climate and fewer instances of students' misbehaviour also contribute positively to teacher job satisfaction (OECD, 2020).

Conversely, a heavy workload, an imbalance between tasks directly relating to teaching and administrative responsibilities, student misbehaviour, and insufficient administrative support undermine occupational well-being and job satisfaction (Aldrup et al., 2018; Collie et al., 2012; Federicova, 2021). The most important negative antecedent of teacher job satisfaction is stress.

Apart from school-level factors, institutional factors are significant antecedents of teacher job satisfaction. These typically include the broader characteristics of educational systems and policies that govern the teaching profession in a given country. These system-level influences include resource allocation, teacher autonomy, and job security (Federicova, 2021; Ingersoll, 2001).

2.2 Teacher occupational well-being and stress

In addition to job satisfaction, teacher occupational workplace well-being is recognized as another critical concept important to understand teacher effectiveness, resilience, and retention. Well-being is a wide, multidimensional construct, covering various outcomes, including psychological resilience, physical health, emotional stability or organisational commitment (Dodge et al., 2012; Granziera et al., 2020). Historically, the literature on teacher occupational well-being has often focused on stress and its negative consequences, such as burnout, which significantly contribute to retention challenges in the profession (Roffey, 2012). However, influenced by the growing field of positive psychology, the perspective has broadened to examine proactive strategies and factors that actively nurture teacher well-being, moving beyond simply addressing deficiencies (Weiland, 2021). This section will review the diverse conceptualisations of teacher well-being and stress and explore the key individual and environmental factors identified in the literature that influence them both.

The occupational well-being of teachers is significantly shaped by their working conditions, with a positive school climate playing a critical role. Factors such as a strong sense of community, collegial support and cooperation among teachers, and constructive feedback on teachers' work are linked to higher levels of teacher occupational well-being (Zakariya, 2020). Beltman, Mansfeld, and Price (2011) emphasise that mentoring and collegial networks are important forms of external support, which together with teacher's personal resources form the foundations for teacher resilience, enabling teachers to manage their work stressors. Moreover, a positive teacher-student relationship is a crucial factor in promoting teacher occupational well-being. Teachers who report strong, positive relationships with their students tend to experience less occupational stress and greater job satisfaction (Aldrup et al., 2018).

Research has consistently mapped stress as the major negative contributor to teachers' occupational well-being. Teacher work-related stress refers to the negative physical and psychological responses that occur when job demands surpass a teacher's perceived coping capabilities (Kyriacou, 2001). Teaching is widely recognised as a stressful profession (Gu & Day, 2007), given the intensive term-time workload, which aggravates stress levels and disrupts work-life balance (Worth and Van

Den Brande, 2019). High levels of occupational stress lead to burnout, emotional exhaustion, and reduced satisfaction with the teaching profession, which can ultimately result in attrition (Skaalvik & Skaalvik, 2016). Skaalvik and Skaalvik (2015) identified seven categories of job-related stressors for teachers: disruptive student behaviour, workload and time constraints, student diversity and adapting instruction to students' needs, lack of autonomy, lack of shared aims and ideals, teacher collaboration challenges, and lack of job prestige.

2.3 School population composition and its relation to teacher job satisfaction and occupational well-being

Schools with a higher concentration of students from low-SES backgrounds¹ often face significant challenges, which not only negatively impact students' educational attainment but also shape the overall learning environment. Such schools, referred to as low-SES/low-income/challenging/(socially) disadvantaged/high-need schools, are more likely than other schools to have, among others, limited access to resources, increased student behavioural issues and absenteeism, limited parental involvement, limited administrative support, and limited professional development opportunities for teachers (Johnson et al., 2012; McKinney, 2007; Ouwehand et al., 2022; Smith & Granja, 2017; Sullivan et al., 2018).

The stressors present in challenging schools negatively impact teachers' job satisfaction and well-being, creating a cycle of stress that can affect teacher retention (Toropova et al., 2020). Adverse working conditions in low-SES schools may foster feelings of isolation and overload resulting in heightened teacher turnover (Allensworth et al., 2009). Also, inadequate support structures and high workloads can act as factors contributing to high attrition rates in urban, high-poverty schools (McKinney et al., 2008).

2.4 Dimensions of school climate and their relation to teachers' job satisfaction and occupational well-being

Generally, school climate is a set of shared perceptions of a school's norms, values, and expectations shaping the experiences and interactions between school community members (Wang & Degol, 2016). Its systematic investigations date back to the 1950s (Cohen et al., 2009). Early research focused on 'school atmosphere' or 'school personality' and how a school's culture is shaped by the leadership styles and interpersonal relations between teachers (Halpin & Croft, 1963). The construct has been subsequently growing in scope and complexity, intersecting with organisational climate research and school effects research (Anderson, 1982). In the early 21st century, with the emergence of concepts of inclusivity and emotional safety in schools, the conceptualisations of school climate also began to reflect the importance of inclusivity, diversity, students' emotional safety, sense of belonging, and their links to students' well-being (Brand et al., 2003) or academic achievement (Cohen et al., 2009) as elements of school climate.

Johnson, Stevens, and Zvoch (2007), in their conceptualisation of school climate, included a broad area of student relations, which encompassed students' behavioural issues, teacher-student relations, and motivation to learn. In addition to the above-mentioned relational dimension of school climate, and to commonly examined components such as collaboration and school resources, Johnson and colleagues highlighted additional facets of school culture, including decision-making processes and instructional innovation. Currently, although most researchers agree that there are four primary areas that clearly influence the overall atmosphere and nature of school life, i.e., safety, relationships, teaching and learning (the academic layer), and the institutional environment (National School Climate Center, 2017), there is no single list of elements that shapes each of these.

Selected elements of school climate will be further discussed below: teacher-student relationships, disciplinary climate, collective teacher innovativeness, and stakeholders' involvement in school decisions (teacher-perceived distributed leadership). Following the conceptual framework for TALIS 2018, these particular factors were used in the present study as indicators of the broader concept of school climate.

2.4.1 School disciplinary climate

Research consistently underscores that adverse working conditions are related to elevated stress levels among teachers. The two most often quoted school climate-related sources of stress are students' misbehaviour and workload. Classroom indiscipline was identified by Simón and Alonso-Tapia (2016) as a significant challenge for teachers and an important contributor to teacher occupational stress and wasted classroom time. In a recent study of teachers in five selected Asian countries, Nalipay (2023) found school disciplinary climate to be one of the best predictors of Asian teachers' occupational stress.

¹ Researchers typically measure SES either at the individual student level (using parental income, education, occupation, or home resources like books and computers) or at aggregate levels. School SES is commonly measured by the percentage of students eligible for subsidized lunches or other available indicators, while neighbourhood SES uses census or administrative data, e.g., on residents' educational attainment (Sirin, 2005). Indicators of this kind are, unfortunately, missing in TALIS data.

In their study of preservice teachers, Klassen et al. (2013) showed that students' behaviour and workload were important sources of teacher occupational stress, which in turn had a negative effect on teachers' commitment to continue teaching. There is some evidence that students' misbehaviour may predict not only the intention to leave teaching (Skaalvik & Skaalvik, 2016) but also actually leaving the profession (Amitai & Van Houtte, 2022).

Indiscipline is also associated with a drop in job satisfaction (Toropova et al., 2020). According to Aloe, Shisler, Norris, Nickerson, and Rinker (2014), students' misbehaviour was most consistently linked not only to lower job satisfaction (Zakariya, 2020), but also to emotional exhaustion, which is a core dimension of burnout. A poor classroom disciplinary climate, which absorbs teachers' time and energy, has long been recognised as elevating the risk of teacher burnout (Lewis et al., 2005).

At the other end of the scale are schools with established disciplinary procedures. Teachers employed in them report lower levels of occupational stress and higher levels of job satisfaction since such procedures lessen disruptions in the classroom, which improves overall job satisfaction for teachers and the teaching experience for students (Emmer & Evertson, 2016).

2.4.2 Teacher-student relationships

Multiple studies showed the significant role teacher-student relations play in shaping teachers' experiences of both job satisfaction and occupational stress. In two recent studies, Nalipay (2023) and O'Shea (2021) showed that teacher-student relations were a significant predictor of teachers' job satisfaction in Asia (Japan, South Korea, Shanghai, Singapore, and Taipei) and the United States, respectively. Also, Collie et al. (2012) established that supportive relationships and effective social-emotional learning, which constitute a positive school climate, were strong predictors of enhanced teacher commitment and job satisfaction.

The beneficial effects of positive teacher-student interactions are also more far-reaching. O'Connor (2008) found that such relationships are one of the primary reasons teachers remain in the profession. The connection is additionally corroborated by Veldman, van Tartwijk, Brekelmans, and Wubbels (2013), who investigated four senior teachers whose job satisfaction remained high. Teachers who had strong, positive relationships with students also reported higher levels of job satisfaction, even if students perceived the very same relationship less positively.

Research consistently highlights the negative impact of classroom misbehaviour on teacher-student relationships. Friedman (2006) found that persistent misbehaviour created stressful classroom environments, harming these relationships and negatively affecting teachers' professional satisfaction and occupational well-being, heightening the risk of emotional exhaustion and burnout. Spilt, Koomen, and Thijs (2011) stated that teachers' emotional investment in their relationships with students was closely tied to their professional identity, with frequent disruptions eroding the personal bonds between teachers and students. On the other hand, Aldrup et al. (2018) found that positive teacher-student relationships help teachers handle discipline problems more effectively, with the quality of these relations mediating the effect of students' misbehaviour on teacher occupational stress. Conversely, strains and conflict in teacher-student relationships may intensify behavioural challenges (Buyse, Verschueren, Doumen, van Damme, and Maes, 2008).

2.4.3 Teacher collective openness to innovation

In the rapidly developing world, schools are no longer expected to equip students only with foundational skills, like reading or mathematics, but also a broader set of complex skills. Innovation is frequently highlighted in this context, together with such skills as creativity, problem-solving, critical thinking, or digital literacy (OECD, 2015). As a result, fostering sustained innovation at the school level has become essential (Fullan, 2015).

Teachers are regarded as primary drivers of educational innovation, shaping the classroom and school environments (OECD, 2014) if they are receptive, open, and fully willing to embrace change (Fullan, 2015). Though teachers' personal inclination towards innovation plays an important role in fostering innovation in teaching practices, there is also an organisational angle to openness to innovation, influencing the initiation, maintenance, and spread of innovations at the school level (Schwabsky et al., 2020). In this sense, it encompasses the shared innovativeness within the groups of teachers, e.g., all teachers in a given school—how strongly they feel they share openness to new ideas and approaches (Anderson and West, 1998). This collective innovativeness is an essential aspect of a school climate supporting innovation.

Some school contexts are more open to innovation than others. An innovation-friendly school climate is characterised by supportive conditions, which reduce occupational stress and increase teacher engagement (Ainley & Carstens, 2018). In a systematic literature review, Zainal and Matore (2019) concluded that whereas teachers' innovative behaviour was shaped by multiple factors, there were two critical ones: leadership and teacher's self-efficacy. As for effective leadership styles, the study by Spillane, Halverson, and Diamond (2004) showed that distributed leadership fosters teachers' innovative practices by promoting shared responsibility and collective participation, thus creating a supportive climate that encourages collaboration among various stakeholders. Teacher cooperation and collaboration are viewed as instrumental in encouraging innovativeness. Nguyen et al. (2019) found that collaborative school culture had a greater impact on teacher innovation than individual autonomy.

2.4.4 Stakeholders' involvement in school decisions

Yet another element of school climate that affects teachers and their professional performance via the influence of the environment is school leadership. Among different leadership styles, distributed leadership is the focus of many studies. This approach decentralises decision-making, allowing teachers and other stakeholders (parents, students) to actively participate in school decisions.

There is accumulating evidence of a direct and positive relationship between distributed leadership and teachers' job satisfaction. It is often attributed to the fact that this type of leadership is associated with a collaborative school culture characterised by mutual support and the culture of shared responsibility (Diagne, 2023; Sun & Xia, 2018). Indeed, Torres (2019) argued that distributed leadership increased both teacher job satisfaction and professional collaboration. Also, Liu and Watson (2020) found a positive association between teachers' perception of their involvement in decision-making and three teacher-related variables: job satisfaction, professional collaboration, and organisational commitment.

Distributed leadership is also positively associated with teacher occupational well-being. Bellibaş, Gümüş, and Chen (2023) concluded that decentralised decision-making within the school community supports teacher professional commitment. Establishing a culture of collaboration and shared responsibility in school operations helps create a less stressful work environment, improving teachers' occupational mental and physical well-being, and reinforcing their professional engagement. Additionally, Liu, Qiang, and Kang (2023) found that distributed leadership can indirectly and positively influence occupational well-being through teacher self-efficacy.

3. THE PRESENT STUDY

The present study aims to determine which aspects of school climate are most important to teacher job satisfaction and occupational well-being. This study re-analyses data from the last cycle of the Teaching and Learning International Survey (TALIS) in 2018. TALIS remains the only large-scale, publicly accessible dataset containing nationally representative teacher data on the constructs that are investigated in this study.

Our study focuses on six selected Central and Eastern European countries: Bulgaria, Croatia, Estonia, Hungary, Lithuania, and Romania. This group of historically and geographically related countries was rather under-represented in the previous secondary TALIS 2018 analyses (Veletić et al., 2024). Moreover, we expand upon the previous TALIS 2018 analyses of school climate (e.g., Fayda-Kinik, 2023; Kang, 2023; Katsantonis, 2020; Nalipay, 2023; Veletić et al., 2023; Zhang et al., 2021; Zhao & Jin, 2023) by adding the aspect of the school's socioeconomic characteristics. Specifically, we explore whether and how teachers in schools with varying proportions of students from socioeconomically disadvantaged homes exhibit different patterns of job satisfaction, given that school composition shapes school climate and is a significant environmental factor in teacher job satisfaction (Toropova et al., 2002).

Based on the theoretical frameworks and existing evidence discussed above, the current investigation is guided by four hypotheses:

H1 School climate influences teachers' job satisfaction and occupational well-being and stress.

H2 Teacher occupational well-being and stress mediate the relation between school climate characteristics and teacher job satisfaction.

H3 Higher school socioeconomic status (SES) is related to higher teacher job satisfaction, higher teacher occupational well-being/lower stress, and positive school climate.

H4 Direct and indirect effects of school climate on teacher job satisfaction, and teacher occupational well-being and stress vary across different countries.

4. METHODS

4.1 Data source

This study used data from the Teaching and Learning International Survey (TALIS) 2018. TALIS is a large-scale survey conducted by the Organisation for Economic Cooperation and Development (OECD). It monitors trends in teaching quality by gathering data from representative samples of teachers and principals in numerous countries every five years since 2008. Since its first cycle, the core TALIS population has comprised teachers and school leaders from lower secondary schools (level 2 of the International Standard Classification of Education - ISCED 2) with each participating country/economy administering the survey at this level of education in every TALIS cycle. TALIS 2018 also offered the possibility of conducting the survey at the ISCED 1 and/or ISCED 3 level, as well as the TALIS-PISA link study, in which TALIS was administered

in the same schools as the Programme for International Student Assessment (PISA) 2018. Another survey module was TALIS Starting Strong 2018 focusing on Early Childhood Education and Care staff and centre leaders.

TALIS 2018 respondents completed self-administered paper or online questionnaires providing insights into, among other things, their teaching practices, work conditions, professional development, school environments, attitudes, motivation, and job satisfaction. A total of 48 countries/economies participated in the TALIS 2018 round. The comparability of collected data was ensured by standardised procedures at all stages of the survey, such as sample design, instrument preparation and translation, data collection, data processing, weighting and scaling (OECD, 2019).

TALIS 2018 employed a stratified two-stage probability sampling design. Implicit strata were used for all participating countries/economies and explicit strata were optional. Explicit strata were usually based on school characteristics such as location or source of financing and were determined in cooperation between the international sampling team and each participating country/economy. Within explicit strata, schools were sorted by a measure of size, typically the number of teachers per school. For each participating country/economy, in the first stage, a sample of schools was selected with probability proportional to school size within strata determined at the national level. In the second stage, a sample of teachers was selected in each participating school. The minimum required national sample size was 200 schools, with 20 teachers selected in each school. The TALIS data consist of survey responses provided by teachers from participating schools as well as obtained from the principals of these schools. To be included in the TALIS 2018 international dataset, at least 50% of teachers within each selected school had to participate in the survey. The Public Use Files for each cycle of TALIS are made available and can be accessed on the OECD website along with detailed documentation on the survey procedures, sampling and data quality, as reported in the Technical Report for TALIS 2018 (OECD, 2019).

4.2 Sample

This study used data from ISCED 2 (International Standard Classification of Education level 2—lower secondary education) teachers from six Central and Eastern European countries: Bulgaria (n = 2862), Croatia (n = 3358), Estonia (n = 3004), Hungary (n = 3245), Lithuania (n = 3759), and Romania (n = 3658). The sociodemographic and occupational characteristics of participants are presented in Table 1. The majority of teachers were women (from 73.0% in Romania to 84.9% in Lithuania), and graduates from a regular teacher education or training programme (from 71.4% in Romania to 87.6% in Hungary). In four out of six countries, the largest age group of teachers was 50- to 59-year-olds (from 31.8% of teachers in Estonia to 40.6% of teachers in Lithuania). In Croatia, the largest age group was teachers aged 30–39 (38.4% of teachers), and in Romania – teachers aged 40–49 (34.2% of teachers).

Table 1 *Sample characteristics by percentages with standard errors (SE) and means with standard deviations (SD)*

	BGR	HRV	EST	HUN	LTU	ROU
n	2862	3358	3004	3245	3759	3658
% of female teachers (SE)	79.5 (0.82)	78.2 (0.53)	83.8 (0.58)	79.1 (0.34)	84.9 (0.43)	73.0 (0.51)
% of teachers who graduated from a regular teacher education or training programme (SE)	- a)	84.9 (0.59)	77.4 (0.8)	87.6 (0.53)	78.1 (0.98)	71.4 (0.64)
% of teachers in age (SE):						
under 30	5.6 (0.36)	8.4 (1.02)	7.1 (0.54)	4.5 (0.28)	2.8 (0.27)	9.0 (0.46)
30-39	12.2 (0.51)	38.4 (0.84)	16.4 (0.76)	18.0 (0.35)	14.1 (0.58)	30.6 (1.24)
40-49	31.2 (0.67)	28.9 (1.73)	22.9 (0.80)	29.9 (1.11)	26.4 (0.76)	34.2 (1.47)
50-59	35.5 (1.33)	16.4 (0.64)	31.8 (0.85)	37.0 (0.91)	40.6 (0.67)	18.0 (0.82)
60 and above	15.5 (0.77)	7.9 (0.40)	21.9 (0.77)	10.6 (0.29)	16.1 (0.71)	8.2 (0.65)
teaching experience in years (mean, SD)	19.9 (12.6)	14.4 (9.8)	22.2 (13.1)	20.2 (11.5)	23.8 (11.1)	17.1 (10.6)

BGR = Bulgaria, HRV = Croatia, EST = Estonia, HUN = Hungary, LTU = Lithuania, ROU = Romania

a) The question on teachers' education path was not asked in Bulgaria

4.3 Variables

Variable operationalisation draws on the TALIS 2018 conceptual framework (Ainley & Carstens, 2018) and the TALIS 2018 Technical Report (OECD, 2019). As a result, the constructs of teacher satisfaction, their occupational well-being, and school climate are investigated using the scales provided in the TALIS 2018 dataset. The scales consolidate relevant questions to capture latent traits and abstract properties (Ainley & Carstens, 2018; OECD, 2019).

Each scale consisted of four or five items with a 4-point rating (construction of scales and items wording in Annex A). Due to the non-invariance of scales of interest across the countries selected for the present study, an alignment procedure was performed. In consequence, the current study did not use the original TALIS 2018 scale scores.

4.3.1 Dependent variable

TALIS 2018 measured teachers' job satisfaction with one composite scale: *Job satisfaction, overall* and two subscales: *Job satisfaction with work environment* and *Job satisfaction with profession*. The present study used the first, i.e., school-based measure of job satisfaction as the main dependent variable, since our major area of exploration—school climate—is closely tied to the immediate school environment. *Job satisfaction with work environment* (JSENV) considers teachers' occupational contentment with various aspects of their work environment, encompassing school resources, collegial and leadership support, as well as the school's physical conditions. A high score on this scale indicates high job satisfaction.

4.3.2 Independent variables

TALIS 2018 operationalised school climate not by means of a single overall school climate scale but by means of a set of scales based on data from the Teacher Questionnaire and Principal Questionnaire. This study uses scales pertaining to the school climate only from the Teacher Questionnaire. These are: *Teachers' perceived disciplinary climate* (DISC), *Teacher-student relations* (STUD), *Participation among stakeholders* (STAKE). The scale *Teachers' perceived disciplinary climate* reflects teachers' perceptions of challenges relating to classroom discipline, including delays due to noise, student disruptions, or time lost to manage behaviour. The higher the score on this scale, the more problems with discipline were reported by teachers. The scale *Teacher-student relations* refers to positive interactions, teachers' belief in the value of their students' well-being, teachers' interest in hearing the students' voice, and support for students in need. The higher the score on this scale, the more positive teacher-student relations teachers reported. The scale *Participation among stakeholders* pertains to the extent to which the school offers opportunities for staff, parents/guardians, and students to engage in decision-making, promoting shared responsibility, and mutual support. It is associated with distributed leadership, so this scale can also be operationalized as the teachers' perspective on distributed leadership. The higher the score on this scale, the more stakeholder involvement was reported by teachers.

The present study also uses the scale *Team innovativeness* (TEAM) to capture teachers' shared perceptions of collective, as opposed to individual, innovativeness. Kang (2023) used this scale as a measurement of innovative school climate. The TALIS 2018 conceptual framework eventually classified this scale as a separate theme (Innovation), but originally it was conceived as 'a cross-cutting issue closely related to teachers' instructional practices and also school climate' (Ainley & Carstens, 2018, p. 23). The scale pertains to a collective attitude towards a certain phenomenon: innovativeness. As such, it does not concern resources connected to innovations but rather expresses the idea of togetherness—how much teachers feel they all share the same predisposition, i.e., openness to innovations. Following this line of reasoning, also expressed by Johnson et al. (2007) in their Revised School Level Environment Questionnaire, *Team innovativeness* was included as a school climate factor in the present study.

4.3.3 Mediating variable

TALIS 2018 measured work stress and well-being in the workplace with the scale *Workplace well-being and stress* (WELS), which was used in the present study as a mediating variable. The scale pertains to teachers' overall occupational well-being and stress levels capturing aspects of job-related emotional and physical strain. The higher the score on this scale, the higher the stress and the lower the occupational well-being. The role of school climate as a mediator between the socioeconomic status of schools and teachers' job satisfaction was also tested in our study.

4.3.4 Control variables

In our model we controlled for the total work experience as a teacher (TT3G11B) as an occupational characteristic that was recognized to be relevant to teachers' perception of school climate. The model also controlled for the school's socioeconomic status. TALIS 2018 obtained school SES data from school principals. They were asked to estimate the proportion of students from socioeconomically disadvantaged homes² in their school by selecting one of five categories: none; 1% to 10%; 11% to 30%; 31% to 60%; and more than 60%. We consolidated these five categories into three broader

² Socioeconomically disadvantaged homes were defined in TALIS 2018 as households lacking basic necessities such as adequate housing, nutrition, or medical care.

ones: high-SES schools (10% or fewer students from socioeconomically disadvantaged homes), medium-SES schools (11% to 30% of such students), and low-SES schools (more than 30% of such students). More than half of the teachers in each country worked in high-SES schools—from 51.4% in Bulgaria to 72.2% in Estonia (see Annex B).

4.4 Data analysis procedures

4.4.1 Multigroup structural equation model alignment modelling

As noted in the TALIS 2018 Technical Report (OECD, 2019), the constructs (scales) used were not fully invariant. To address the measurement non-invariance of latent constructs across the six countries included in our analysis (Bulgaria, Croatia, Estonia, Hungary, Lithuania, and Romania), the alignment method proposed by Muthén and Asparouhov (2014) was applied using Mplus 8.0 software. The alignment method adjusts for cross-country differences in measurement parameters to maximize the comparability of latent constructs while allowing for partial non-invariance. More specifically, in the first step, measurement models for each latent variable (JSENV, WELS, DISC, STUD, STAKE, TEAM) were estimated using a mixture model with known classes corresponding to each country. These models allowed factor loadings and intercepts to vary across countries, capturing country-specific measurement characteristics. The alignment method was subsequently applied to optimize factor loadings and intercepts, achieving approximate measurement invariance. By identifying the most invariant parameter configuration across countries, this approach minimizes non-invariance across countries without imposing strict equality constraints, allowing meaningful cross-country comparisons to be made while acknowledging inherent differences in measurement.

The model estimation employed the expectation-maximization (EM) algorithm with random starts and the maximum likelihood with the robust standard error (MLR) estimator. To address potential local maxima, 100 initial random starts and 10 final-stage optimizations were used. Although largely effective, occasional convergence issues arose, reflecting the complexity of working with large-scale survey data and missing observations.

In the second step, the aligned measurement parameters from the first stage were incorporated as constraints in a multigroup structural equation model (SEM). Factor loadings and intercepts were fixed at alignment-derived values for each latent construct and country, ensuring consistency in construct measurements across contexts. The structural model examined the relationships between these latent constructs and predictors, including school socioeconomic status (operationalized with binary variables for low-SES and high-SES schools, using medium-SES as the reference category) and teacher experience (in years, centred on the mean). This two-step alignment and SEM approach provided a robust methodological framework for addressing measurement non-invariance, maintaining construct comparability, and enabling the accurate assessment of structural relationships. Furthermore, it accounted for the complex survey design and appropriately applied sampling weights, ensuring a valid estimation of standard errors and statistical tests.

The measurement model performed well. Across the latent classes, the factor loadings for the six latent constructs—JSENV, WELS, DISC, STUD, STAKE and TEAM—on their respective observed variables were consistently strong and statistically significant. The standardised factor loadings typically ranged between 0.5 and 0.9, indicating a robust relationship between latent variables and their indicators.

4.4.2 Weighting and missing data

We estimated Multigroup Structural Equation Models using data from the two-stage TALIS sampling design. While we included teacher weights (TCHWGT) to account for unequal selection probabilities and used cluster-robust standard errors based on school identifiers to address nesting, we did not incorporate replicate weights or a multilevel specification that would better reflect the hierarchical data structure and complex sampling. This was driven by the technical limitations in integrating these procedures with the multigroup modelling framework, particularly when combined with the alignment method used for measurement invariance.

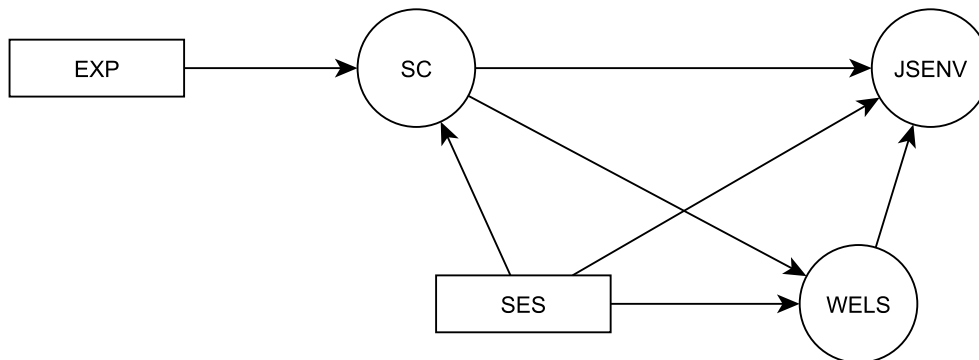
As part of our sensitivity analyses, we calculated intraclass correlation coefficients (ICCs) for each scale in each country (Annex C), revealing meaningful clustering at the school level. For job satisfaction with the work environment (JSENV), ICCs indicate that 10–17 % of variability is attributable to between-school differences. Workplace well-being and stress (WELS) ICCs range from 0.035 (Croatia) to 0.122 (Bulgaria), underscoring the influence of school-level factors on teachers' occupational stress and well-being. Disciplinary climate (DISC) and stakeholder participation (STAKE) also exhibit substantial clustering, with ICCs reaching 0.146 and 0.138, respectively. These findings suggest that our current analysis approach might have decreased the accuracy of our conclusions. By not accounting for school-level differences, we may be underestimating how much schools actually matter for teacher job satisfaction. Secondly, we might be overestimating the importance of individual teacher characteristics.

Missing data was addressed using full information maximum likelihood (FIML). The extent of missing data is examined and detailed in Annex D. To address potential deviations from normality, we employed the maximum likelihood estimator with robust standard errors (MLR).

5. RESULTS

Based on the literature review, a conceptual model was developed (Figure 1), in which school climate factors directly influence both teachers' occupational well-being and job satisfaction. The model assumes that school climate factors indirectly influence job satisfaction via teacher occupational well-being. It posits positive direct and indirect effects of specific school climate components, such as teacher–student relations, stakeholder participation, team innovativeness, and high school SES on both teacher occupational well-being and job satisfaction. Conversely, it predicts negative direct and indirect effects of the disciplinary climate and low school SES on both teacher occupational well-being and job satisfaction.

Figure 1 *The simplified conceptual model*



Note: SC = school climate; JSENV = job satisfaction with work environment; WELS = workplace well-being and stress; EXP = total work experience as a teacher; SES = school socioeconomic status

The multigroup structural equation model (SEM) analysis validated the theoretical model, revealing both direct and indirect relationships between school climate factors and teacher job satisfaction with the work environment. Our findings partially supported the theoretical model regarding the effects of school socioeconomic status (SES) on teacher job satisfaction, occupational well-being and stress. SES exhibited marginal and mostly insignificant direct and indirect effects on job satisfaction and no effect on occupational well-being and stress.

SEM results—standardised regression coefficients with corresponding standard errors and p-values for direct, indirect, and total effects of school climate and school SES on WELS and JSENV—are presented in Annex F. Path diagrams for each country with statistically significant standardised regression coefficients are presented in figures 2A–2F. As for the regression coefficients, we interpreted the values of ≥ 0.10 as small effects, ≥ 0.30 as medium effects, and ≥ 0.50 as large effects (Cohen, 1988). Additionally, we considered coefficients smaller than 0.10 as marginal. The results are discussed below.

5.1 Direct effects

The structural model largely corroborated H1 by showing the direct paths between school climate variables (STAKE, STUD, TEAM, DISC) and teacher job satisfaction with work environment (JSENV) and teacher occupational well-being and stress (WELS) when controlling for school SES and teachers' job experience.

JSENV was positively predicted by STAKE in all countries; the strength of the effect was medium in Croatia, Bulgaria, Estonia and Lithuania (β from 0.318 to 0.442) and small in Hungary and Romania ($\beta = 0.265$ and 0.22). Another positive predictor of JSENV was STUD which had a small effect in all countries (β from 0.153 to 0.239). TEAM had a small positive effect in Hungary and Croatia ($\beta = 0.122$ and 0.106). The effect of TEAM in other countries was marginal but positive and statistically significant.

On the other hand, JSENV was negatively predicted by teachers' occupational stress and lower well-being (WELS) and disciplinary problems with students (DISC). WELS had a medium negative effect in Bulgaria, Estonia, and Croatia (β from -0.354 to -0.362) and a small negative effect in Hungary, Lithuania, and Romania (β from -0.226 to -0.265). The negative effect of DISC was marginal but statistically significant in all countries (β from -0.035 to -0.80).

In the developed model, WELS was positively predicted by DISC (teachers' occupational stress was higher in schools with more disciplinary problems), with a small effect in all countries (β from 0.149 to 0.262), and negatively predicted by STAKE (teachers' occupational stress was lower in schools where stakeholders were involved in the decision-making process)—also with a small effect in all countries (β from -0.176 to -0.228). Further, there was a negative and marginal effect of TEAM on WELS (β from -0.023 to -0.068), which means that a climate conducive to team innovation was associated with higher teachers' occupational well-being. The effects of STUD on WELS turned out to be not statistically significant.

As for the effect of school socioeconomic status (SES) on teachers' occupational satisfaction, occupational well-being/stress, and school climate, H3 was only partially supported. High SES had a positive and low SES a negative effect on

JSENV in comparison to medium school SES; however, the majority of these effects were marginal. The only exception was Bulgaria, where the negative effect of low school SES was small ($\beta = -0.105$). Next, neither high SES nor low SES predicted WELS. The investigation of the paths between school socioeconomic status and school climate revealed only one statistically significant path: high SES was associated with lower DISC with marginal effects (β from -0.035 to -0.057). The effects of high or low SES—in comparison to medium SES—on other school climate characteristics (STUD, TEAM and STAKE) were not statistically significant.

5.2 Indirect effects

Indirect effects were analysed to describe the role of workplace well-being and stress (WELS) as a mediator between school climate and JSENV. We explored the paths from school climate through WELS to JSENV, next from school SES through school climate to JSENV, and finally from school SES through school climate and WELS to JSENV. Our results partially support H2.

We found that the indirect effects of WELS were positive but marginal for STAKE (β from 0.040 to 0.080) and TEAM (β from 0.010 to 0.20) for all countries. This means that these characteristics were associated with a lower level of occupational stress, which negatively predicted JSENV. On the other hand, a negative and marginal indirect effect of DISC through WELS was discovered (β from -0.040 to -0.089). Thus, the challenging disciplinary climate had not only negative direct effects on JSENV, but also an indirect effect by being associated with a higher level of WELS. The indirect effects of STUD through WELS on JSENV were found to be not statistically significant in all countries.

Most of the indirect effects of SES through school climate and through school climate and WELS on JSENV were not statistically significant. The developed model showed a significant, marginal indirect effect of high SES through DISC on JSENV ($\beta = 0.003$) and high SES through DISC and WELS on JSENV ($\beta = 0.003$) only in Bulgaria.

5.3 Total effects

The analysis of the total effects of school climate and SES on JSENV showed an important positive role of stakeholders' involvement in school decision-making processes (STAKE) in all countries. Its total effect was large in Croatia ($\beta = 0.520$), medium in Bulgaria, Estonia, Hungary, and Lithuania (β from 0.310 to 0.445), and small in Romania ($\beta = 0.260$). This total effect was partially mediated by WELS—indirect effects account for approximately 15–16% of total effect of STAKE on JSENV in all countries.

The total effect of positive student–teacher relationships (STUD) on JSENV was positive and small in all countries (β from 0.158 to 0.230) and a small proportion of it was mediated by WELS (from 3.3 to 5.9%).

Further, a total positive effect of team innovativeness (TEAM) was small in Croatia, Hungary and Romania (β from 0.110 to 0.140) and marginal in other countries. The proportion of mediated effects was 9.0 to 16.7%.

A challenging disciplinary climate (DISC) had a small negative total effect in all countries (β from -0.110 to -0.169) but Hungary, where it was marginal. More than half of this effect was mediated through WELS (50.0–54.5%).

The total effect of high school SES in comparison to medium school SES was positive but did not exceed 0.100 in any country. The negative effect of low school SES was small in Bulgaria and lower than 0.100 in other countries.

5.4 Comparison across the countries

The SEM analysis tested H4, which posits that the direct and indirect effects of school climate variables (STAKE, TEAM, STUD, DISC) on teacher job satisfaction (JSENV) and occupational stress and well-being (WELS) vary across the six countries. The results support H4, indicating cross-country differences in the strength and relevance of these predictors.

The total effect of stakeholders' involvement in decision-making (STAKE) on teachers' job satisfaction with work environment (JSENV) was positive. Still, its strength varied across countries—it was small in Romania, medium in Bulgaria, Estonia, Hungary, and Lithuania, and large in Croatia.

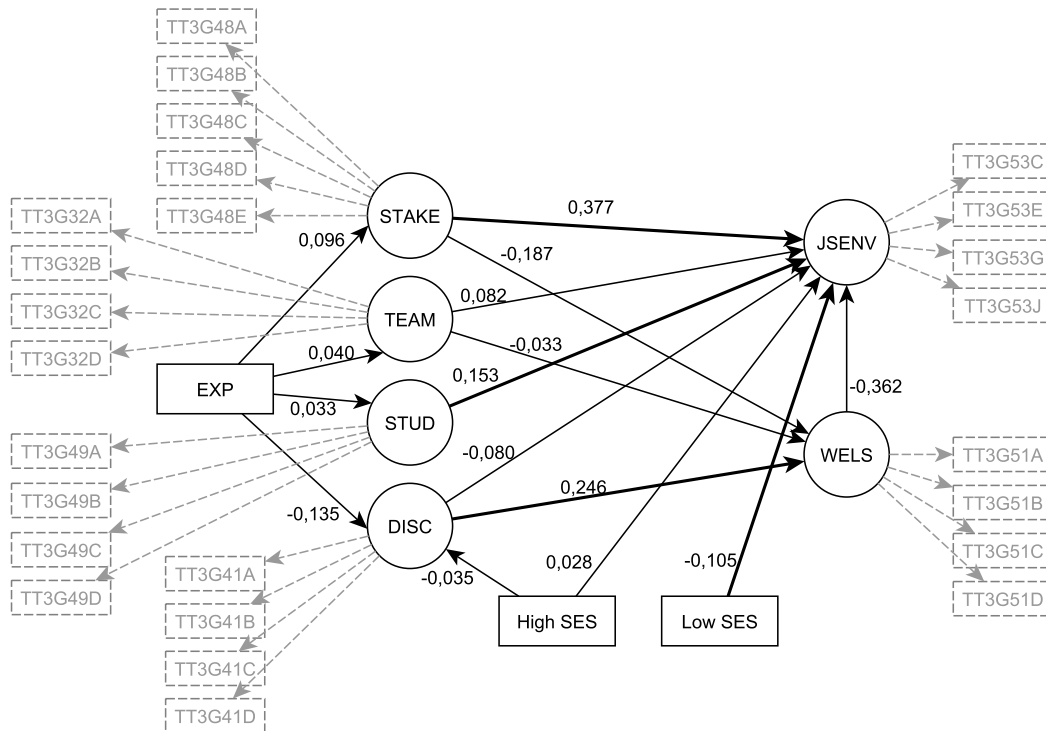
Next, collective team innovativeness (TEAM) was a positive predictor of JSENV with small strength in Croatia, Hungary, and Romania, and of marginal importance in the other countries. The total effects of teacher–student relationships (STUD), disciplinary climate (DISC), as well as high and low school SES on JSENV across countries had the same direction and were at similar levels in all countries: positive and small for STUD, positive and marginal for high SES, negative and small for DISC (marginal in one country), negative and marginal for low SES (small in one country). The analysis of indirect effects indicated that half or more of the total, negative effect of disciplinary problems (DISC) on JSENV was mediated through work stress (WELS), indicating that poor classroom conditions affect teachers' job satisfaction by increasing their occupational stress levels.

Variables relating to school climate explained a higher proportion of variance in JSENV in Croatia, Bulgaria, and Estonia (R-square respectively 0.466, 0.401, and 0.379) than in the other three countries (R-square from 0.203 to 0.252; for details see Annex E). This indicates that for teachers in Croatia, Bulgaria, and Estonia, the school climate elements investigated in this study matter significantly more in shaping their job satisfaction than for teachers in Lithuania, Hungary, and Romania. For teachers in the second group of countries, other factors might play a more substantial role in influencing their occupational well-being.

*School climate as a predictor of teacher job satisfaction and occupational well-being:
TALIS 2018 evidence from Central and Eastern Europe*

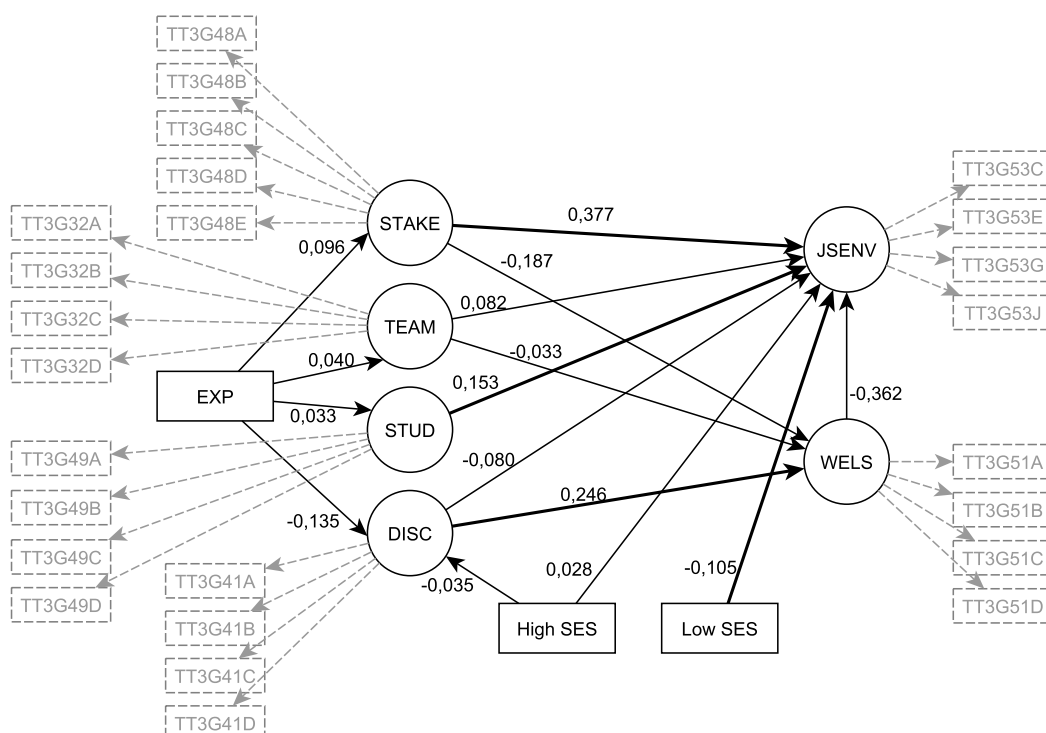
By and large, school climate variables explained a smaller proportion of variance in WELS than in JSENV (Annex E), indicating that STUD, DISC, STAKE, and TEAM have a stronger impact on teachers' level of job satisfaction than on how stressed they feel. The extent of school climate's influence on teachers' occupational well-being varied across countries. Our model explained approx. 10% of the variance in teachers' occupational well-being and stress for Bulgaria, Croatia, Lithuania, and Romania, while for Estonia and Hungary it was approx. 6%.

Figure 2A **Structural equation model results – Bulgaria**



Note: Standardised regression coefficients. Only significant paths are presented

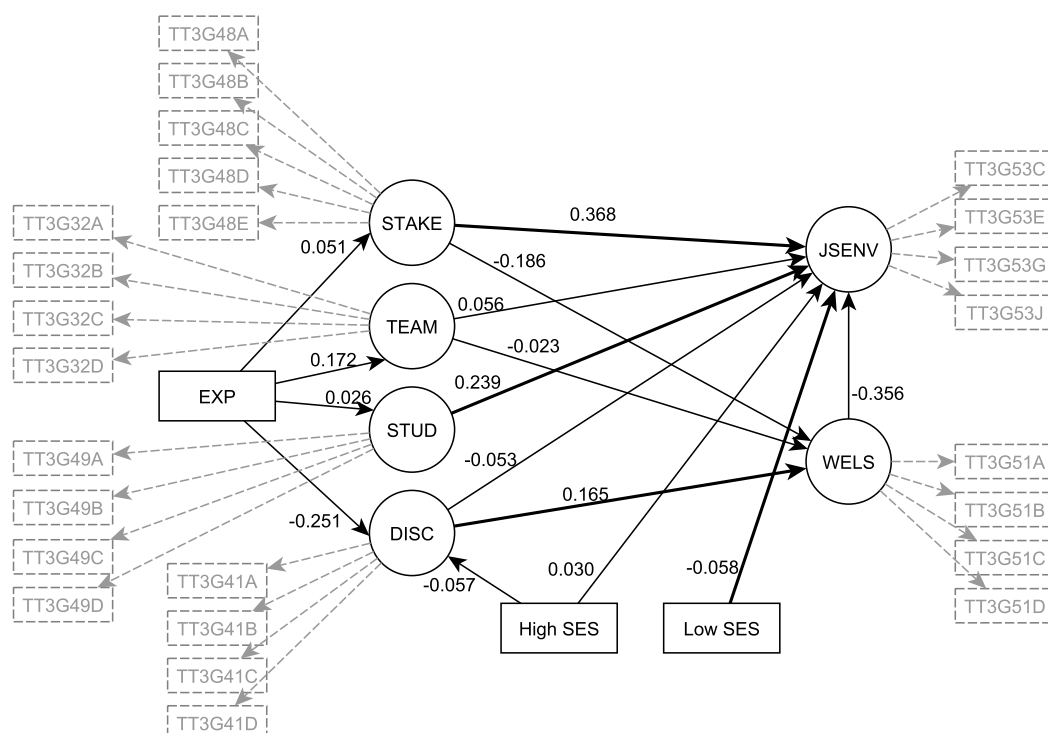
Figure 2B **Structural equation model results – Croatia**



Note: Standardised regression coefficients. Only significant paths are presented

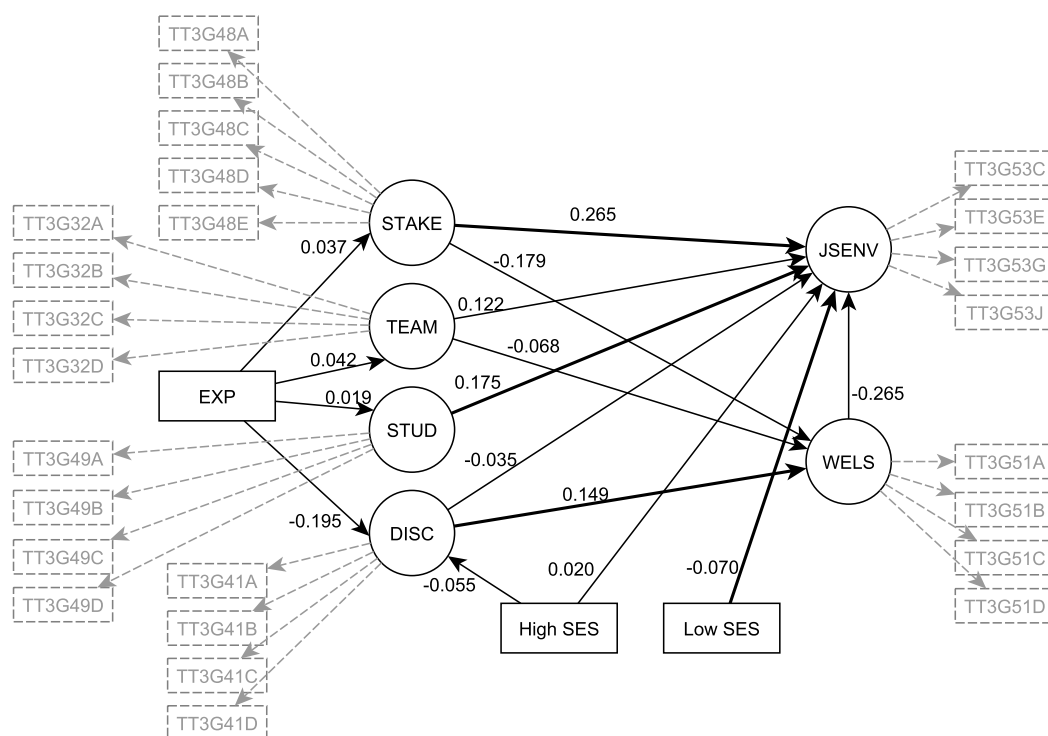
*School climate as a predictor of teacher job satisfaction and occupational well-being:
TALIS 2018 evidence from Central and Eastern Europe*

Figure 2C **Structural equation model results – Estonia**



Note: Standardised regression coefficients. Only significant paths are presented

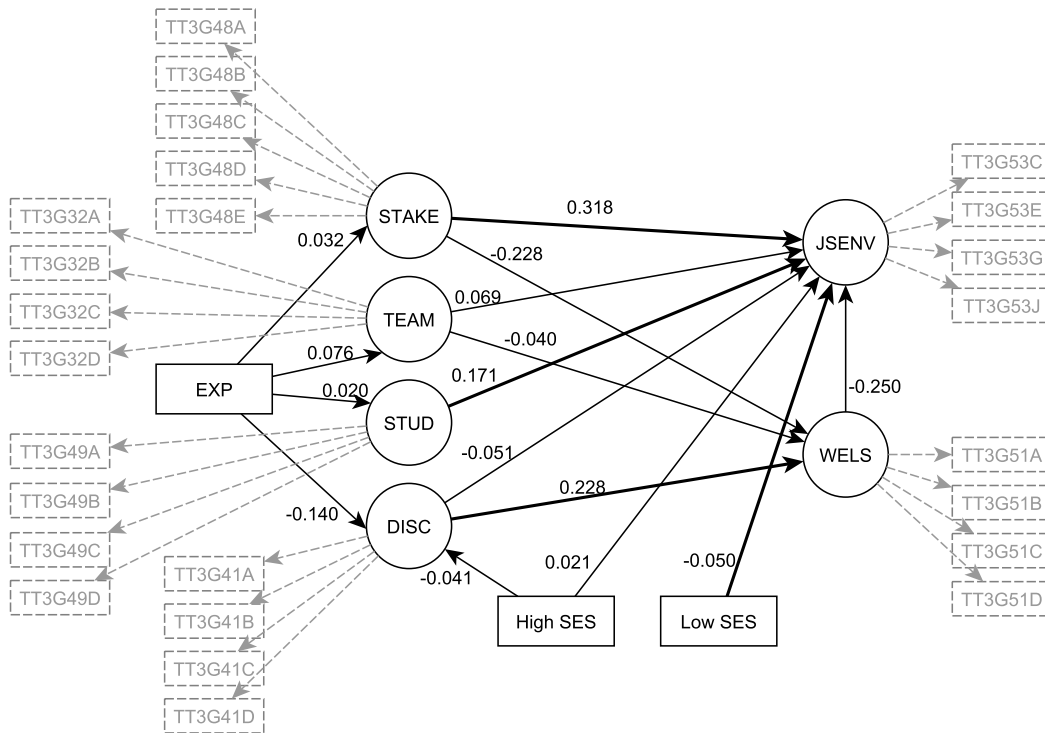
Figure 2D **Structural equation model results – Hungary**



Note: Standardised regression coefficients. Only significant paths are presented

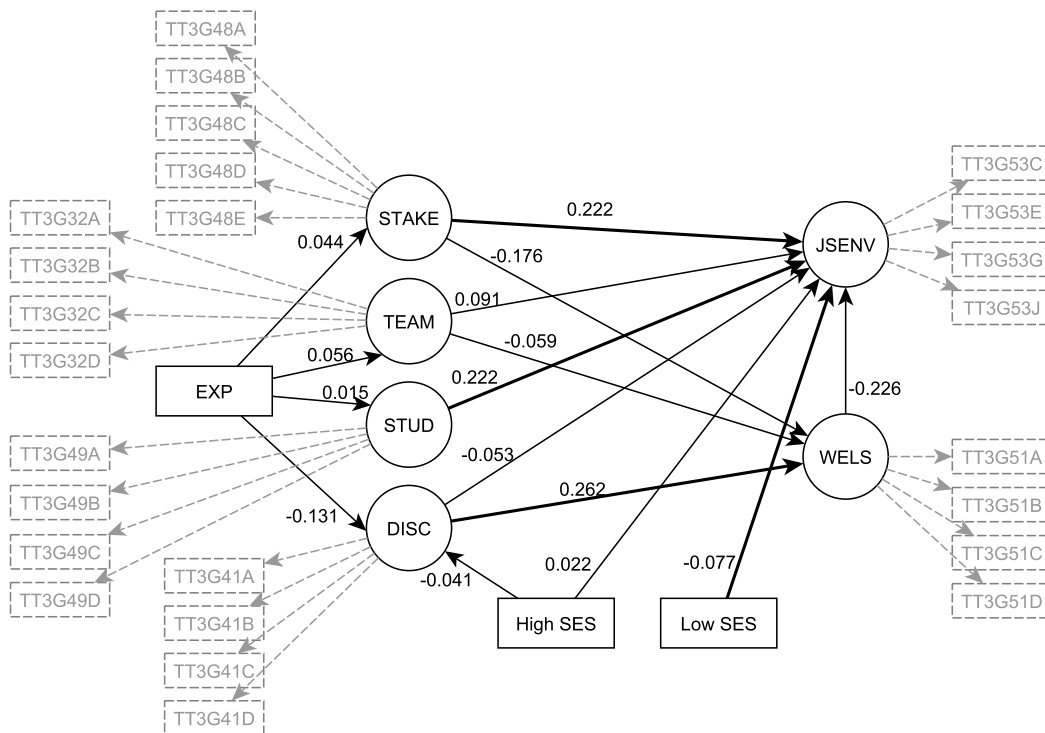
*School climate as a predictor of teacher job satisfaction and occupational well-being:
TALIS 2018 evidence from Central and Eastern Europe*

Figure 2E **Structural equation model results – Lithuania**



Note: Standardised regression coefficients. Only significant paths are presented

Figure 2F **Structural equation model results – Romania**



Note: Standardised regression coefficients. Only significant paths are presented

6. DISCUSSION

Teachers' job satisfaction and occupational well-being strongly affect both their teaching effectiveness and their decision to stay in the profession. High job satisfaction is linked to greater retention, while dissatisfaction often signals an increased risk of attrition (Skaalvik & Skaalvik, 2011). One of the well-documented factors affecting teacher job satisfaction, and in turn teacher outcomes, is school climate. Still, identifying the specific aspects of school climate that most impact teacher job satisfaction and occupational well-being is crucial, as it could inform some targeted educational policies that better meet teachers' needs.

To that end, this study examined the role of school climate and school socioeconomic status in predicting teacher job satisfaction and occupational stress, and the mediating effect of teacher occupational stress in the relation between school climate and job satisfaction, using international data from TALIS 2018 for selected Central and Eastern European countries (Bulgaria, Croatia, Estonia, Hungary, Lithuania, Romania). The results of structural equation modelling, preceded by the alignment procedure, yielded several important findings.

6.1 The role of school climate in predicting teacher job satisfaction and occupational well-being (H1)

Our analyses showed that school climate affects both the work satisfaction and occupational well-being of teachers, which is in line with previous research (Aldridge & Fraser, 2016; Ghavifekr & Pillai, 2016). Notably, in our research, teachers' perception of stakeholders' involvement in school decision-making, which is associated with distributed leadership, showed the strongest positive association with teacher job satisfaction consistently in all six countries. It was also significantly associated with higher teacher occupational well-being in all countries. In parallel with our conclusions, Liu and Watson (2020) found a positive association between teachers' perception of their involvement in decision-making and their job satisfaction. Considering these results, the involvement of stakeholders in decision-making seems to be a potentially impactful area of teacher job satisfaction-oriented policies. Moreover, thanks to its particular emphasis on promoting teamwork in the work environment, distributed leadership also plays a role in supporting teacher innovativeness. Collective teacher innovativeness was found to be a weak but significant contributor to teacher job satisfaction in our study, echoing the results of Buyukgoze, Caliskan, and Gümüş (2022), who also found job satisfaction to be a mediating variable between distributed leadership and collective teacher innovativeness.

We found that teacher-student relationships also reliably predicted teacher job satisfaction but not teacher occupational well-being and stress, whereas school disciplinary climate (similarly to stakeholder engagement) was a consistent driver of both workplace well-being and stress. This means that good teacher-student relationships raised job satisfaction without affecting stress, whereas student misbehaviour reduced satisfaction and heightened stress. Supporting our findings, Nalipay's (2023) research on Asian teachers reached the same conclusions, suggesting that rapport with students and disciplinary problems show similar patterns of influencing teacher job satisfaction irrespectively of educational system and cultural background.

Our findings corroborate existing literature (Veldman et al., 2013; Lopes & Oliveira, 2020; Liu et al., 2023), indicating that initiatives aimed at improving teacher job satisfaction should focus on the classroom, particularly on improving teacher-student relationships and mitigating teacher occupational stress, which in our study turned out to be associated mainly with students' misbehaviour. Offering support to teachers in aspects such as classroom instruction and management may enhance their self-efficacy and job satisfaction.

6.2 The mediating role of occupational stress in the relationship between school climate and job satisfaction (H2)

This study confirmed a statistically significant, yet marginal, mediating role of teacher occupational stress in the relationships between each of the three school climate elements— (1) stakeholders' involvement in decision-making, (2) collective team innovativeness, (3) disciplinary climate—and teacher job satisfaction. For stakeholders' involvement in decision-making and collective team innovativeness, the indirect effect through occupational stress and well-being accounted for only a small proportion of the total effect on teacher job satisfaction. Notably, in the case of disciplinary climate, half of its negative effect on job satisfaction was mediated through occupational stress.

Disciplinary climate also had a direct negative effect on teacher occupational well-being in all six countries. This means that teachers who experience disciplinary problems with their students have lower job satisfaction, and to a large extent this is so because behavioural problems elevate teachers' occupational stress levels, lowering their job satisfaction.

Thus, in order to tackle the detrimental effect of student misbehaviour on teacher occupational satisfaction, educational policies should focus not only on measures designed to improve students' behaviour, but also on equipping teachers with tools to weaken the association between student misbehaviour and increased occupational stress, such as training in effective classroom management or programmes fostering positive student-teacher relationships. Stakeholder involvement plays a notable role, demonstrating a small but significant indirect effect on job satisfaction via stress reduction,

which is consistent with distributed leadership theory. Collaborative decision-making fosters teacher autonomy and shared responsibility, which lowers stress levels (Bellibaş et al., 2023; Liu et al., 2023). While the total effect of stakeholders' involvement in decision-making on job satisfaction exceeds its mediated effect through occupational stress—accounting for 15–16% of the total effect across countries—its stress-mitigating role remains significant but context-dependent.

6.3 School socioeconomic context and school climate, teacher job satisfaction and occupational well-being (H3)

There was no significant association between school socioeconomic status (SES) and teacher occupational well-being. However, job satisfaction showed a weak but consistent association with school SES across all six countries. This aligns with prior studies by Johnson et al. (2012), who found that teacher job satisfaction and the likelihood of transferring schools are more strongly influenced by workplace factors—such as collegial support, school leadership, and school culture—than by the composition of the student body. Similarly, Grissom (2011) emphasized the role of principal efficacy in shaping teacher job satisfaction, irrespective of individual or broader school characteristics.

Moreover, the negative relation between school SES and teacher job satisfaction was not mediated by almost any of the school climate elements (the only exception was the finding that fewer disciplinary issues occurred in high SES schools compared to medium SES schools). This suggests that school socioeconomic context did not influence school climate in a way that would either enhance or diminish teacher job satisfaction. When interpreting the results, it is important to highlight the limitations of our SES measure. The SES variable was recoded into three categories, which facilitated analysis and interpretation, but also introduced simplifications. Furthermore, SES data were derived from principals' responses to the TALIS questionnaire. This approach may have oversimplified the complexities and nuances of socioeconomic diversity.

Still, in every country the detrimental effect of school low socioeconomic status on teacher job satisfaction was bigger than the favourable effect of school high socioeconomic status, suggesting that the elements of school climate included in this study can increase teacher job satisfaction only to a certain level. Beyond a certain threshold, additional advantages from a positive disciplinary climate, good teacher–student relationships, and a participative decision-making leadership style may not lead to substantial gains in job satisfaction since teachers' needs and expectations may already be met to a sufficient degree in medium SES environments. What is more, other factors not accounted for in our model, such as workload, the personal predispositions of teachers, or other elements of school climate, may be more substantial in shaping the school environment and raising teacher job satisfaction and occupational well-being. This implies that initiatives designed to enhance teacher job satisfaction should address the unique challenges encountered in low and high SES schools.

6.4 Patterns of interaction between the study variables: differences between the researched countries (H4)

Some factors influencing teacher job satisfaction in this study showed similar results across the six countries examined. How well students behave and the quality of teacher–student interactions had similar effects on teacher job satisfaction in all contexts. Also, school socioeconomic composition consistently showed a statistically significant but marginal impact on teacher job satisfaction across the region. However, the impact of stakeholders' participation in school decisions varied across countries. Its impact on teacher job satisfaction varied from small in Romania to medium in Bulgaria, Estonia, Hungary, and Lithuania, to large in Croatia. The findings highlight that country-level variations are likely to be shaped by cultural and institutional factors. This finding aligns with the results of Eryilmaz and Sandoval-Hernandez (2023), who compared the latent means of distributed leadership based on TALIS 2018 data from principals using the alignment optimisation approach. They found substantial differences in leadership styles across education systems that were attributed to cultural and contextual factors shaping how distributed leadership is perceived and implemented across countries. Due to traditional authority models, principals in countries with low scores on teacher-perceived distributed leadership may be required to assume accountability for decision-making, blocking teachers from being involved in school decisions. Variability in the between-school variations of the scales used (Annex C) also suggests more localized differences.

7. CONCLUSIONS

Our findings align with the theoretical perspectives commonly used in organisational behaviour research, such as exchange theory and self-determination theory, showing that relational and participatory aspects of school life outweigh broader contextual disadvantages (i.e., school socioeconomic status) in shaping teacher experiences. Specifically, stakeholder involvement in decision-making (distributed leadership) was most strongly associated with higher job satisfaction and occupational well-being. Positive teacher–student relationships were associated with greater satisfaction, whereas a more challenging disciplinary climate was linked with elevated stress levels that partly mediated its adverse association with satisfaction. Although school socioeconomic status showed a small direct association with job satisfaction, it was not linked to lower stress or a more positive climate, underscoring the primacy of organisational and interpersonal factors over socioeconomic background.

Our study is observational and we cannot make causal claims. However, from a policy and practice standpoint some organisational and relational conditions seem to support teacher well-being. More specifically, fostering distributed leadership practices to increase teacher agency in school governance can reinforce a sense of autonomy and organisational commitment (Leithwood et al., 2019). Strengthening teacher competence in building good teacher–student relationships may further enhance job satisfaction, while targeted efforts to improve the disciplinary climate through, e.g., consistent, fair, and supportive behaviour policies, can help mitigate teacher stress. These strategies can be applied across diverse school contexts, highlighting the need for systemic attention to cultivating inclusive, collaborative, and psychologically safe school environments, beyond socioeconomic considerations.

8. LIMITATIONS

This study has several important limitations that need to be acknowledged. First, as a secondary analysis, it relied on predefined constructs and measures, which, despite their widespread use and careful translation verification and psychometric testing, may not capture the full nuance of teachers’ experiences. Second, the single-level model does not account for the hierarchical nature of the TALIS two-stage sampling design (schools and teachers). This was a deliberate methodological choice that prioritized measurement invariance over model complexity. However, future research could explore more sophisticated, multilevel approaches. Third, the SES variable was based on principals’ self-reported data recoded into three broad categories, which may have introduced subjective biases and oversimplified the socioeconomic diversity. Finally, the cross-sectional design precludes ruling out unobserved confounders.

The temporal limitations are also important. The dataset predates the COVID-19 pandemic, which substantially affected educational systems and teachers in particular. More recent data—such as the ongoing TALIS 2024 collection—could provide more insights into how global disruptions have reshaped teacher job satisfaction and school climate. Future research could profitably expand on several fronts: exploring the cultural and institutional factors underlying cross-national differences, developing longitudinal analyses to track the evolution of teacher job satisfaction, or possibly testing specific mechanisms in randomised experiments. Additionally, employing mixed-method approaches that integrate quantitative findings with qualitative insights to teacher experiences could further inform this strand of research. Such comprehensive investigations would offer a more holistic understanding of the complex dynamics that influence teacher job satisfaction and occupational well-being.

SUPPLEMENTARY MATERIAL

Supplementary data for this article can be found online at

[HTTPS://IBE.EDU.PL/IMAGES/EDUKACJA/NUMERY/2023_04/7_EDU_4_23_KUTYLOWSKA_FINAL_DOPUBLIKACJI_BG%20ANEKS.PDF](https://ibe.edu.pl/images/edukacja/numery/2023_04/7_edu_4_23_kutylovska_final_dopublikacji_bg%20ANEKS.PDF)

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