REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
JOURNAL OF ELEMENTARY EDUCATION

ISSN 2350-4803 (SPLET/ONLINE)
ISSN 1855-4431 (TISK/PRINT)

The Journal of Elementary Education is published with the support of the Slovenian Research and Innovation Agency
Revija za elementarno izobraževanje izhaja s podporo Javne agencije za znanstvenoraziskovalno in inovacijsko dejavnost Republike Slovenije

Revija za elementarno izobraževanje

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Journal of Elementary Education

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Journal of Elementary Education, Editorial Board of Journal of Elementary Education
Koroška cesta 160, SI-2000 Maribor, Slovenija , e-pošta: rei.pef@um.si, http://rei.um.si

PUBLISHED BY

University of Maribor Press
Slomškov trg 15, 2000 Maribor, Slovenia
e-mail: zalozba@um.si, http://press.um.si/, http://journals.um.si/

Articles appearing in this journal are abstracted and indexed in: SCOPUS (Elsevier Bibliografhic Databases), DOAJ, ERIH PLUS**,** EBSCO (EBSCOhostweb), Ulrich`s Periodicals Directory, IBZ (Internationale Bibliographie der Zeitschriftenliteratur), Proquest, dLib.si, DKUM, COBISS (Co-operative Online Bibliographic System and Services).

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Revija za elementarno izobraževanje
Journal of Elementary Education

Volume 19 **Number 1** **March 2026**

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REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
JOURNAL OF ELEMENTARY EDUCATION
Vol. 19, No. 1, pp. 1–17, March 2026

PARENTAL MOTIVATIONAL BELIEFS, SCHOOL INVOLVEMENT, AND PERCEPTIONS OF ADOLESCENT ACADEMIC SELF-EFFICACY

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Potrjeno/Accepted
15. 10. 2025

Objavljeno/Published
18. 3. 2026

Abstract/Izvleček

Grounded in the revised Hoover-Dempsey and Sandler model of parental involvement, this study examined motivational beliefs of parents regarding their school involvement, specific forms of involvement, and how these relate to parents' perceptions of their child's academic self-efficacy. Using a quantitative survey design, data were collected from a sample of 331 Slovenian parents of adolescents aged 12 to 15 years. Parents reported high levels of general invitation to participate in school, high levels of beliefs about their active role in their child's education, and generally positive attitudes toward school. These motivating beliefs were consistently and positively associated only with their direct involvement at the school level. Both forms of involvement (school and home activities) were negatively related to adolescents' academic self-efficacy.

Keywords:
parental involvement, academic self-efficacy, motivational beliefs, parents, adolescents.

Starševska motivacijska prepričanja o vključevanju v izobraževanje, oblike vključevanja in učna samoučinkovitost mladostnikov

Na podlagi revidiranega Hoover-Dempsey in Sandlerjevega modela starševske vključenosti smo v raziskavi preučevali motivacijska prepričanja staršev glede njihove vključenosti v šolo, specifične oblike vključenosti ter njihovo povezanost z zaznavo učne samoučinkovitosti otrok s strani staršev. Podatke smo zbrali z anketnim vprašalnikom na vzorcu 331 slovenskih staršev mladostnikov, starih od 12 do 15 let. Starši so poročali o visoki stopnji zaznanih povabil s strani šole, močnih prepričanjih o svoji vlogi pri izobraževanju, pozitivni vrednosti šole ter zaupanju v lastno znanje in sposobnosti za vključevanje. Ta motivacijska prepričanja so bila enotno in pozitivno povezana le s starševskim vključevanjem v šoli. Obe obliki vključevanja (v šoli in doma) sta bili negativno povezani s starševsko zaznavo učne samoučinkovitosti mladostnikov.

Ključne besede:
starševsko vključevanje, učna samoučinkovitost, motivacijska prepričanja, starši, mladostniki.

UDK/UDC
37.015.3-055.52

DOI https://doi.org/10.18690/rei.5131

Introduction

The education of children is often perceived as the sole responsibility of schools and teaching staff. Communication between parents and schools is often limited to solving problems that children have (Jurčević Lozančić et al., 2019). However, parents can play an important role in the education of their children. It is very important that they be involved in education from an early age and persist in it, especially for adolescents (DePlanty et al., 2007).

Through their involvement, parents influence their children's academic performance in both primary and secondary school and in the longer term. By instilling positive values in children, they can create a positive attitude towards school and learning, influencing children's sense of self-efficacy and the development of knowledge and skills (Fan and Chen, 2001; Rong, 2024). In a meta-analysis of studies examining the associations between parental forms of involvement and academic success between 2003 and 2017, the authors Boonk et al. (2018) found that parental motivational beliefs, such as parental high expectations regarding the child's education, communication between parents and children regarding school and obligations, and parental support and encouragement regarding learning were consistently and positively associated with academic achievement. In contrast, many behavioural forms of parental involvement, such as help with and control of homework or some forms of school-based involvement (e.g., attendance at teacher meetings, volunteering) showed no effect or even negative effects (Boonk et al., 2018).

The forms of parental involvement and their effectiveness also change with the child's age. During the transition to adolescence, children desire more freedom and independence, and parents adjust their level of control and involvement accordingly. While direct parental control over schoolwork typically decreases as adolescents strive for greater autonomy, home-based support (e.g., encouragement, academic expectations, supervision) and school-based involvement (e.g., communication with teachers) remain important factors in academic success (Benner et al., 2016). It is important to note that strategies for parental involvement in education need to be age-appropriate to be effective and to foster academic achievement (Green et al., 2007). Evidence from a sample of Chinese adolescents further suggests that the effectiveness of parental involvement depends on the specific approach employed, with autonomy-supportive practices proving more beneficial than high levels of involvement or control (Li et al., 2020).

While the effects of parental involvement on children's education have been extensively researched, less attention has been paid to the underlying motivations for parental engagement (Walker et al., 2005). In this study, we therefore investigated the motivational beliefs of parents that drive parental involvement. In this way, we could identify ways in which collaboration between parents and schools can be strengthened to optimise educational outcomes for children.

Theoretical Background

The Hoover-Dempsey and Sandler Model of Parental Involvement in Education

Hoover-Dempsey and Sandler's model (Hoover-Dempsey and Sandler, 1995, 1997) provides a theoretical model for understanding the psychological basis of parental involvement in childrearing. It focuses on the causes, forms and effects of such involvement on academic achievement. The model consists of five levels, which are organised in a linear fashion. It begins with the psychological factors that influence parents' decision to become involved and progresses through the subsequent levels. *The first level* describes four key psychological factors that influence parents' decision to become involved in their child's education: parental role construction (i.e., parents' beliefs about their role in their child's education), parents' sense of self-efficacy in assisting their child, the perceived school invitations for involvement, and the child's perceived invitations for involvement. *The second level* occurs when parents decide to become involved and choose strategies for involvement according to their skills and knowledge, their available time and energy, and specific invitations from the child and the school. For example, work commitments or caring responsibilities may determine the extent of their involvement. *The third level* describes the influence mechanism of parental involvement. Parents can act as role models, reinforcers of desired behaviour or transmitters of instructions. *The fourth level* of the model examines the appropriateness of parental involvement strategies in relation to the child's developmental needs and the school's expectation of involvement. For example, younger children tend to benefit from more intensive involvement, while older children value autonomy but still benefit from tailored support. *The fifth level* of the model encompasses the cumulative effects of parental involvement that are reflected in student outcomes, including knowledge, skills, and academic self-efficacy. Hoover-Dempsey and Sandler (1997) emphasise that several factors can influence parental involvement simultaneously, and to varying degrees.

Expansion of the Hoover-Dempsey and Sandler Model (Walker et al., 2005)

Hoover-Dempsey and Sandler's (1995, 1997) original model was primarily intended to explain the process of parental involvement, but not so much in terms of recommending how educational institutions and parents should act (Walker et al., 2005). Later, Walker et al. (2005) revised and adapted the model to improve its applicability in real-life contexts.

Walker et al. (2005) merged Levels 1 and 2 of the original model into a single level (Level 1 in the revised model), which incorporates three key constructs: parental motivational beliefs, perceived invitations for involvement, and perceived life context (see Figure 1).

Parental motivational beliefs encompass parents' perceptions of their role in their child's education and their self-efficacy for involvement. Role beliefs shape parents' sense of obligation and expectations for engagement, influenced by cultural norms and community values. These beliefs evolve as children develop, reflecting their achievements and changing developmental stages (Eccles and Harold, 1993; Hoover-Dempsey and Sandler, 1997). Self-efficacy, as defined by Bandura (1997), refers to parents' confidence in their ability to positively influence their child's education. Parents with a strong sense of self-efficacy are more likely to persist in involvement, influencing children's academic control and achievement goals (Bubić and Tošić, 2016; Bubić et al., 2021).

Perceived invitations for involvement refer to parents' understanding of their welcome by schools, teachers, and their child. These perceptions significantly influence parents' decisions to engage in their child's education (Walker et al., 2005). Schools can foster these perceptions through inclusive policies, open communication, and invitations to participate in activities (Balli et al., 1998; Griffith, 1998). Teachers play a critical role by encouraging collaboration, maintaining open lines of communication, and exhibiting positive attitudes toward parental involvement (Chliara et al., 2024; Westergård, 2013). Children also motivate engagement through direct or indirect requests for support, such as seeking help with homework (Pomerantz and Eaton, 2001).

Perceived life context refers to parents' self-assessment of their available time, energy, knowledge, and skills. These factors influence both their willingness and ability to participate (Walker et al., 2005). For example, parents with demanding jobs or caregiving responsibilities may find it difficult to engage in school-related activities. Additionally, parents' confidence in their abilities affects the strategies they employ to support their child's education. Cultural context is also crucial, as schools must

respect and adapt to diverse family backgrounds, including language barriers and differing cultural values (Deslandes, 2019; Garcia Coll et al., 2002).

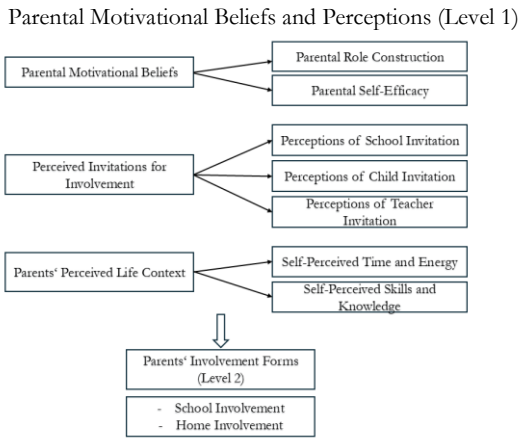
The above-mentioned constructs represent the psychological and contextual factors that influence parental involvement and contribute to two forms of parental involvement in children's education: school involvement and home involvement (Level 2 in the revised model; Walker et al., 2005; see Figure 1).

Parental school involvement typically involves formal activities outlined in school policies, such as parent-teacher meetings and consultation hours. Other forms of involvement include participation in extracurricular activities, excursions, and written or phone communication between parents and schools.

Milosavljević Đukić et al. (2022) examined parental involvement among 198 parents in Serbia. They found that 93% recognized parent-teacher meetings as a form of collaboration, but only 34% viewed lectures for parents similarly. Even fewer parents identified one-on-one meetings at their initiative, discussions with school counsellors, or scheduled individual interviews as forms of collaboration. Additionally, only about 20% of parents expressed willingness to engage with school psychologists, and only 12% showed interest in participating in the Parents' Council.

Parental home involvement includes interactions between parents and children related to school activities that occur outside the school environment (Walker et al., 2005). They include parents' interest in their child's school responsibilities, attitudes toward education, assistance with homework and learning, and monitoring academic progress (Green et al, 2007; Sivabalan et al., 2024). Parental involvement at home has a significant positive impact on children's academic performance. Key activities include talking about school responsibilities (Epstein and Sheldon, 2002) and helping children to organise their tasks (Van Voorhis, 2003). These conversations can reduce problematic behaviours in the child (Epstein and Sheldon, 2002). DePlanty et al. (2007) found that one of the most important contributions parents can make is to ensure that their children complete their homework. Similarly, Perriel (2015) emphasises that most parents see support, encouragement and help with homework as the core of their involvement. On the other hand, Fan and Chen (2001) found a weak correlation between parental control and academic achievement, suggesting that struggling students may need more parental control than their higher-achieving peers.

Figure 1
Walker et al.'s Revised Hoover-Dempsey and Sandler's Model



Note. Levels 1 and 2 of the original model are subsumed under Level 1 in the revised model, representing the psychological factors, underlying parental involvement behaviours (Walker et al., 2005, p. 88).

Study Aims

This study examines motivational beliefs of parents regarding their educational role, perceived knowledge and skills and perceived invitations to involvement (Level 1), and two forms of parental involvement (Level 2) as described in the revised Hoover-Dempsey and Sandler model of parental involvement (Walker et al., 2005). The study focuses on Slovenian parents with adolescent school-aged children. We formulated the following research questions:

RQ1: How are the characteristics of parental involvement related to children's academic self-efficacy as perceived by parents?

RQ2: What is the relationship between parental involvement, parents' level of education, and the age of their children?

Method

Participants

The sample consisted of 331 parents of adolescent children who attended the 6th, 7th, 8th or 9th grade of a Slovenian compulsory school. In Slovenia, compulsory

basic education lasts nine years and typically includes children aged 6 to 15. The 6th to 9th grades are usually attended by adolescents aged 11 to 15. The 6th grade is part of the second cycle, while the 7th to 9th grades represent the third cycle of basic education. These grades form the subject-based stage (*predmetna stopnja*), where individual subjects are taught by different subject-specific teachers. Of the participants, 298 (90%) were mothers and 33 (10%) were fathers. The average age of the participants was 43.9 years (SD = 4.7, *min.* = 31, *max.* = 62). A total of 87 parents (26.3%) had completed primary or secondary education, 208 parents (62.8%) had completed post-secondary or university education, and 36 parents (10.9%) held a master's or doctoral degree. The sample of children for whom parents completed the questionnaire comprised 331 children, including 149 (45%) girls and 182 (55%) boys. Among these, 88 children (26.6%) were in the 6th grade, 78 children (23.6%) were in the 7th grade, 77 children (23.2%) were in the 8th grade, and 88 children (26.6%) were in the 9th grade.

Instruments

Demographic Data

Participants answered a question regarding their relationship to the child for whom they were completing the questionnaire (mother or father), recorded their age, and indicated their level of education, the child's gender, and the grade the child was attending in the school. Additionally, parents rated, on a scale from 1 to 6, the extent to which they believed their child was capable of learning the study material independently (from 1 = not capable at all to 6 = fully capable).

Parental Involvement in Children's Education (Walker et al., 2005)

The following domains of beliefs that contribute to parents' decision to be involved in their child's education were included in the study: 1) Role Activity Beliefs (10 items; beliefs about responsibility for the child's education), Valence Toward School (6 items; parents' personal experiences and feelings about school), Parents' Perceptions of General Invitations for Involvement from the School (6 items; extent to which invitations or activities from the school make parents feel welcome and useful to support student learning) and Parents' Perceived Life Context – Knowledge and Skills (9 items; parents' beliefs about the skills and knowledge for involvement). In addition, Parents' Involvement in Home-Based Activities (5 items; involvement in the child's school-related activities at home) was included. All items

were translated with the help of two English teachers using the back-translation method. Parents responded to the statements in the domains of Role Activity Beliefs, Parents' Perceptions of General Invitations for Involvement from the School, and Parents' Perceived Life Context – Knowledge and Skills on a 6-point Likert scale (from 1 = disagree very strongly to 6 = agree very strongly). The Valence Toward School domain was assessed using a 6-point rating scale between two polar descriptors (e.g. 'disliked-liked'). The statements in the Parents' Involvement in Home-Based Activities domain were rated on a 6-point scale (from 1 = never to 6 = always).

Forms of Parental Involvement at the School Level (Milosavljević Đukić et al., 2022).

The domains of parental involvement in school-based activities as defined in the Serbian study were considered more contextually appropriate for the Slovenian school context than the domains proposed by Walker et al. (2005). The latter included activities related to parental involvement at school level, which are less common in Slovenia (e.g., voluntary parental participation in school trips). In contrast, the Serbian authors included activities more in line with Slovenian cultural and pedagogical practises (e.g., parental attendance at parent-teacher meetings, consultation hours and communication with the school counsellor). Nine forms of involvement in school-based activities (e.g. 'lectures for parents') were converted into statements (e.g. 'I attend lectures for parents at school'). Parents rated the extent of their participation in each form of involvement using a 6-point scale (1 = never to 6 = always).

Procedure

Data collection took place between January and April 2024. The request to complete the questionnaire was sent to compulsory schools across Slovenia, from which we obtained approximately half the study sample. In the request, school secretariats were asked to forward the link to the online questionnaire to homeroom teachers of 6th to 9th grade classes, who were then asked to share the link with the parents of children in their class. The remaining half of the sample was obtained using the snowball sampling method. Specifically, the request to complete the questionnaire was posted in various groups on the social networking platform Facebook. Users were invited to complete the survey if they belonged to the target population and to share it with acquaintances who met the inclusion criteria (parents of children in grades 6 to 9 of compulsory school).

Results

Descriptive statistics of the factors influencing parental involvement and the forms of parental involvement are presented in Table 1. As can be seen, the data of all measured variables follow a normal distribution, as indicated by the skewness and kurtosis coefficients which fall within the range of -1 to 1. Table 1 also shows that all measured variables exhibit satisfactory to good internal consistency, with Cronbach's alpha values ranging from 0.71 to 0.91 (Tavakol and Dennick, 2011).
On average, parents most strongly perceived positive invitations for involvement from school. They also expressed a strong belief in the importance of their role in their children's education, confidence in their knowledge and skills, and generally positive attitudes toward the school. Parents generally perceived their frequency of involvement in home-based activities and school-based activities as occasional to frequent. Additionally, on a scale from 1 to 6, parents rated their children's academic self-efficacy highly on average.

Table 1
Descriptive Statistics of the Measured Variables

	M	*SD*	Skewness	Kurtosis	α
Role Activity Beliefs	4.15	.65	-.19	.27	.71
Valence Toward School	4.46	1.12	-.78	.06	.91
Invitations for Involvement from the School*	4.66	.85	-.75	.44	.83
Knowledge and Skills**	4.29	.77	-.38	.38	.73
Parents' Involvement in Home-Based Activities	3.60	1.00	.38	-.61	.79
Parents' Involvement in School-Based Activities	3.39	.85	.16	-.12	.71
Child's Academic Self-Efficacy***	4.85	1.20	-.83	-.19	/

Note. Scores for the parental involvement beliefs and activities were calculated as an average score per item (possible range was 1-6), child's academic self-efficacy (one item) was rated on a scale 1 to 6; * Parents' Perceptions of General Invitations for Involvement from the School; ** Parents' Perceived Life Context – Knowledge and Skills; *** as perceived by parents.

Next, we examined the relationships between motivational factors influencing parental involvement, the two forms of parental involvement, and children's academic self-efficacy as perceived by their parents (see Table 2). The associations between motivational factors and forms of parental involvement were low to moderate. The strongest positive correlations were found between parents' perception of invitations from the school and their perceived knowledge and skills,

as well as between parental beliefs about their responsibility for their child's education and their perceived knowledge and skills. This suggests that parents who feel more welcomed by the school and who perceive a greater responsibility for their child's education also have greater confidence in their knowledge and skills to participate. Positive role activity beliefs were related to more frequent home-based involvement, while positive role activity beliefs, positive valence toward school, perceived invitations for involvement from school, and perceived knowledge and skills were related to more frequent school-based involvement. The correlations were low to moderate.

Furthermore, parents who more strongly believe that they are invited to be involved by the school and that they possess the necessary skills and knowledge for involvement rated their child's academic self-efficacy more highly. However, parental involvement in both home-based and school-based activities was negatively associated with the perceived academic self-efficacy of the child.

Table 2

Correlations Among Parental Involvement Beliefs and Activities and Child's Academic Self-Efficacy as Perceived by the Parent

	1	2	3	4	5	6
1 Role Activity Beliefs	1.00					
2 Valence Toward School	.09	1.00				
3 Invitations for Involvement from the School*	.32**	.17**	1.00			
4 Knowledge and Skills**	.40**	.21**	.41**	1.00		
5 Parents' Involvement in Home-Based Activities	.34**	.09	-.13*	.10	1.00	
6 Parents' Involvement in School-Based Activities	.37**	.16**	.14**	.22**	.31**	1.00
7 Child's Academic Self-Efficacy***	-.00	.06	.16**	.19**	-.43**	-.18**

Note. * Parents' Perceptions of General Invitations for Involvement from the School; ** Parents' Perceived Life Context – Knowledge and Skills; *** as perceived by parents.

Next, we examined whether parents with lower or higher levels of education are more frequently involved in their children's education. Parents were divided into two groups based on their educational attainment: those who had completed general secondary education or lower were classified as less educated, while those with at least a post-secondary education were classified as more educated. The results indicate a statistically significant difference between the two groups (less and more educated parents) in the frequency of home-based involvement ($t(329) = 2.01$, $p <$

.05, 95% CI [.00; .50], d = .25). More educated parents (M = 3.53, SD = 1.00) were less involved in home-based activities compared to less educated parents (M = 3.79, SD = .99). In contrast, more educated parents (M = 3.45, SD = .85) participated in school-based activities more frequently than less educated parents (M = 3.24, SD = .84), (t(329) = 1.97, p = .05, 95% CI [-.42; .00], d = .25).

Finally, we examined differences between parents of younger adolescent children (sixth and seventh grades) and parents of older adolescent children (eighth and ninth grades) in terms of the two forms of parental involvement. The results indicate a statistically significant difference between the two groups in the frequency of home-based involvement (t(323,368) = 4.26, p < 0.001, 95% CI [.25; .67], d = 0.47). Home-based involvement was more common among parents of younger adolescent children (M = 3.83, SD = 1.04) compared to parents of older adolescent children (M = 3.37, SD = .91). The two age groups did not differ in parental school-based involvement (t(329) = .26).

Discussion

Parental involvement in their children's education has long been recognised as an important factor in academic achievement and positive developmental outcomes (DePlanty et al., 2007; Izzo et al., 1999). While school is the formal institution for learning, the role of the family - particularly parental involvement - continues to be important in shaping children's educational pathways. This is particularly true in early adolescence, a developmental period characterised by increasing autonomy, greater academic demands and the need for less directive forms of parental involvement (Eccles and Harold, 1993; Li et al., 2020; Spera, 2006). In this context, it is particularly important to understand the motivational and contextual factors that influence parental involvement and how these relate to adolescents' academic self-efficacy.

The present study aimed to investigate how Slovenian parents perceive the key motivational factors for involvement in their children's education as conceptualised by Walker et al. (2005) in their revision of the Hoover-Dempsey and Sandler model. We also examined how these factors relate to two different forms of parental involvement - at home and at school - and to children's academic self-efficacy. In addition, we analysed differences in parental involvement as a function of parents' educational level and the age of their children.

One of the key findings of the study is that parents generally reported strong motivational beliefs regarding their involvement in their adolescent child's education. They perceived positive invitations from schools to participate, believed that their role in their child's education was important, and expressed confidence in their own knowledge and skills to engage effectively. These findings suggest that parents not only feel welcomed by schools but also perceive themselves as competent and responsible partners in the educational process. Such perceptions are crucial, as parental motivational beliefs - particularly role construction and self-efficacy - have been identified as important predictors of actual parental involvement (Bubić and Tošić, 2016; Hoover-Dempsey and Sandler, 1997; Walker et al., 2005).

In the present study, all four domains of motivational beliefs - beliefs about role activity, positive valence towards school, perceived knowledge and skills, and perceived invitations from school - were significantly positively associated with parental involvement in school. This suggests that parents who feel more responsible for their adolescent child's education, perceive stronger invitations from the school and have more confidence in their ability to contribute are more likely to be directly involved with the school during their child's adolescent years (e.g., by attending parent-teacher meetings or consultation hours). Interestingly, while a significant difference was found between the groups of parents of younger and older adolescent children in terms of parental involvement at home, no such difference was found for parental involvement at school. Specifically, parents of younger (6th and 7th grade) and older adolescents (8th and 9th grade) reported similar levels of engagement at school, such as attending parent-teacher meetings or communicating with school staff. This result suggests that parental involvement at school remains stable in early adolescence, in contrast to parental involvement at home, which is less pronounced in older groups of adolescents than in younger ones. One possible explanation for this is that direct contact with school is more structured and scheduled and is often encouraged by the school, which could promote relatively constant parental involvement regardless of the child's age.

Of all the motivational factors analysed, only parents' beliefs about their responsibility for their child's education (role activity beliefs) were significantly and positively related to home involvement in the child's learning. This is consistent with the findings that children increasingly seek autonomy in adolescence (aged 12–15 years), which often leads to a decrease in direct parental involvement in academic tasks (Cheung and Pomerantz, 2015; Eccles and Harold, 1993). Consistent with this, our study also found that parents of younger adolescents were more involved in

school-related activities at home compared to parents of older adolescents. As adolescents strive for greater independence in managing their school-related tasks, parental involvement needs to adapt - moving away from direct supervision to a more supportive and autonomy-enhancing role (Li et al., 2020).

Parents who were more confident in their knowledge and skills and felt more welcomed by schools also rated their children's academic self-efficacy more positively. This finding is consistent with the perspective that parents' attitudes and involvement are internalised by children and contribute to the development of their academic self-efficacy (Bandura, 1997; Bubić et al., 2021; Fan and Chen, 2001). When parents perceive themselves as competent partners in education and feel that their involvement is valued by the school, they are more likely to convey positive messages about learning, consistently offer encouragement, and provide appropriate academic support. Such behaviours can support a constructive learning environment and a sense of self-efficacy in their children.

However, the directionality of this relationship justifies a cautious interpretation. It is possible that parents perceive their children as more academically self-efficacious because they observe them overcoming academic challenges on their own, which in turn boosts parents' confidence in their own ability to support learning. In this sense, the relationship could be bidirectional, with children's achievements and autonomy reinforcing parents' perceptions of their own effectiveness and role adequacy.

Interestingly, the study also found a negative correlation between parental involvement at home and at school and children's academic self-efficacy as perceived by parents. While this may seem counterintuitive, it is consistent with previous findings suggesting that higher parental involvement is sometimes reactive rather than proactive: i.e. parents become more engaged and contact schools when their children are struggling academically (Balli et al., 1998; Fan and Williams, 2010; Grolnick et al., 2002). In such cases, increased involvement may reflect underlying parental concerns rather than an intentional strategy to promote self-efficacy.

Another notable finding is that parents with higher levels of education reported greater involvement in school but less involvement in home activities related to the child's education. This could be because parents conceptualise their role differently depending on their level of education. Parents with a high level of education may be more likely to participate in institutional forms of involvement - such as attending parent-teacher meetings or being involved in school governance - and rely on their children to complete school tasks independently at home. In contrast, parents with lower levels of education may place more emphasis on home involvement, such as

helping with homework or monitoring study habits. These differences are consistent with research findings that show that socioeconomic and educational background influence the forms and frequency of parental involvement (Green et al., 2007; Hoover-Dempsey and Sandler, 1997; Williams-Johnson and Gonzalez DeHass, 2022).

Limitations and Implications

This study has several limitations that should be considered when interpreting the results. First, all data were collected using parental self-reporting, which may lead to social desirability bias or inaccuracies in the assessment of children's actual self-efficacy. Including the views of the adolescent children themselves would lead to a more comprehensive understanding in future studies. Second, the sample composition represents a limitation, as most participants were mothers (90%), which may restrict the generalizability of the findings. The perspectives of fathers or other caregivers may differ and are underrepresented in this study. Finally, the cross-sectional design limits causal interpretations of the relationships between variables. Longitudinal studies would allow for a better understanding of how parental involvement develops over time and influences students' academic performance.

Despite some limitations, the results have several practical implications. Schools should continue to actively promote parental involvement by emphasising the importance of their participation for better student learning and academic well-being. All four motivational domains were positively associated with parental involvement in school activities, highlighting the importance of direct collaboration with the school as a channel through which motivated parents can remain active even as their children strive for greater independence at home. Parental participation in parent-teacher meetings and other forms of co-operation with the school can therefore be an appropriate way for parents to stay informed about and connected to their adolescent children's education. Schools play a crucial role in maintaining parental engagement by continuing to offer engaging activities and creating a welcoming environment for all parents. In addition, parent training sessions organised by the school could help parents to adapt their involvement to the developmental needs of adolescents by encouraging them to engage in a way that support their autonomy rather than control them.

Funding

This work was financially supported by Javna agencija za znanstvenoraziskovalno in inovacijsko dejavnost Republike Slovenije (Slovenian Research and Innovation Agency) within the research program Applied Developmental Psychology (research core funding No. P5-0062).

Data Availability Statement

The article is based on data fully presented and discussed within the article itself; therefore, no additional data archiving is required.

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REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
JOURNAL OF ELEMENTARY EDUCATION
Vol. 19, No. 1, pp. 19–31, March 2026

TEMPERAMENTAL CORRELATES AND PREDICTORS OF TODDLER ADAPTATION TO NURSERY

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Potrjeno/Accepted
19. 10. 2025

Objavljeno/Published
18. 3. 2026

Abstract/Izvleček

This study aimed to analyse the relationship between children's adaptation to nursery and children's temperament. The results show a statistically significant relationship between children's shyness and emotionality and the time of adaptation to nursery. Shy children displayed more negative and less positive behaviours during adaptation. Children with less control over their emotional reactions showed more negative emotions and behaviours during separation from their parents. Moreover, further statistical analysis divided by sex showed that the older and shier the boys were, the more negative behaviours they displayed—as perceived by the nursery staff—during nursery adaptation.

Keywords:
nurseries, early childhood, adaptation, temperament.

Temperament kot dejavnik prilagoditve otroka na jasli: korelati in napovedovalci

Namen študije je bil analizirati razmerje med prilagajanjem otrok na jasli in temperamentom otrok. Rezultati raziskave kažejo na statistično pomembno povezavo med sramežljivostjo in čustvenostjo otrok ter časom prilagajanja na jasli. Sramežljivi otroci so med prilagajanjem pokazali več negativnega in manj pozitivnega vedenja. Otroci z manj nadzora nad svojimi čustvenimi reakcijami so med bivanjem v vrtcu pokazali več negativnih čustev in vedenja. Nadaljnja statistična analiza, razdeljena po spolu, je pokazala, da so starejši in bolj sramežljivi fantje med prilagajanjem na jasli – tako so jih zaznali vzgojitelji – kazali več znakov negativnega vedenja.

Ključne besede:
jasli, zgodnje otroštvo, prilagajanje, temperament.

UDK/UDC
373.2:159.922.7

DOI https://doi.org/10.18690/rei.5068

Introduction

A nursery is the first non-family environment that a child may attend as a toddler. In EU countries, 47.9% of children aged 1 to 2 received formal care or education as of 2023. In Poland, this rate was below 20%, which means that the European Commission will strive to increase the percentage of children in care to 23.3% by 2030 (EUROSTAT, 2024). According to Statistics Poland, 216 out of 1,000 children under the age of 3 attend a nursery (SP, 2024). Despite the availability of daycare centres and relatively low fees, few parents decide to entrust their child to nursery care. The reasons may be varied. First, toddlers tend to be strongly attached to their parents, and being in an unfamiliar environment can cause stress and unpleasant emotions (Dettling, 2000; Nystad, 2021). Moreover, Polish culture often negatively stereotypes nurseries as institutions that provide only basic care, without supporting the child's development, especially in terms of emotional or mental growth. Parents often consider a nursery only when no other childcare option is available while they are at work. Scientific research is therefore needed to familiarize society with the realities of children's everyday functioning in daycare settings.

Adaptation in Nurseries: Key Concepts and Research Findings

One of the key issues in nursery care is the adaptation process experienced by children and their families. According to *Colman's Dictionary of Psychology*, adaptation is a general term referring to any process whereby behaviour or subjective experience changes to fit a different environment or circumstances or in response to social pressure (Colman, 2009, p. 11). Therefore, a child's task during adaptation to the nursery is to adjust to the conditions imposed by the new environment. The author of this article defines adaptation of the youngest children to nursery care as both a process and its outcome, reflected in children's behaviours and emotional expressions that indicate a more or less successful adjustment (Świdrak, 2020). In the literature, it is emphasized that adaptation to nursery is a social and relational experience in which not only the child actively participates, but also parents and caregivers (van Trijp, 2025).

Based on available research, adaptation to nursery lasts from a few days to several weeks or months (Świdrak, 2020; Andonova, 2024; van Trijp et al., 2025). During the first days, children display behaviours and emotions typical or atypical of adaptation.

These include intense crying, anxiety, withdrawal, reluctance to play, clinging to the caregiver, sleep or eating disturbances, and changes in cognitive and play activity. A successful adaptation is visible through participation in nursery activities, contact with peers, and adjustment to the daily routine (Shin and Yun, 2016; Świdrak, 2020). Świdrak's research distinguishes between positive and negative behaviours. Negative behaviours and emotions – undesirable from the nursery staff's perspective – indicate stress or crisis related to separation and the stay in the new environment. They also include behaviours used by the child to cope with stress. Positive behaviours reflect adaptation and describe the child's engagement in the new environment. The first weeks in nursery are associated with difficulties, and overcoming them is necessary for the child to engage in play and the activities offered by the facility.

The Multifactorial Nature of the Adaptation Process in Nurseries

Theoretical approaches emphasize that adaptation is a complex and multifactorial process (Rapoport and Piccinini, 2001; Georgieva, 2016), explained in physiological, biological, pedagogical, psychological and social terms. Some researchers claim that it is impossible to predict the course of adaptation based on a single factor (Rapoport and Piccinini, 2001). This corresponds with opinions of caregivers and parents who, while observing children, cannot predict how they will react in a new environment. Parents often experience uncertainty, sadness or guilt, while at the same time hoping the nursery will support their child's development and socialization. Caregivers also face an emotional burden—they want to ensure children's safety, build bonds, and support families (White et al., 2020). Despite this uncertainty, observing children in the first days allows adults to adjust their behaviour, because adaptation is not a passive process, but a form of active interaction (Sumsion, 2011). Sumsion et al. (2011) demonstrated that children's experience depends on the quality of their relationships with caregivers and on how adults introduce them to new situations. This supports the need for adaptation programmes and allows planning support for children and parents even before the child enters a nursery group.

Only a few studies have examined the importance of parental and caregiver behaviour. Andonova (2024) found that active parental involvement shortened the adaptation period. Children whose parents strictly followed the procedure met the criteria of successful adaptation within two weeks.

In Korean research (Hwang et al., 2012), factors important for adaptation included the child's age and the caregivers' professional experience and age. Mothers' parental attitudes were not significant. In another Korean study (Bang, 2014), teacher-caregivers believed that their programmes facilitated adaptation, emphasizing the importance of caregivers as programme providers. Some focused specifically on children's emotions and individual needs. Croatian research (Tatalović Vorkapic et al., 2015) indicated that most children securely attached to their main caregiver experienced a normal course of adaptation, contradicting public beliefs that nurseries disrupt attachment.

White et al. (2022) indicated that successful adaptation does not depend on a single factor but on a network of small actions, such as careful observation of the child, gradual separation, safety rituals (greetings, favourite toys, routine), calm communication with parents, and flexible pedagogy tailored to individual needs.

Few studies concern temperament. Klein (1991) found that shy and withdrawn children or those with difficult temperaments were more vulnerable to emotional and social difficulties. Zajdeman and Minnes (1991) showed that mood predicted adaptation—children perceived as happier reacted more positively.

Research linking cortisol levels with temperament shows that cortisol increases are associated with negative emotionality and low self-control (Dettling et al., 2000). Albers et al. (2016) confirmed that children have higher cortisol levels during daycare days than at home, but high-quality care lowers stress. Children with reactive temperament show greater fluctuations, but sensitive caregiving can mitigate them. These findings were supported by German (Ahnert, 2023) and American research (Bernard, 2015).

Based on these results, one may assume that individual patterns of emotional and social functioning in early childhood may be important for the adaptation process. This corresponds with Buss and Plomin's theory of temperament (1984).

The Theory of Temperament by A. H. Buss and R. Plomin

Arnold H. Buss and Robert Plomin (1984) define temperament as a set of hereditary personality traits that are revealed in early childhood (in the first year of life). They form the basis for the formation and development of personality.

In the theory of Buss and Plomin (1984), temperament plays a vital role in a person's interaction with the environment. For example, active people seek situations in which they can use their energy, while sociable people prefer teamwork and activities

but also strive to organize their environment in such a way as to provide themselves with the greatest possible number of social interactions. Temperament traits can also be a source of difficulty in the functioning of an individual. Excessive emotionality negatively affects the quality of a person's relations with the environment. The authors distinguish three components of temperament: Emotionality, Activity and Sociability. The last of these is associated with the fourth trait—Shyness—which is treated by the authors as a derivative of temperament associated with Sociability or as a separate trait. Emotionality is a dimension which ranges from a lack of reaction at one end to intense, difficult-to-control or uncontrolled reactions at the other end, including fear and anger (Buss and Plomin, 1984, pp. 50-54). Activity is the only feature of the EAS temperament theory that refers to the style of behaviour. The main components of activity are tempo (speed of action) and vigour (related to the strength or intensity of reaction) (Buss and Plomin, 1984, p. 84) Sociability, the third temperament feature according to the EAS theory, manifests itself in a general tendency of a person to seek out other people and spend time with them and avoid loneliness. People characterized by a high intensity of this feature are strongly motivated to seek the company of other people. They tend to be frustrated and unbalanced in conditions of isolation and want, above all, to remain in long-term contact with other people. The source of this tendency is specific social rewards, such as shared activities, attention from others and not feeling isolated (Buss and Plomin 1984, p.63). Shyness refers to behaviours displayed in the presence of random people or strangers. It manifests itself as inhibition and embarrassment, which are accompanied by a sense of tension and discomfort and a desire to withdraw from social interactions. The presence of little-known people or strangers facilitates the emergence of this feature (Buss and Plomin, 1984 pp. 77-80).

From the analysis of the previous literature on factors that may be significant for the adaptation process and the importance of temperament for social relations, it can be assumed that temperament revealed in behaviours and emotional expression may play a significant role in toddlers' adaptation to nursery. On the other hand, the complexity of the adaptation process awareness leads to the assumption that it may also be regulated by other factors at different process stages.

This study aimed to analyse the relationship between toddlers' temperamental traits and their time of adaptation to nursery.

Based on the literature, the following hypotheses were made:

H1. Increased emotionality and shyness are positively correlated with the duration of negative emotional and behavioural responses during adaptation.

H2. Increased sociability and activity are negatively correlated with the duration of negative emotional and behavioural responses during adaptation.

Method

To verify the hypotheses, research was conducted in Polish nurseries, in the city of Lublin. Before the study began, parents and caregivers were informed about the purpose, procedure, and method of the study. Parents were asked for consent to their children's participation in the study and informed about the privacy policy for their children. Caregivers were trained in the use of the researcher's observation technique. At the research planning stage, the internal grant committee, which was also the ethics committee at the John Paul II Catholic University of Lublin, gave its consent to the research. The study included 109 children (60 girls and 49 boys) aged 8 to 33 months (average age: 18.68 months). The children were observed during their first 20 days of nursery stay by their caregivers. The study took place in the second half of 2024. A limitation of the study was the failure to include factors such as the quality of the caregiver-child relationship, including caregiver responsiveness and familiarity with the children, among the intervening variables. However, considering the children's safety and the possibility that the presence of a stranger—i.e., the researcher—might exacerbate their difficult emotional state, the choice of the caregiver as an observer was justified.

The time of adaptation of children to nursery was examined using the observation scale described in Świdrak's article "Adaptation of children up to three years of age to institutional forms of care based on the example of Lublin nurseries" from 2020. The scale consists of 2 parts. In the first part, caregivers were asked to estimate the number of days during which the child showed specific behaviour while separated from parents, and in the second part, the number of days during which the child showed specific behaviour or emotion in the nursery room. Each part considered positive and negative behaviours and emotions. The variable that described negative behaviours observed during separation included four items: crying -sadness, anger, reluctance to enter the room, and taking a long time to separate from the parent. This variable was abbreviated as "neg1". The variable that described positive behaviours experienced before entering the room included four items: smiling, establishing contact with the caregiver and entering the room calmly and without problems, taking a short time to separate from the parent and making a "bye-bye" gesture. This variable is named and abbreviated as "poz1".

Negative behaviours displayed during the nursery stay were described using four items: crying—sadness, isolation and a lack of contact with peers and caregivers, clinging to the caregiver (e.g., sitting on the lap), recalling and searching for mom/dad/other relatives. As part of the work on the tool, the item "sleeping difficulties" was removed, because it reduced the reliability of the scale. All negative behaviours and emotions during the nursery stay form a general variable named "neg2". There were three items among the positive behaviours observed during the nursery stay: establishing contact with peers and staff, participating in nursery games and activities and displaying joy. This variable is abbreviated as "poz2" in the description of the research results. As regards the psychometric properties of the measure, the collected empirical data made it possible to analyse the reliability of the schedule. The reliability was assessed using Cronbach's α coefficients of positive and negative groups of behaviour. The reliability coefficients are given in Table 1. Psychometric validation of this instrument suggests a satisfactory level of reliability.

Table 1

Reliability Coefficients (Cronbach's a) for negative and positive behaviours during separation and nursery stay

Adaptation observation scale	Cronbach's α
Negative behaviour and emotions during separation (neg1)	.65
Positive behaviour and emotions during separation (poz1)	.63
Negative behaviour and emotions during nursery stay (neg2)	.69
Positive behaviour and emotions during nursery stay (poz2)	.78

Children's temperament was examined using the EAS scale—the TS version for children—which refers to observational data yielded from parents, as authored by Arnold H. Buss and Robert Plomin and adapted into Polish by Włodzimierz Oniszczenko (1997). The questionnaire consists of 20 items forming 4 scales: Emotionality (E), Activity (A), Sociability (S) and Shyness (Sh). Each scale contains 5 items. Using a 5-point scale, parents or teachers determine to what extent each statement describes the child, on a scale from 1 to 5. The results are converted to a STEN score.

The results obtained in the study were statistically analysed using SPSS Statistics, version 29.0. Bilateral Pearson's r correlations were calculated between variables for the entire group of respondents as well as for the girls' and boys' subgroups. Additionally, models that would make it possible to predict the adaptation process based on selected variables were sought using linear regression analysis.

Results

The first stage of the analysis yielded the results of the correlation between the individual scales of temperament and adaptation. Additionally, the age variable was also subjected to correlation. The results are presented in Table 2.

Table 2
Correlations Between Temperament, Child Age and Adaptation (N=109)

Adaptation		Age	E	A	S	Sh
neg1	Pearson's r	.011	.236*	-.008	.104	.305**
	p	.906	.013	.933	.281	.001
poz1	Pearson's r	.133	.086	-.063	-.009	-.275**
	p	.169	.373	.515	.927	.004
neg2	Pearson's r	.065	.193*	-.076	-.072	.339**
	p	.501	.044	.431	.458	<.001
poz2	Pearson's r	.052	.087	.032	.017	-.224*
	p	.588	.371	.744	.862	.019

(E) Emotionality (A) Activity (S) Sociability (Sh) Shyness

*p<0.05
**p<0.01

The correlation coefficients indicate that there is a relationship between children's adaptation in nurseries and their shyness. The higher the level of shyness, the more negative behaviours the children displayed, both when separating from their parents (r=.305**) and during the nursery stay (r=.339**). As their shyness decreased, the children showed more positive behaviours both when separating from their parents (r=-.275**) and during the nursery stay (r=-.224*). Negative behaviours such as crying or reluctance to play also correlated with the child's emotionality, both when separating from their parents (r=.236*) and during the nursery stay (r=0.193*). In the girls' group, statistically significant correlations were similar to those in the entire group of observed children (Table 3). Shyness, as one of the girls' temperamental features, had a significant relationship with both positive and negative behaviours and emotions during adaptation. Additionally, a statistically significant relationship occurred between the girls' negative behaviours during separation and emotionality (r=.287*). The higher the level of Emotionality (E), the more negative behaviours and emotions occurred during the separation of girls from their parents in the nursery hall (r=.287*).

In the boys' group, statistically significant correlations were different than in the girls' group. Negative behaviours and emotions observed during the nursery stay significantly and directly correlated with the age of boys (r=.389**) and with their shyness (r=.349*). In the boys' group, correlations in the remaining areas of adaptation were statistically insignificant.

Table 3
Correlations Between Temperament, Child's Age and Adaptation in the Groups of Boys and Girls

Sex	Adaptation		Age	E	A	T	NS
	neg1	Pearson's r	-.178	.287*	-.013	.164	.326*
		p	.172	.026	.921	.212	.011
	poz1	Pearson's r	.044	-.048	-.064	-.023	-.310*
Girls		p	.740	.717	.630	.860	.016
(N=60)	neg2	Pearson's r	-.180	.215	-.035	.091	.297*
		p	.168	.099	.793	.487	.021
	poz2	Pearson's r	-.022	.029	-.006	-.047	-.262*
		p	.870	.829	.964	.719	.043
	neg1	Pearson's r	.199	.160	.008	.088	.239
		p	.170	.271	.958	.547	.098
	poz1	Pearson's r	.252	.258	-.067	-.007	-.222
Boys		p	.081	.073	.645	.963	.125
(N=49)	neg2	Pearson's r	.389**	.135	-.113	-.226	.349*
		p	.006	.354	.438	.118	.014
	poz2	Pearson's r	.161	.176	.067	.072	-.154
		p	.270	.225	.648	.621	.291

(E) Emotionality(A) Activity(S) Sociability(Sh) Shyness

*p<0.05
**p<0.01

All statistically significant correlations in the entire group, as well as in the girls' group, show a small relationship between variables. In the separate boys' group, statistically significant correlations showed a slightly higher level in relation to the girls' group and the group comprising all children. Therefore, a linear regression analysis was performed in the boys' group, where the child's age and shyness were assumed as independent variables, and the dependent variable was the number of days in which the children showed negative behaviours in the nursery (neg2). The regression results are shown in Table 4.

Age and shyness proved to be significant predictors of negative behaviour in boys during their adaptation to nurseries. The older and the shyer a boy was, the more negative behaviours he showed during adaptation (Model 3). The analysed variables explained 32% of the variance in the dependent variable (ΔR2=.320). Moreover, the

model with two variables (Model 3) had greater predictive power than models in which only one variable (Sh or age) was analysed.

Table 4
Predictors of Negative Behaviours During Adaptation to Nursery in the Group of Boys.

Predictors	Model 1		Model 2		Model 3	
	B	p	B	p	B	p
Age	.389	.006			.415	.001
Shyness			.349	.014	.450	<.001
F (df)	8.396 (1)		6.536 (1)		10.835 (2)	
ΔR2	.152		.122		.320	

*p < .05; **p < .001
Dependent variable—neg2

Discussion

The results indicate a statistically significant relationship between children's shyness, emotionality, and the duration of their adaptation to nursery settings, thereby confirming the first hypothesis. Shy children demonstrated more negative and fewer positive behaviours during adaptation. Shyness was apparent in relation to strangers and little-known people, and this is exactly the type of contacts that take place during adaptation.

Hypothesis 2 was not confirmed. There was no statistically significant correlation between children's sociability and activity and the duration of negative emotional and behavioural responses during adaptation. Importantly, sociability—a feature related to shyness—was not related to adaptation. Therefore, it should be assumed that prior familiarization with the nursery staff and children could reduce the experience and expression of negative emotions in shy children during adaptation. Moreover, children with less control over their emotional reactions showed more negative emotions and behaviours when separating from their parents. Therefore, it seems that if the nursery staff were to make efforts to prevent children's strong emotional reactions, especially during separation from parents in the nursery lobby, this would help facilitate the adaptation process. Based on the author's observations and conversations with nursery carers, it appears that they often ask parents to part with their children as quickly as possible and not to escalate feelings such as sadness, regret or fear.

Further statistical analysis with a breakdown into boys and girls showed that the older and shyer the boys were, the more negative behaviours they displayed, as

perceived by the nursery staff. All significant covariations showed weak relationships between the variables, which prompts the search for other factors that may be important in the adaptation process, e.g., nursery staff or the child's family.

Awareness of the importance of individual temperamental differences between children in the adaptation process encourages paying special attention to the needs of shy and emotionally vulnerable children. Therefore, the teachers' task in the adaptation process is to respond to the child's individual needs; however, this is not always possible, given the size of nursery groups. It also seems that any kind of action aimed at familiarizing new children with the nursery, staff and children in advance can shorten the adaptation period because shy children react with increased anxiety only in new situations and when encountering people they do not know very well.

The above research findings support the need for adaptation programs for children in daycare, considering the individual needs of the child and the role of parents. The research by White et al. (2020), mentioned in the article, confirms that adult emotions have a real impact on the adaptation process: a calm, confident adult helps the child feel safe. Therefore, facilities should support parents in this process, create relationships based on trust and cooperation, and demonstrate flexibility and sensitivity to the child's individual needs and previous experiences.

Moreover, research conducted by Ahnert, Pinquart, and Lamb (2006) demonstrates that children's sense of security in non-parental care settings is strongly associated with the quality of caregiver–child interactions. Caregiver sensitivity, attentive observation of children's behavioural signals, and flexible, responsive caregiving contribute to a smoother process of adaptation to the new environment. Findings from this meta-analysis further indicate that systematic staff preparation and structured adaptation programmes can effectively reduce separation-related stress and enhance children's overall well-being during the initial days of attendance.

Therefore, the responsibility for the children's well-being during the adaptation process rests with the caregivers, whose role is to consider the children's temperamental differences, especially their shyness and emotionality and to cooperate with the child's parents.

Data Availability Statement

The article is based on data fully presented and discussed within the article itself; therefore, no additional data archiving is required.

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REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
JOURNAL OF ELEMENTARY EDUCATION
Vol. 19, No. 1, pp. 33–49, March 2026

DIGITAL STRESS AND TEACHERS' PSYCHOSOMATIC HEALTH

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Potrjeno/Accepted
7. 11. 2025

Objavljeno/Published
18. 3. 2026

Abstract/Izvleček

This study validated the Croatian version of the Digital Stress Scale (DSS) and examined its relationship with psychosomatic symptoms, self-efficacy, and ICT use on a sample of 152 Croatian teachers. Confirmatory factor analysis supported a ten-factor structure for the DSS with high internal reliability. All ten dimensions of digital stress as well as the total digital stress score showed significant positive correlation with both the frequency of psychosomatic symptoms and their interference in daily life. Total digital stress significantly predicted both psychosomatic symptom dimensions, while self-efficacy demonstrated a protective role, highlighting the importance of ICT education in preventing digital stress.

Keywords:
digital stress, ICT use, psychosomatic symptoms, self-efficacy, teacher well-being.

Digitalni stres in psihosomatsko zdravje učiteljev

V študiji smo validirali hrvaško različico *lestvice digitalnega stresa* (angl. Digital Stress Scale – DSS) in preučili njen odnos glede na psihosomatske simptome, splošno samoučinkovitost ter uporabo informacijsko-komunikacijske tehnologije na vzorcu 152 hrvaških učiteljev. Potrditvena faktorska analiza je podkrepila desetfaktorsko strukturo DSS z visoko notranjo zanesljivostjo. Vseh deset dimenzij digitalnega stresa ter skupna ocena digitalnega stresa so pokazali pomembno pozitivno korelacijo tako s pogostostjo psihosomatskih simptomov kot tudi z njihovim vplivom na vsakdanje življenje. Skupni digitalni stres je pomembno napovedoval obe dimenziji psihosomatskih simptomov, medtem ko se je samoučinkovitost izkazala kot zaščitni dejavnik, kar poudarja pomen izobraževanja o IKT pri preprečevanju digitalnega stresa.

Ključne besede:
digitalni stres, uporaba IKT, psihosomatski simptomi, samoučinkovitost, dobro počutje učiteljev.

UDK/UDC
159.944.4:37.018.26:004

DOI https://doi.org/10.18690/rei.5077

Introduction

With the rapid evolution of digital technologies, teachers are increasingly integrating Information and Communication Technology (ICT) into their daily work. While beneficial, this can also provide challenges that can lead to stress. This stress, caused by constant connectivity and pervasive digital device use is known as digital stress and has its conceptual roots in "technostress," a term introduced by clinical psychologist Craig Brod in 1982. Technostress is described as a condition that arises when individuals or organizations find it difficult to adapt to the introduction and use of new technology (Hall, 2020). Given how digital technologies have become part of everyday life and educational practices, the term has evolved into "digital stress," reflecting the specific challenges posed by modern digital environments, such as multitasking, work-life boundaries, and information overload (Fischer et al., 2021). Previous studies (Kader et al., 2020; Ma and Turel, 2019; Nimrod, 2018) have shown that perceived technology induced stress can negatively affect individuals concerning their physical and mental well-being as well as their social interactions.
Research by Kush et al. (2022) and Estrada-Muñoz et al. (2021) also assessed teacher mental health during the COVID-19 pandemic and found that teachers reported higher levels of mental health concerns than professionals in other occupations. The study also found that distance learning teachers reported higher levels of stress than those teaching in-person, emphasizing the mental health issues associated with digital teaching environments. These findings underline the importance of addressing digital stress among teachers to increase their well-being and effectiveness in the classroom. Highlighting the need for comprehensive strategies in educational settings, Ayyagari et al. (2011) notes the importance of addressing technological antecedents to mitigate technostress (digital stress). For this purpose, new questionnaires were developed to address digital stress (Nimrod, 2018; Fischer et al., 2021; Pirkkalainen et al., 2019; Ragu-Nathan et al., 2008).
Fischer, Reuter, and Riedl (2021) developed the highly comprehensive Digital Stressors Scale (DSS) to measure perceived stress from digital technology in the workplace. The DSS is a self-assessment tool for measuring the extent of distress related to digital technology in the workplace and helps to further explain how and why information and communications technology can lead to negative outcomes for individuals. It enables researchers to measure digital stress reliably and practitioners to assess it in organizations, aiding effective coping strategies.

Riedl, Fischer, and Reuter (2023) abbreviated the original version which assesses digital stress across 10 categories: complexity, conflicts, insecurity, invasion, overload, safety, social environment, usefulness, technical support and unreliability. In this study, the DSS scale will be utilized, and its validity and reliability will be assessed and verified.

Studies have shown that perceived digital stress depends not only on excessive use of technology but also on a way a person perceives their own abilities at managing ICT (Estrada-Muñoz et al., 2020; Fischer et al., 2021). A systematic review by Estrada-Muñoz et al. (2020) reveals that teachers feel a lot of anxiety and stress when using educational technology in the classroom. The study shows that an increase in the demand for technology usage in the academic environment leads to unpleasant emotions such as anxiety especially when teachers do not receive the right training or are being forced to integrate technology into their teaching. Findings of Fernández-Batanero et al. (2021) also reveal that teachers experience high levels of anxiety or stress when using educational technology in the classroom. Similarly, Gavade et al. (2023) examined how hybrid teaching in low-income schools affected teacher stress, mediated by requirements for skill development and adaptation in remote teaching. The research further reveals that the sudden shift to online teaching during the COVID-19 pandemic increased the pressure on teachers to acquire new skills and adopt remote teaching techniques. For example, research by Estrada-Muñoz et al. (2020) showed that teachers who had higher levels of digital self-efficacy (GDSE) reported lower levels of technostress, which may mean that confidence in using digital tools reduces digital stress. The same research also pointed out techno-fatigue and techno-anxiety among teachers, showing how self-efficacy could reduce the overall impact of digital stress in educational settings. Similarly, findings by García-Martín et. al. (2023) indicate that enhancing GDSE through targeted training programs can reduce digital stressors, such as communication overload and constant availability expectations, among educators. These findings underscore the importance of fostering GDSE among teachers to alleviate digital stress and promote well-being in increasingly technology-driven educational environments. Recent studies emphasize the growing importance of assessing digital competences and self-perceived digital skills, particularly in the context of modern education and the increasing integration of technology, some focusing on students while others concentrate on teachers (Tomaš et al., 2024; Yang, et al., 2024).

There is evidence of the effects of technology-induced stress resulting in psychosomatic symptoms. Constant adjustment to emerging technologies without proper support may lead to chronic stress responses; physical manifestations thereof are also possible. Using a sample of ICT users, Salanova et al. (2007) noted that technostress was associated with higher levels of complaints from the musculoskeletal system. Moreover, studies have found a significant association between long computer work and the appearance of musculoskeletal symptoms (Jensen et al., 2002) and have identified visual discomfort (Das et al., 2022).

Studies have also reported that more time spent on the internet and more screentime exposure are related to somatic symptoms, such as headache, dizziness and migraine (Barbieri et al., 2024; Das et al., 2022; Stiglic et al., 2022).

Also, digital stress resulting from constant connectivity may disrupt sleeping patterns and eventually cause tension headaches, among other stress disorders. Furthermore, research emphasizes that technostress is a multidimensional variable with substantial effects on physical health through its biological mechanisms. By understanding these mechanisms, interventions can be designed that reduce health risks from pervasive technology use (Riedl, 2013).

Understanding digital stress in teachers is critical as educational environments increasingly take on digital aspects. By supporting educators adequately, educational institutions will foster healthier, more sustainable teaching practices for the ultimate benefit of educators and students.

Despite a few studies having been conducted in Croatia in the context of digital stress (Ćuk et al., 2022; Tomaš et al., 2024) most research focuses on employees in sectors outside education. Studies specifically examining digital stress among Croatian teachers remain limited, particularly in the context of integrating digital technology into educational practices.

This study validated the Croatian version of the Digital Stress Scale (DSS) and examined its relationship with psychosomatic symptoms, self-efficacy, and ICT use on a sample of Croatian teachers. Given the objectives described above, the study addresses the following research questions:

RQ1: Is the Croatian version of the Digital Stressors Scale (DSS) a valid and reliable instrument for measuring digital stress among teachers?

RQ2: What is the relationship between teachers perceived digital stress and the frequency and interference of psychosomatic symptoms?

RQ3: To what extent does general digital self-efficacy (GDSE) predict the relationship between digital stress and psychosomatic symptoms?

RQ4: Does the frequency of ICT use (e.g., computers, smartphones) significantly predict levels of digital stress or psychosomatic symptoms among teachers?

The results of this empirical study are part of a broader research project *Digital stress and mental health in relation to different age groups and life roles, (project number: uniri-iskusni-drustv-23-160).*

Research methodology

Sample of participants

A cross-sectional study was conducted with 152 Croatian teachers from elementary, high school, and university levels. The sample included 24 males (16%), 127 females (84%), and 1 undeclared. Ages ranged from 26 to 65 years (M = 46.65, SD = 9.81). Most held a university degree (72%), 19% held a doctorate, 8% a higher professional qualification, and 1% had secondary education. Out of 205 initial respondents, 53 were excluded because of incomplete data, yielding a final sample of 152 complete responses and a 74.1% completion rate. Only complete responses were analysed to ensure data quality.

Instruments

For the purposes of this study, short versions of the Digital Stressors Scale (DSS) (Riedl et al. 2023) and Psychosomatic symptoms questionnaire (PSS) (Vulić-Prtorić, 2019) were used. DSS was primarily translated into Croatian using the back-translation method. A 7-point Likert scale was consistently used ranging from 0 "strongly disagree" to 6 "strongly agree." Hence, the value "3" constitutes the neutral position on the scale for each question. A higher score indicates a higher level of digital stress, with a maximum possible score of 180. According to the authors, all subscales demonstrate satisfactory reliability, with Cronbach's alpha values exceeding .72; in the current study, Cronbach's alpha values ranged from .71 to .89.

The Psychosomatic Symptoms Questionnaire (PSS) (Vulić-Prtorić, 2019) consists of a list of 35 symptoms and sensations, along with three additional questions. For the purposes of this study, the questionnaire was shortened to focus on the most common symptoms associated with ICT use (Barbieri et al., 2024; Das et al., 2022; Salanova et al., 2014). A subset of 10 items was chosen: headache, dizziness, back

pain, lack of energy/fatigue, joint pain, pain in arms/legs, muscle tension, double vision, blurred vision, and chest pain. This instrument assesses the number of somatic symptoms an individual has experienced over the past three months, their frequency during this period, and the extent to which these symptoms interfere with their daily activities (distress). Participants rated the frequency of experiencing these symptoms using a four-point scale (1 = never, 2 = a few times per month, 3 = a few times per week, 4 = almost every day) and then the extent to which each symptom interferes with their daily activities (distress) using a three-point scale (1= does not bother me at all, 2 = it bothers me a little, and 3 = it bothers me a lot). A total score was computed by summing the scores across all items, with higher scores indicating greater symptom intensity (frequency scale) and more interference in everyday life (interference scale), reflecting the severity or distress caused by somatic complaints. Thus, in determining the PSS score, the total score for the frequency subscale ranges from 10 to 40, and the total score for the interference (severity) subscale ranges from 10 to 30. Subscales demonstrate satisfactory reliability, with Cronbach's alpha values exceeding .71; in the current study Cronbach's alpha exceeded .82.

The study also incorporated a scale measuring the frequency of ICT use and assessed how often different digital tools were utilized. Specifically, the frequency of use was examined for various ICT devices, including computers or laptops, tablet computers, mobile phones or smartphones, smartboards, and LCD projectors. This additional measure provided insight into the extent of technology usage among participants and its potential relationship with digital stressors.

In addition, general digital self-efficacy (GDSE) was assessed using a 4-point Likert scale ranging from 1 (no competence at all) to 4 (highly developed competence), evaluating participants' overall confidence in their ability to manage challenges, particularly those related to ICT use.

Data collection

The study was conducted between June and September 2024 on a convenience sample of Croatian teachers from elementary, secondary, and higher education levels, allowing time for responses and ensuring representation. School principals and university deans were contacted via email and asked to distribute the questionnaire to available teachers and professors. The survey was administered online, with participants informed about the study's purpose, confidentiality, and voluntary participation.

The study followed ethical guidelines and received approval from the Ethics Committee of the Faculty of Humanities and Social Sciences, University of Rijeka. Statistical analyses were conducted, including descriptive analysis (digital stress, psychosomatic symptoms, GDSE, and ICT usage patterns), exploratory and confirmatory factor analysis, correlation and regression analysis, using the statistical software JASP 0.19.1.0.

Results

Computers were the most frequently used ICT devices, with 33% using them over five hours daily. Smartphone use was also common, with 38% using them 1–2 hours and 27% over five hours per day. LCD projectors had moderate use (29% several times a week). Smartboards were less used (47% never), while tablets were the least used (61% never).

The factor structure of the DSS, based on previous research by Riedl et al. (2023), was confirmed using a confirmatory factor analysis (CFA) on the Croatian teacher sample.

To determine the factor structure of the DSS, a confirmatory factor analysis (CFA) was performed. The data were suitable for analysis (KMO = .93; Bartlett's test: $X^2 = 3038.8$, df = 43, $p < .001$). Model fit indices indicated good adequacy (RMSEA = .06, CFI = .92, SRMR = .05), and the CFA showed acceptable model fit ($X^2 = 1257.40$, df = 405, $p < .001$).

Standardized factor loadings ranged from .69 to .94 ($p < .001$), indicating strong contributions to latent constructs. Table 1 presents the loadings and each factor's reliability (Cronbach's alpha).

Table 1
Factor loadings and reliability coefficients (Cronbach's Alpha - a) of the Digital stressor scale (DSS)

Factors and Items	Factor loadings	α
I—Complexity		.77
I.1 I often find it too complicated to accomplish a task using the ICT that are available to me at work.	.78	
I.2 I feel that the ICT that are available to me at work are too confusing.	.77	
I.3 I often do not find enough time to keep up with new functionalities of ICT at work.	.74	
II—Conflicts		.89

II.1 I feel that my private life suffers due to ICT enabling work-related problems to reach me everywhere.	.86	
II.2 It is too hard for me to keep my private life and work life separated due to ICT.	.86	
II.3 ICT make it harder to create clear boundaries between my private life and work life.	.82	
III—Insecurity		.81
III.1 I fear that I could be replaced at work due to the increasing standardization of work processes, which is enabled by ICT.	.78	
III.2 I fear that I could be replaced by machines.	.73	
III.3 I fear that digitization will cost me my job.	.94	
IV—Invasion		.79
IV.1 I fear that my use of ICT is less confidential than I would like it to be.	.78	
IV.2 I fear that the information that I exchange using ICT is not as protected as I would like it to be.	.86	
IV.3 I fear that malevolent outsiders (e.g., hackers) can easily copy my identity due to ICT.	.79	
V—Overload		.85
V.1 Due to ICT I have too much to do.	.82	
V.2 Due to ICT I have a too large variety of different things to do at work.	.82	
V.3 I never have any spare time because my schedule is too tightly organized by ICT.	.80	
VI—Safety		.86
VI.1 I have to worry too often whether I might receive malicious e-mails.	.78	
VI.2 I feel anxious when I get an e-mail from somebody that I do not know as it could be a malevolent attack.	.85	
VI.3 E-mails whose sender I do not know make me nervous.	.88	
VII—Social Environment		.79
VII.1 Due to ICT I have too much to do with the problems of others.	.80	
VII.2 I think that ICT generate too much of an expectation that I have to be reachable everywhere and at any time.	.83	
VII.3 I feel that ICT create unwanted social norms (e.g., the expectation that e-mails should be answered right away).	.80	
VIII—Usefulness		.71
VIII.1 I think that I do not gain enough benefits from using the ICT that I am provided with at work for my tasks.	.82	
VIII.2 The ICT I use at work are full of too many functionalities that I never need.	.69	
VIII.3 I think that most of the ICT I am supplied with at work is not useful enough and I could work without it.	.71	
IX—Technical Support		.82
IX.1 In the case of ICT-related problems, it happens too often that there is not enough support available at work.	.73	
IX.2 I think that it happens too often that technical support is not available when I need it.	.78	
IX.3 I often have to wait for a long time because technical problems cannot be adequately solved in our organization.	.84	
X—Unreliability		.87
X.1 I think that I lose too much time due to technical malfunctions.	.86	
X.2 I think that I spend too much time trying to fix technical malfunctions.	.88	
X.3 There is just too much of my time at work wasted coping with the unreliability of ICT.	.84	

Internal consistency, assessed via Cronbach's alpha for each of the ten DSS factors, ranged from .71 to .89, demonstrating acceptable to excellent reliability. These results confirm that the Croatian version of the DSS is a reliable and valid tool for assessing digital stress. Reliability across subscales closely matches the original DSS (Riedl et al., 2023).

Furthermore, exploratory factor analysis with oblimin rotation was conducted to explore the Psychosomatic Symptoms Questionnaire (PSS) structure. A predefined two-factor structure, based on previous research (Vulić-Prtorić, 2019) was confirmed: symptom frequency (Factor 1) and interference with daily activities (Factor 2). The first factor includes variables assessing how often psychosomatic symptoms occur (e.g., headaches, dizziness, back pain, muscle tension). Highest loadings were obtained for items such as back pain (.68), fatigue (.52), and joint pain (.77). The second factor, which captures the extent to which psychosomatic symptoms interfere with daily activities (distress), includes variables related to functional impairment. This distinction highlights that while some participants may experience frequent symptoms, they do not necessarily perceive these as highly disruptive. In contrast, others may report lower symptom frequency but significant interference with their daily lives and distress.

The results confirm a meaningful two-factor structure, indicating that symptom occurrence and its impact on daily functioning should be considered separately in psychosomatic research. These findings emphasize the importance of distinguishing perceived symptom burden from its actual impact on quality of life.

Pearson correlation coefficients were calculated to explore relationships among ICT use (computer and smartphone), digital stress (total and subscales), general digital self-efficacy (GDSE), and psychosomatic symptoms of frequency (PSS-F) and interference (PSS-I). The results are presented in Table 2.

Table 2
Descriptive Statistics and Intercorrelations of Study Variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Computer Use	—															
2. Smartphone Use	.24**	—														
3. Complexity	.23**	.10	—													
4. Conflicts	.27***	.12	.51***	—												
5. Insecurity	.09	.12	.47***	.43***	—											
6. Invasion	.25**	.14	.53***	.50***	.39***	—										
7. Overload	.19*	.13	.47***	.47***	.33***	.48***	—									
8. Safety	.21*	.15	.47***	.50***	.33***	.51***	.53***	—								
9. Social Environment	.23**	.13	.48***	.48***	.41***	.52***	.49***	.54***	—							
10. Usefulness	.10	.12	.38***	.40***	.34***	.39***	.34***	.37***	.38***	—						
11. Technical Support	.17*	.13	.41***	.44***	.34***	.46***	.39***	.42***	.45***	.38***	—					
12. Unreliability	.20*	.15	.43***	.49***	.37***	.46***	.40***	.44***	.47***	.40***	.53***	—				
13. DSS Total	.21*	.17	.59***	.63***	.51***	.61***	.59***	.65***	.62***	.47***	.55***	.55***	—			
14. GDSE	.03	-.01	-.28***	-.31***	-.34***	-.30***	-.35***	-.28***	-.22**	-.20*	-.24**	-.30***	-.42***	—		
15. PSS-F	.09	.09	.29***	.31***	.31***	.36***	.36***	.29***	.29***	.23**	.23**	.28***	.45***	-.31***	—	
16. PSS-I	.10	.11	.29***	.32***	.31***	.37***	.37***	.31***	.29***	.24**	.25**	.29***	.47***	-.32***	.87***	—
Mean	4.75	4.78	5.97	8.36	2.74	6.78	7.02	5.03	9.17	6.62	6.52	5.89	63.99	3.26	16.69	14.22
Standard deviation	1.10	0.99	3.87	5.31	3.43	4.27	4.19	4.67	4.86	3.69	4.30	4.19	33.85	0.98	5.71	4.17

Note: *$p < .05$, **$p < .01$, ***$p < .001$.

Legend: DSS Total – Total Digital stress scale; GDSE - general digital self-efficacy; PSS-F – Psychosomatic symptoms questionnaire - frequency; PSS-I – Psychosomatic symptoms questionnaire - interference.

As presented in Table 2, age showed a small but significant positive correlation only with GDSE ($r = .31$, $p < .001$), while gender was not significantly correlated with any of the main study variables.

Computer use was significantly associated with eight DSS dimensions excluding Insecurity and Usefulness and with a total DSS score. Smartphone use was not significantly associated with either DSS or PSS scores. This finding was unexpected and inconsistent with prior studies (Winkler et al., 2020) that have reported associations between smartphone-related digital stress and mental health. It can be assumed that teachers use smartphones primarily during leisure time and for entertainment, which may entail lower task demands and perceived stress.

These findings suggest that digital stress is significantly associated with increased psychosomatic burden, while self-efficacy may serve as a protective factor.

A multiple linear regression analysis was conducted to examine whether computer use (CU), GDSE, and total digital stress (DSS) predict the frequency and interference of psychosomatic symptoms in two separate models (PSS-F and PSS-I).

Table 3

Multiple Linear Regression Predicting Psychosomatic Symptom Frequency and Interference

	Psychosomatic symptoms									
	Frequency (PSS-I)					Interference (PSS-I)				
Predictor	B	SE	β	t	p	B	SE	β	t	p
CU	0.57	.35	.12	1.63	.106	0.12	0.24	0.04	0.50	0.616
GDSE	-1.19	.63	-.15	-1.89	.061	-0.87	0.43	-0.15	-2.00	.047
DSS	0.05	.01	.34	4.47	< .001	0.04	0.01	0.35	4.67	< .001

The overall model predicting PSS-F was statistically significant, $F(3, 148) = 9.49$, $p < .001$, explaining 16.1% of the variance ($R^2 = .161$, Adjusted $R^2 = .144$). Similarly, the PSS-I model was also significant, $F(3, 148) = 9.84$, $p < .001$, accounting for 16.6% of the variance ($R^2 = .166$, Adjusted $R^2 = .149$). These findings indicate that the predictors contribute to explaining both symptom frequency and their impact on daily life.

As shown in Table 3, DSS was a significant predictor in both models $\beta = .35$, $p < .001$ for PSS-F and for PSS-I $\beta = .36$, $p < .001$.

These results suggest that higher digital stress is associated with both more frequent psychosomatic symptoms and greater interference with daily functioning.
General digital self-efficacy (GDSE) demonstrated a significant negative association PSS-I, $\beta = -.15$, $p = .047$, suggesting a potential protective effect. However, it did not significantly predict the PSS-F, $p = .061$. Similarly, computer use did not reach statistical significance in predicting either PSS-F ($p = .106$) or PSS-I ($p = .616$).

Discussion

The aim of this manuscript was twofold (validation of the instrument and examining the burden of digital stress in the educational context).
Confirmatory factor analysis (CFA) supported the validity of the Croatian adaptation of the DSS, confirming the original 10-factor structure (Fischer et al., 2021; Riedl et al. 2023). Results showed high internal consistency, indicating that the Croatian DSS is a reliable and valid scale for future research.
The Psychosomatic Symptoms Questionnaire (PSS) confirmed a two-factor structure (symptom frequency and interference) supporting previous findings separating the burden of symptoms from their actual impact (Barbieri et al., 2024; Salanova et al., 2014; Vulić-Prtorić, 2019). Not all frequent symptoms were perceived as disruptive, indicating the importance of addressing both their occurrence and interference.
This study focused on the mental well-being of teachers by examining the burden of digital stress in the educational context, particularly in relation to its impact on physical health. The findings provide valuable insights into the relationship between digital stress and psychosomatic symptoms among Croatian teachers. The aim was to understand how different forms of digital stress, resulting from technological demands such as system unreliability and work-life conflicts, affect teachers' well-being and daily functioning. The roles of general self-efficacy and ICT use were also examined, further contextualizing how personal and technological factors interact with digital stress in impacting psychosomatic outcomes.
Correlation analysis showed strong associations between digital stress and both psychosomatic symptom dimensions, particularly in subscales like overload, invasion, and conflicts highlighting the complex structure and wide-ranging health implications of digital stress (Das et al., 2022; Jensen et al., 2002; Pirkkalainen et al., 2019).

Regression analyses revealed that digital stress was the strongest predictor of both symptom frequency and interference. These findings support earlier studies on the health effects of digital workload (Das et al., 2022; Pirkkalainen et al., 2019; Riedl et al., 2023). The findings highlight the importance of addressing digital work environments to improve teacher well-being, a concern that has been increasingly recognized in educational research (Fernández-Batanero et al., 2021; Gavade, Sidotam and Varanasi, 2023).

The results, reinforce prior research on the negative effects of technology-related stress on well-being (Fischer et al., 2021; Riedl et al., 2023; Nimrod, 2018). These findings align with Ayyagari et al. (2011), who emphasized the role of technological demands and overload in health outcomes. However, reported stress likely reflects multiple stressors. According to Lazarus and Folkman's (1984) transactional model, these perceptions are shaped by personal and contextual factors (personality traits, life circumstances and coping strategies).

General digital self-efficacy (GDSE) had a significant negative association with symptom frequency and interference. This suggests that while higher DSE may serve as a protective factor in mitigating the perceived impact of psychosomatic symptoms, it does not necessarily prevent their occurrence. These findings are in line with recent research on GDSE, which highlights its role in buffering job-related stress (Paredes-Aguirre et al., 2025). Self-directed digital training formats were more effective in enhancing GDSE than structured, directed programs, suggesting that personalized learning may be more beneficial in fostering digital coping skills. Similarly, Estrada-Muñoz et al. (2020) emphasize that technostress influences teacher performance, and that enhancing self-efficacy can reduce its effects. These insights emphasize the importance of investing in digital self-efficacy development, as a strategy to mitigate digital stress and its impact on well-being.

Computer use was not a significant predictor in either model. This finding aligns with research suggesting that stress associated with digital interactions and not mere usage, drives psychosomatic outcomes (Riedl et al., 2023). Age correlated weakly but significantly only with GDSE. Studies (Tekavc and Vončina, 2023) show both early-career and experienced teachers report high levels of work-related stress, indicating that professional experience may not significantly reduce stress exposure. One explanation for this may be the fast-paced and evolving demands of modern teaching environments, which pose challenges for teachers regardless of age or experience. This supports the conclusion that digital stress, rather than exposure to technology alone, is the key determinant of adverse health effects.

Results underscore the strong effects of digital stress on psychosomatic symptoms, highlighting its potential impact on well-being. While self-efficacy may serve a protective role in reducing symptom interference, its effect on symptom frequency was not statistically significant. The lack of significant effects of technology use suggests that digital stress, rather than technology use itself, is the key factor influencing psychosomatic outcomes.

These findings emphasize the argument that continuous professional development in digital literacy and stress management is essential for educators. Targeted interventions should be implemented in educational settings to reduce digital stress and improve teachers' physical and mental health. Results highlight the importance of interventions aimed at mitigating digital stress as a strategy to reduce adverse health effects and improve overall well-being. Schools and policymakers should promote digital well-being by limiting digital overload, improving work-life balance and providing adequate technical support.

Implications for Future Research

The Croatian DSS proved to be a reliable and valid instrument for measuring various dimensions of digital stress and is suitable for future research use. Given self-efficacy's potential protective role in reducing psychosomatic symptoms, teacher training programs should aim to strengthen digital confidence and coping strategies. Future research should also explore potential mediating and moderating variables such as coping mechanisms, sleep quality, or organizational support that may influence the relationship between digital stress and psychosomatic symptoms. Understanding these variables may guide the development of more effective interventions to enhance teacher well-being in digital environments.

Limitations

Despite its contributions, this study has certain limitations. The sample was relatively small and limited to Croatian teachers, limiting generalizability. Future research should replicate these findings in larger, more diverse populations and educational contexts. Given its correlational design, causal conclusions cannot be drawn. Longitudinal studies are needed to explore the long-term effects of digital stress on psychosomatic symptoms and potential mediators, such as coping strategies and workplace support.

As this study focused only on teachers, future research should examine whether similar patterns of digital stress occur across other digitally intensive work environments.

Data Availability Statement

The article is based on data fully presented and discussed within the article itself; therefore, no additional data archiving is required.

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Note: This paper benefited from language editing and writing assistance using OpenAI's ChatGPT, version GPT-4.

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REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
JOURNAL OF ELEMENTARY EDUCATION
Vol. 19, No. 1, pp. 51–76, March 2026

RECOGNIZING EVERYDAY MATHEMATICAL CONCEPTS IN A TEXT DEPICTING DAILY LIFE

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Potrjeno/Accepted
15. 12. 2025

Objavljeno/Published
18. 3. 2026

Abstract/Izvleček

This research investigates the relationship between mathematics teachers' performance and students' recognition of everyday mathematical concepts in real-world texts. A quantitative, non-experimental, multilevel correlational design was employed, utilizing Hierarchical Linear Modeling (HLM) to analyze nested data from 17 teachers and 796 middle school students. A text depicting daily life served as the data collection instrument. Results showed a statistically significant but limited fixed effect for teacher performance, explaining 6.2% of Level-2 variance. Regarding student-level factors, sixth graders underperformed compared to fifth and seventh graders, while gender showed no significant differences, supporting evidence of gender parity.

Ključne besede:
everyday mathematical concepts, HLM, teacher effects, grade level, gender.

Prepoznavanje vsakdanjih matematičnih pojmov v segmentu vsakdanjega življenja

Ta raziskava preučuje odnos med uspešnostjo učiteljev matematike in zmožnostjo učencev za prepoznavanje vsakdanjih matematičnih pojmov v besedilih iz stvarnega sveta. Uporabljen je bil kvantitativen, neeksperimentalen, večnivojski korelacijski načrt, pri čemer je bilo za analizo gnezdenih podatkov 17 učiteljev in 796 osnovnošolcev uporabljeno hierarhično linearno modeliranje (HLM). Kot instrument za zbiranje podatkov je služilo besedilo, ki opisuje vsakdanje življenje. Rezultati so pokazali statistično značilen, a omejen fiksni učinek uspešnosti učiteljev, ki pojasnjuje 6,2 % variance na ravni 2 (Level-2). Glede dejavnikov na ravni učencev so šestošolci dosegli slabše rezultate v primerjavi s petošolci in sedmošolci, medtem ko pri spolu ni bilo zaznati značilnih razlik, kar potrjuje dokaze o enakosti spolov.

Keywords:
vsakdanji matematični pojmi, HLM, učiteljski učinki, razredna stopnja, spol.

UDK/UDC:
373.3:51

DOI https://doi.org/10.18690/rei.5431

Introduction

Connecting mathematics to real-life situations is an essential aspect of mathematics teaching that aids in the integrated development of students' mathematical proficiency (NCTM, 2000; NRC, 2001). When lessons are rooted in everyday contexts, they become more relevant and engaging for students (Morris, 2003). For instance, out-of-school activities, such as those involving real money and shopping, play a crucial role in shaping the mathematical knowledge students bring into the classroom (Nunes et al., 1993). Therefore, integrating students' daily experiences with formal instruction is strategically mediated using everyday language, which serves as a critical bridge between students' real-world understanding and formal mathematical concepts. By translating mathematical symbols and ideas into the familiar context of daily speech, language supports students in recognizing mathematical principles embedded in authentic situations (Meiers and Trevitt, 2010). Ideally, math problems should incorporate words, symbols, and events that students encounter daily, providing opportunities for them to express mathematical terms in personally meaningful ways while negotiating the difference between everyday and formal classroom discourse (Adams et al., 2005).

However, while the pedagogical value of connecting mathematics to real-life contexts has long been recognized—especially within the frameworks of Realistic Mathematics Education (RME) (Freudenthal, 2002) and Contextual Teaching and Learning (CTL) (Johnson, 2002)—a closer examination of the existing literature reveals a critical gap that this study directly addresses. Prior research overwhelmingly concentrates on the later phases of mathematization, such as solving, interpreting, or modelling (Blum & Borromeo Ferri, 2009), typically assuming that the initial act of identifying the mathematical structure embedded within a realistic context occurs naturally and effortlessly (Stillman, 2011; Verschaffel et al., 2000). This assumption has rarely been scrutinized empirically.

The present study challenges that premise by shifting attention to: the ability to detect and recognize mathematical concepts within everyday texts before any formal solution process begins. This focus constitutes a departure from established RME/CTL work, which generally presumes that learners will seamlessly notice the mathematically relevant features of a context. Findings suggest that this noticing process is neither automatic nor trivial and may itself be a source of inequality in students' opportunities to mathematize real-world situations. Furthermore, Halliday's (1978) notion of the mathematical register

includes the capacity to unpack mathematical meanings that are embedded—often implicitly—within natural language. Similarly, Niss and Højgaard (2011) conceptualize such decoding as a prerequisite competence for participating in the mathematization process. Consequently, measuring "concept recognition in text" is not peripheral to mathematical language proficiency; it operationalizes a foundational component of it. Without the ability to identify mathematical structures in context, students cannot meaningfully engage in the discourse practices that RME and CTL assume. Thus, this study extends these theoretical traditions by empirically testing a competence that is logically prior to the types of communication typically examined.

Spontaneous (everyday) concepts and scientific (formal) concepts

When relating mathematics to everyday life for meaningful mathematics instruction, the interplay between language and conceptual development is critical. Within this context, the study adopts a synthesized framework that bridges Vygotsky's (1986) classic distinction between concept types with contemporary views on Mathematical Literacy (OECD, 2019) and Language as a Resource (Moschkovich, 2015).

Vygotsky emphasizes the interdependence of two conceptual types: spontaneous concepts, which emerge from personal, unsystematic everyday experiences, and scientific concepts, which are acquired through formal, structured instruction. Spontaneous concepts provide the necessary intuitive foundation, while scientific concepts restructure this thinking into a systematic whole. In the context of this study, Vygotsky's theory is operationalized by treating the 'concept recognition task' as the cognitive interface between these two domains. The everyday text represents the realm of spontaneous concepts (informal, context-dependent), while the mathematical terms to be identified represent scientific concepts (formal, systematic). Success in this task, therefore, indicates the successful mapping of spontaneous understandings onto formal scientific terminology.

This mapping process aligns with Moschkovich's (2015) perspective of 'language as a resource,' which argues that students' everyday language practices are not deficits but essential starting points for mathematical reasoning. Similarly, the OECD/PISA (2019) framework defines mathematical literacy as the capacity to formulate situations mathematically—a process that explicitly requires decoding the mathematical structure hidden within real-world (spontaneous) contexts. This interdependence can be illustrated through specific mathematical applications.

Abstract scientific concepts, such as zero or volume, are more effectively mastered when anchored in spontaneous perceptual experiences (Vygotsky, 1986). For example, a child's informal notion of "nothing there" (spontaneous) serves as a conceptual scaffold for approaching the formal symbol 0 (scientific) (Lakoff & Núñez, 2000). However, teachers must clarify that these everyday analogies are not literal definitions, as the number 0 possesses intrinsic formal properties. Similarly, everyday experiences of heaviness or fullness provide the initial grounding for formal concepts of mass and volume. Thus, 'recognizing' a concept in text is interpreted here as the moment where the student recruits their spontaneous resources to access the scientific register.

Furthermore, pedagogical guidelines such as the NCTM (2000) communication standard support this transition. By allowing students to use informal language initially and guiding them toward precision, instruction respects the Vygotskian trajectory from spontaneous to scientific. This approach is validated by empirical examples, such as Meriwether (1997) using food arrangements to teach geometry, or Dowling (1992) utilizing comparative situations (Schleppegrell, 2004).

Teachers' use of mathematical language

Spontaneous, everyday concepts provide students with informal, intuitive, and experience-based understandings that form the foundation for learning formal mathematical concepts (Nelson, 1995; Vygotsky, 1986). Research indicates that the development of mathematical concepts is supported through frequent engagement in mathematical discourse, where students articulate ideas, justify reasoning, and interact with peers and teachers, fostering the co-construction of mathematical understanding (Cobb et al., 1993). For example, home mathematics activities and mothers' math talk have been shown to predict children's early math skills and use of mathematical language (Oğul and Aktaş, 2020). Similarly, participation in out-of-school mathematics programs helps students recognize and engage with mathematics in real-world settings, thereby reinforcing their conceptual understanding (Duatepe-Paksu et al., 2022). Integrating everyday experiences with structured discourse allows students to bridge informal knowledge and formal instruction, facilitating the transition from spontaneous to scientific concepts and enhancing conceptual understanding in mathematics. In addition to that, prior research has consistently demonstrated that language plays a pivotal role in shaping both perception and cognitive processing. For example, Whorf (1956) emphasized

that linguistic structures influence thought patterns, and Başkan (1974) further illustrated this by showing that individuals with a richer vocabulary for colour terms could distinguish shades more effectively. These findings highlight the broader principle that language is not merely a vehicle for expressing mathematical ideas-it fundamentally shapes one's performance in recognizing and understanding them.

Within mathematics education, this connection between daily life language and conceptualization becomes especially critical. Researchers have long underscored that teachers' effective use of informal, real-world examples and everyday language serves as a bridge to more formal mathematical reasoning (Moschkovich, 2002). However, despite its importance, implementing accurate and meaningful mathematical language in the classroom remains a challenge. Students often struggle with words that hold different meanings in mathematical and everyday contexts, leading to misconceptions or incomplete understanding (Pimm, 1987). These linguistic challenges are not limited to students; they extend to preservice and in-service teachers as well. Umay (2003) found that some preservice teachers inaccurately identified non-mathematical everyday words such as seat and bus as mathematical concepts, suggesting underlying weaknesses in their pedagogical content knowledge. Similarly, Fırat and Dinçer (2018) reported that preservice teachers frequently relied on a very narrow set of mathematical terms—mostly limited to counting, numbers, and simple measurement—when communicating in classroom settings. This limited linguistic repertoire is concerning because research has shown that a teacher's precise and consistent use of mathematical language is essential for fostering deep conceptual understanding in children (Boonen et al., 2011).

Significance of research

Considering these challenges, it can be said that effective mathematics instruction requires teachers to be intentional and reflective in their daily life and mathematical language use. High-quality teaching involves fostering environments rich in mathematical discourse, where students can articulate their ideas, reason through concepts, and engage in mathematically meaningful dialogue (Franke et al., 2007; Sfard, 2008). Studies by Barwell (2016), and Prediger and Wessel (2013) also demonstrate that when teachers explicitly support students' navigation between everyday and mathematical registers, students' recognition of mathematical concepts in authentic contexts increases significantly. Thus, the interplay between language,

cognition, and instructional practice forms the foundation for student performance in identifying and interpreting everyday mathematical ideas.

Given the central role of language and teachers' professional use of mathematical terminology in shaping students' understanding, it becomes essential to examine how effectively teachers themselves recognize everyday mathematical concepts. If teachers struggle to identify the mathematical ideas embedded in daily contexts or fail to translate these into accurate mathematical language, their students are likely to experience similar or even amplified difficulties. Despite the substantial body of research emphasizing the importance of mathematical language, limited attention has been given to the direct relationship between teachers' performance in recognition of everyday mathematical concepts and their students' parallel performance in so doing. Moreover, it remains unclear whether this relationship varies across different student groups, particularly in terms of grade level and gender—factors known to influence students' mathematical performance in other domains. Addressing these gaps, the present study aims to investigate the performance of middle school mathematics teachers and their students in identifying everyday mathematical concepts within a text, to determine whether teachers' performance predicts that of their students, and to examine potential differences across students' grade levels and gender. In this context, the research questions of the study are structured as follows:

RQ 1. What is the performance of middle school mathematics teachers and their students in recognizing everyday mathematical concepts embedded within a non-mathematical text?

RQ 2. To what extent does the performance of mathematics teachers in recognizing everyday mathematical concepts within the text affect the performance of their students in recognizing the same concepts?

RQ 3. What is the effect of students' grade level and gender on their performance in recognizing everyday mathematical concepts embedded within the text?

Existing literature often assumes that teachers' proficient use of mathematical language naturally supports students' conceptual recognition, yet this assumption remains insufficiently examined through empirical evidence. Moreover, although demographic factors such as grade level and gender are known to influence students' mathematical achievement more broadly (e.g., Hyde et al., 2008; McKeen, 2019), there are not enough studies to date that have investigated whether these differences

also emerge in identifying everyday mathematical concepts, nor whether teacher competence contributes to such variation.

By addressing these underexplored areas, the present study provides a novel and necessary contribution to research on mathematical language, teacher expertise, and students' conceptual access in real-world contexts.

Method

Research design

Considering the purpose of the study and the nested structure of the data, in the frame of a non-experimental and quantitative research design, multilevel correlational design with Hierarchical Linear Modeling (HLM) was employed because the primary aim of the study was to examine naturally occurring differences and the relationships between teacher- and student-level variables. Given that students are nested within teachers, the data possesses a hierarchical structure that violates the independence assumption of traditional regression analyses. To appropriately account for this nesting, hierarchical linear modelling (HLM) was used, allowing for the partitioning of variance at both the teacher and student levels and providing unbiased estimates of the associations between teachers' success, student characteristics (grade level and gender), and students' recognition of everyday mathematical concepts (Raudenbush and Bryk, 2002).

Participants

The population of the study consisted of mathematics teachers working in public middle schools in a mid-sized city centre and their students. In the given region, there are a total of 68 public middle schools, forming the sampling frame for the study. Using a cluster sampling approach, approximately 10% of these schools (7 schools) were randomly selected. Within the selected schools, mathematics teachers who volunteered to participate were included in the study, along with their students. Ultimately, data were collected from 17 mathematics teachers and 796 students taught by these teachers. Table 1 presents the distribution of students by teachers, along with their grade level and gender.

Table 1
Participant details

Teacher ID	Students grade level	Students n (female +male)	Teacher ID	Students grade level	Students n (female + male)
1	8	14 + 17 = 31	10	7	31 + 17 = 48
2	5	19 + 23 = 42	11	5	22 + 22 = 44
3	6	24 +17 = 41	12	8	54 + 42 = 96
4	8	22 + 15 = 37	13	5	10 + 7 = 17
5	5	14 + 13 = 27	13	7	15 + 11= 26
5	7	13 + 17 = 30	14	5	14 + 16 = 30
6	6	27 + 27 = 54	15	5	20 + 21= 41
7	6	17 + 24 = 41	16	7	16 + 12 = 28
8	7	21 + 21 = 48	16	8	11 + 12 = 23
9	7	11 +12 = 23	17	6	26 + 24 = 50
9	8	14 + 5 = 19			

The cluster sampling approach, combined with voluntary teacher participation, allows for meaningful examination of the relationships between teachers' recognition of everyday mathematical concepts and students' corresponding performance. Nevertheless, because the sample includes only a subset of schools and teachers from the city centre, caution is warranted when generalizing the findings to the broader population. Since the data were collected from schools of different sizes and participation was voluntary, the number of students from whom data were collected varied across teacher groups. Consequently, the number of students associated with each teacher also differed.

Data collection instrument

A text designed by Umay (2003), depicting a segment of daily life, was used as the data collection instrument in this study. Participating teachers and students were asked to identify and mark the mathematical concepts within the text. The data collection was conducted in schools, with students and teachers completing the task in their own classrooms. The English-translated version of the text used as the data collection instrument is provided in the appendix.

The text contains a total of 40 distinct mathematical concepts grouped into 13 mathematical categories (dimensions), as shown in the scoring key (Umay, 2003). These categories range from basic concepts like time-measurement (e.g., 9.30,

Saturday) and quantity-number (e.g., two [bites], three [people]) to more abstract concepts like operation (e.g., change, losing [money]) and comparison (e.g., shorter, at least). Each identified concept constitutes a separate item. The total score for each participant is the count of correctly recognized concepts. According to aim of the study, it is important to note that while the scoring key includes 13 distinct categories (time, quantity, operation, etc.), the analysis in this study focuses exclusively on the total number of concepts correctly recognized across the entire text, rather than performance within individual categories.

Given that the instrument requires participants to freely identify concepts within a text, consistency in applying the established scoring key is paramount. Although Umay (2003) provided a comprehensive key of 40 mathematical concepts, to ensure rigorous scoring, two independent researchers were trained to use the pre-validated scoring key (Umay, 2003) to code a randomized sample of participant responses. Inter-rater reliability was subsequently calculated using Cohen's Kappa to assess the agreement between the two raters on the concept identification task. The resulting coefficient was 0.93, indicating excellent agreement and confirming the high objectivity and replicability of the scoring process.

Data analysis

The text used as the data collection instrument contained a total of 40 mathematical concepts. The scoring for the concept identification task was criterion-referenced, utilizing the pre-validated key established by Umay (2003). Each concept correctly identified by the participants was awarded one point, while missed concepts or incorrect markings received no points. In this way, participants obtained a total score based on the number of correct concepts they identified. These total scores were referred to as the participants' performance in recognizing mathematical concepts. Therefore, the minimum possible score was 0, and the maximum possible score was 40. This total score served as the primary dependent variable, representing the participant's overall performance in recognizing mathematical concepts. The high internal consistency of the instrument, previously established, ensures that the total score accurately reflects this single, underlying construction.

The scores reflecting students' performance in recognizing mathematical concepts served as a continuous dependent variable, whereas the scores reflecting mathematics teachers' performance in the same text functioned as a continuous primary independent variable. The control variables in the study were students' grade

level and gender, both of which are categorical. Finally, each teacher, i.e., the teacher level, was treated as a random effect.

Since the data had a nested structure, with students grouped under teachers, multilevel mixed-effects models within the framework of Hierarchical Linear Models (HLM) were employed (Raudenbush and Bryk, 2002). In the analysis models, students were classified as Level-1 and teachers as Level-2, adopting a two-level hierarchical structure. The statistical analysis was conducted using SAS® Studio, running the SAS 9.4 version of the statistical software package. Given the hierarchical data structure (students nested within teachers), the PROC MIXED procedure was employed for all inferential tests. The models consistently utilized the Restricted Maximum Likelihood (REML) method for parameter estimation, which is a standard and robust approach for mixed modelling and assumed a residual covariance structure to properly partition the variance at the teacher and student levels. The teacher variable (teacher id) was explicitly designated as the subject effect in the random statement to account for the non-independence of student scores within the same classroom. Furthermore, while some models utilized the containment method for degrees of freedom, the more complex models employed the Kenward-Roger method to ensure a more accurate and conservative estimation of standard errors and degrees of freedom for the fixed effects, thereby enhancing the rigor of the statistical inference.

The decision to model heterogeneous residual variance based on the combined factor of student gender × grade level was evaluated using information criteria. The analysis revealed substantial differences in within-group variability, with residual variance estimates ranging from 4.89 to 17.14 across subgroups. When this heterogeneous variance structure was introduced, a more favourable Akaike Information Criterion (AIC: 4006.2) was observed compared to the homogeneous alternative, confirming that accounting for this heterogeneity was necessary for accurate model fit. Initially, a model assuming homogeneous residual variance across all gender × grade level subgroups was fit. However, preliminary examination of residuals and formal tests for variance heterogeneity revealed significant differences in within-group variability of student performance. Ignoring this heterogeneity would violate the assumption of independent and identically distributed errors, potentially biasing standard errors and compromising inference regarding fixed effects. Therefore, the residual covariance structure was refined to allow residual variance to differ across the gender × grade level subgroups, implemented via the

GROUP= option in the REPEATED statement. This specification ensures accurate parameter estimation and reliable hypothesis testing for the fixed effects.

The analysis first examined whether the assumptions of HLM were met. Although initial diagnostic procedures, including Q-Q plots and histograms of standardized residuals, suggested minor deviations from strict normality, the analysis was deemed robust given that the skewness and kurtosis coefficients were within the ±2 range (George and Mallery, 2010; Kline, 2011) and the dataset indicated a sufficiently large sample, it was concluded that parametric tests could still be applied (Tabachnick and Fidell, 2013).

To address the lack of homogeneity of variances, appropriate measures were taken during the analysis. First, the gender × grade level combination was defined as a group effect, and separate residual variances were estimated for each combination. This approach relaxed the homogeneity assumption by explicitly modelling heterogeneous variance for each gender × grade level combination, as recommended in the literature (West et al., 2022). Second, Restricted Maximum Likelihood (REML) was used as the estimation method. REML reduces bias in variance component estimates, particularly in unbalanced datasets and in the presence of heterogeneous variance (Patterson and Thompson, 1971). Finally, the standard errors and degrees of freedom for the fixed effects were calculated using the Kenward–Roger adjustment. The Kenward–Roger method is a reliable approach developed to provide more accurate p-value estimates in mixed models under conditions of heterogeneous variance and small sample sizes (Kenward and Roger, 1997). Together, these three methods enhanced the reliability of the analysis results in situations where the homogeneity of variance assumption was not met.

Results

Teachers' and students' performance in recognizing everyday mathematical concepts within the text

The scores obtained for teachers and students based on the scoring procedure are presented in Table 2.

According to Table 2, among the teachers, the lowest performance in recognizing mathematical concepts within the text was observed for teacher 16, who correctly identified 7 out of 40 concepts, corresponding to a 17.5% performance rate. In contrast, the highest performance among teachers was achieved by teacher 15, who identified 24 correct concepts out of 40, yielding a 60% performance rate.

Table 2
Teachers' and students' performance in recognizing everyday mathematical concepts

Teachers			Students					
			n			mean score		
ID	mean score	grade level	female	male	all	female	male	all
1	16.00	8	14	17	31	10.2	10.1	10.16
2	12.00	5	19	23	42	10.7	10.3	10.50
3	13.00	6	24	17	41	6.9	6.8	6.88
4	16.00	8	22	15	37	9.0	8.8	8.89
5	11.00	5	14	13	27	9.9	9.7	9.79
5		7	13	17	30	10.1	9.5	
6	19.00	6	27	27	54	9.8	9.8	9.80
7	21.00	6	17	24	41	10.3	10.1	10.22
8	12.00	7	27	21	48	10.4	10.3	10.35
9	11.00	7	11	12	23	9.8	9.6	9.79
9		8	14	5	19	9.9	9.7	
10	12.00	7	31	17	48	9.7	9.6	9.63
11	8.00	5	22	22	44	8.8	8.7	8.75
12	8.00	8	54	42	96	9.5	9.3	9.44
13	9.00	5	10	7	17	10.6	10.5	10.67
13		7	15	11	26	10.8	10.6	
14	11.00	5	14	16	30	9.5	9.1	9.30
15	24.00	5	20	21	41	12.9	12.6	12.78
16	7.00	7	16	12	28	9.1	8.7	8.92
16		8	11	12	23	9.0	8.8	
17	14.00	6	26	24	50	9.6	9.5	9.54

For students, the lowest performance was observed in the class of teacher 3, with an average of 6.88 correct concepts out of 40 (17.2% performance rate). Conversely, the highest student performance was in the class of teacher 15, with an average of 12.78 correct concepts out of 40 (31.95% performance rate).

These findings indicate that teachers' scores in recognizing mathematical concepts did not exceed 24 out of 40, with a mean score of 13.18. Students' performance in recognizing concepts reached a maximum average score of 12.78, with an overall mean of 24.28. Additionally, it is noteworthy that the highest performance was observed for teacher 15 and the students of teacher 15, regardless of gender, for both girls and boys.

Model

The random effects and their components included in the model is presented in Table 3.

Table 3
Random effects and residual variances

Parameter	Level / Group (gender × grade)	Estimated Variance
Intercept (Teacher_ID)	Teacher level random intercept	0.62
Residual	Male × 5th grade	17.14
Residual	Male × 6th grade	7.25
Residual	Male × 7th grade	10.07
Residual	Male × 8th grade	9.67
Residual	Female × 5th grade	13.91
Residual	Female × 6th grade	5.48
Residual	Female × 7th grade	4.89
Residual	Female × 8th grade	6.66

As seen in Table 3, 6.2% of the total variance is attributable to differences between teachers (ICC = 0.062). This indicates significant differences in teachers' performance scores in recognizing mathematical concepts, and it is clear that students of some teachers systematically perform better in recognizing mathematical concepts compared to others. Moreover, the analysis revealed that teacher efficacy has a significant positive effect on student performance (γ= 0.1745, se = 0.056, t = 3.09, $p < .01$). Specifically, a one-unit increase in teacher efficacy score relates to a 0.1745-point increase in student concept recognition scores.

Furthermore, based on the residual variances obtained for each group, the highest variance was found in the 5th-grade male group, indicating that the performance of these students in recognizing mathematical concepts is highly variable. Conversely, the lowest variance was observed in the 7th-grade female group, suggesting that these students' performance scores are more consistent and closely aligned. Information on the Type 3 tests for the fixed effects included in the model is presented in Table 4.

As shown in Table 4, teachers' performance has a positive and significant effect on students' performance ($F = 9.55$; $p = .007$). Similarly, the overall effect of grade level on student performance is significant ($F = 3.06$; $p = .042$), whereas the overall effect of gender was not significant in the Type III test ($F(= 0.02$; $p = 0.885$).

Table 4
Type 3 tests for fixed effects

Effect	Num df	Den df	F	p	Decision
Teacher Performance	1	15.8	9.55	0.007	significant
Grade	3	30.6	3.06	0.042	significant
Gender	1	637	0.02	0.885	not significant

($p < 0.05$)

Effect of mathematics teachers' performance on student performance

It was concluded that mathematics teachers' performance in recognizing mathematical concepts within the text significantly affects their students' performance in recognizing the same concepts. The related estimates are presented in Table 5.

Table 5
Fixed effect estimates for teacher performance

Effect	Coefficient (β)	se	df	t	p	95% CI Lower	95% CI Upper	Decision
Teacher Performance	0.1745	0.0565	15.8	3.09	0.007	0.055	0.294	significant

According to the table, a one-unit increase in teachers' performance in recognizing concepts within the text is associated with an average increase of 0.1745 units in student performance in recognizing the same concepts, and this effect was found to be statistically significant ($p < 0.05$).

Effect of students' grade level on performance

The fixed effect estimates obtained from the analysis examining the impact of students' grade levels on their performance in recognizing mathematical concepts within the text are presented in Table 6.

Table 6
Fixed effect estimates for grade level

Grade (Ref: 8th grade)	Coefficient (β)	se	df	t	p	Decision
5th grade	0.3183	0.5651	41.9	0.56	0.576	not significant
6th grade	-1.3268	0.6491	15.7	-2.04	0.058	not significant
7th grade	0.5333	0.4445	80.5	1.20	0.234	not significant

($p < 0.05$)

In the analysis, where 8th-grade students were taken as the reference group, the most notable difference was observed among 6th-grade students. Specifically, 6th graders scored an average of 1.3268 units lower than 8th graders; however, this difference was not statistically significant ($t = -2.04$; $p = .058$). Similarly, the differences between 8th graders and students in 5th grade ($t = 0.56$; $p = .576$) and 7th grade ($t = 1.20$; $p = .234$) were smaller and not statistically significant.

To present these findings in greater detail, the LSMeans values obtained are shown in Table 7, and the results of the pairwise comparisons using the Tukey-Kramer method are presented in Table 8.

Table 7
Estimated mean scores (LSMeans) by grade level

Grade	Mean	se
5th grade	10.0705	0.4177
6th grade	8.4255	0.4906
7th grade	10.2856	0.3528
8th grade	9.7523	0.3981

Table 7 presents the adjusted mean performance scores for each grade level. The highest mean score was observed in 7th grade, while the lowest was in 6th grade. These differences are directly comparable because they were calculated while controlling for the effects of other variables in the model.

According to Table 8, the multiple comparison analysis examining the statistical significance of differences between grade levels revealed significant differences only between 5th and 6th grades (adj $p = .02 < .05$) and between 6th and 7th grades (adj $p = .03 < .05$).

Table 8

Tukey-Kramer results by grade level

Compared Grades	Difference	se	df	t	p-adj	Decision
$5^{th} - 6^{th}$	1.6451	0.6428	17	2.56	0.020	significant
$6^{th} - 7^{th}$	-1.8601	0.6349	16.4	-2.93	0.031	significant
Other Pairs	—	—	—	—	>0.05	not significant

($p < 0.05$)

As seen from the mean scores in Table 7, these differences are in favour of the higher-grade students. Specifically, 6th-grade students performed 1.64 units lower than 5th graders and 1.86 units lower than 7th graders.

Effect of students' gender on performance

The fixed effect estimates obtained from the analysis examining the impact of students' gender on their performance in recognizing mathematical concepts within the text are presented in Table 9.

Table 9

Fixed effect estimates for gender

Gender (Ref: Female)	Coefficient (β)	se	df	t	p	Decision
Male	0.0304	0.2110	637	0.14	0.885	not significant

($p < 0.05$)

The average score of male students was only 0.03 points higher than that of female students, and this difference was not statistically significant ($p = .885 > .05$). This finding indicates that gender does not have a significant effect on student performance.

Conclusion and Discussion

In this study, HLM was employed to examine the effects of various factors on student performance in recognizing mathematical concepts within a text depicting a segment of daily life. The variables considered included the mathematics teachers' performance in recognizing the same concepts within the text, students' grade levels, and their gender. The findings indicate that teachers' performance in recognizing mathematical concepts and students' grade levels significantly affect student performance in recognizing the concepts within the same text, whereas students' gender was found to have no such effect.

The initial results also showed that both teachers and students demonstrated relatively low performance in recognizing mathematical concepts within a verbal text dealing with daily life. Similar results have been reported in the literature. For example, Umay (2003) mentions that preschool teacher candidates struggled to determine daily life mathematical concepts, and Şahin and Korkmaz (2019) found that preschool children frequently made errors with concepts such as "circle," "side," "wide–narrow," and "yesterday–today–tomorrow," with conceptual confusion being the most common type of error.

These findings can be meaningfully interpreted through Vygotsky's theory of concept formation and the Zone of Proximal Development (ZPD). According to Vygotsky, students progress from everyday concepts to scientific concepts through guided mediation, in which teachers support learners within their ZPD using linguistic clarification, guided questioning, and concept-focused dialogue. Within this framework, the statistically significant yet limited effect of teacher performance observed in the study may reflect the extent to which teachers were able to provide effective scaffolding for students as they worked to identify mathematical ideas embedded in everyday language. Teachers who were more successful in recognizing these concepts themselves would be better positioned to offer verbal scaffolding, targeted explanations, and structured interactions, all of which help students bridge familiar, context-based interpretations with formal mathematical meanings. Thus, the findings suggest that while teacher mediation plays a meaningful role in students' conceptual recognition, substantial variation remains attributable to factors beyond the teacher's immediate capacity to scaffold learning within students' ZPD.

A closer examination of the findings reveals that although the teacher effect was statistically significant, it accounted for only 6.2% of the total variance, suggesting a limited practical impact. While a variance of 6.2% might appear modest statistically, it represents a substantial effect in the context of educational research, where teacher effects typically range between 5% and 20% (Hedges and Hedberg, 2007). On the other hand, 93.8% of the variation is attributable to factors beyond teachers' influence, such as student-level characteristics, family background, and school resources. Therefore, while the teacher effect is non-negligible, it should be characterized as a modest contributory factor rather than a strong causal determinant. Research consistently reports that although teacher quality exerts a measurable effect on achievement, its contribution is modest compared with other influences (Chetty et al., 2014; Jackson et al., 2014). Furthermore, research confirms that a teacher's use of precise mathematical language is a critical component of

effective instruction and a predictor of student achievement (Moschkovich, 2003; Moschkovich, 2007). In sociocultural terms, Wertsch (1988) emphasizes that mediation depends not only on the presence of a knowledgeable adult but also on the appropriateness and accessibility of the symbolic tools—especially language—used in instruction. Therefore, even when teachers themselves recognize mathematical concepts effectively, students may still struggle if mediation does not explicitly support how mathematical ideas are encoded in everyday language. In other words, most of the variation (93.8%) is attributable to student-level factors and other contextual variables. From a theoretical perspective, this aligns with Vygotsky's ZPD framework, which posits that teachers can provide scaffolding to support students' progression from everyday to formal mathematical concepts, while overall development also depends on each student's readiness, prior knowledge, and engagement. Practically, this finding suggests that although enhancing teacher efficacy is important, additional strategies—such as targeted scaffolding, guided dialogue, and structured classroom supports—are necessary to maximize students' ability to recognize and apply mathematical concepts in real-world contexts.

The limited size of the teacher effect in this study may stem from several factors. First, the outcome measure—students' recognition of mathematical concepts in a highly context-specific text—may reflect influences beyond direct instruction. In line with this, Sfard's (2008) argument that mathematical thinking develops through participation in discourse suggests that students' difficulties may arise when everyday and mathematical discourses are insufficiently bridged. Similarly, Moschkovich (2005) notes that learners require linguistic scaffolding to navigate between everyday talk and mathematical registers, further indicating that discourse-related challenges may dilute the measurable impact of teachers. Taken together, these perspectives may partially explain why teacher performance accounted for a relatively small proportion of variance in the present study. A critical contextual factor to consider in interpreting these results is the highly centralized nature of the Turkish education system.

In Turkey, the Ministry of National Education dictates the curriculum, textbooks, and instructional pacing, leaving teachers with limited autonomy regarding course content. Typically, in such standardized environments, one might expect the variance attributable to teachers to be minimized. However, our findings reveal a significant teacher effect (ICC = .062) and a positive correlation between teacher efficacy and student performance. This suggests that even within a rigid, centralized structure, the delivery of instruction is as critical as the content itself. The significant

impact of teacher efficacy implies that how teachers interpret, adapt, and present the standardized curriculum creates a substantial difference in students' ability to recognize mathematical concepts. Thus, teacher efficacy emerges not just as a personal trait, but as a vital compensatory mechanism that diversifies student outcomes in an otherwise uniform system.

Another critical factor influencing students' performance was grade level. The analysis revealed significant fluctuations across grades, where seventh-grade students demonstrated the highest performance, while sixth-grade students performed the lowest. Specifically, the least squares means analysis reveals a sharp decline in 6th grade ($M = 8.42$) compared to 5th grade ($M = 10.07$), representing a significant mean difference of 1.64 points ($p < .05$). However, this trend reverses in 7th grade ($M = 10.28$), where students score significantly higher than their 6th-grade peers (mean difference = 1.86, $p < .01$).

This trajectory reflects the broader instructional shift from concrete arithmetic to more abstract domains characteristic of middle school mathematics ((NRC,2001). In the context of the national curriculum, the sixth grade serves as a pivotal transitional year, introducing integers and symbolic algebraic reasoning. Research highlights that such abrupt increases in curricular complexity may temporarily hinder performance before stabilizing in later grades (Common Core State Standards Initiative, 2010). This aligns with Vygotsky's notion of developmental readiness within the Zone of Proximal Development (ZPD), suggesting that these new instructional expectations may temporarily outpace students' conceptual development. Consequently, the observed decline in sixth grade represents a mismatch between curricular pacing and students' developmental needs, primarily driven by the specific transitions within the national mathematics curriculum. Unlike the fifth-grade curriculum, which often reinforces arithmetic fluency, the sixth-grade curriculum introduces distinctively abstract domains—such as integers and algebraic expressions—for the first time (MoNE, 2018, 2024).

This shift necessitates a transition from concrete operations to abstract reasoning, resulting in a temporary performance dip due to increased cognitive load. The subsequent recovery in seventh grade indicates a successful adaptation to these new cognitive requirements. This pattern underscores the critical importance of scaffolding that effectively bridges real-life contexts with abstract mathematical concepts. Furthermore, this phenomenon is supported by recent international curriculum analyses, suggesting it is not isolated to the national context. For instance, Tugores et al. (2025) found that the cognitive demands of primary mathematics

curricula in Spain and Portugal progress unevenly, indicating that difficulty does not increase linearly across grades. Similarly, Leite and Valente (2024) reported that the mathematics curriculum in Portugal's early grades already possesses relatively high cognitive demand. These comparative findings suggest that the challenge of adapting to nonlinear increases in cognitive requirements is a shared characteristic across different educational systems.

Finally, students' gender was examined and found to have no statistically significant effect on performance. This aligns with extensive meta-analytic evidence suggesting that gender differences in mathematics achievement are negligible, particularly during adolescence (Else-Quest et al., 2010; Hyde et al., 1990). However, beyond general achievement, the specific nature of the task offers a deeper explanation for this parity. Unlike traditional assessments that prioritize procedural fluency or spatial reasoning—domains where male advantages have occasionally been reported—the concept identification task employed in this study relies heavily on linguistic processing. Success in this task requires not only mathematical knowledge but also the ability to decode text and map verbal descriptions to mathematical constructs. Research consistently indicates that female students demonstrate distinct advantages in reading literacy and verbal processing tasks (Robinson and Lubienski, 2011; Voyer and Voyer, 2014). Consequently, the strong linguistic component of this instrument likely counterbalanced any potential disparities in pure procedural domains, resulting in the observed equilibrium (Robinson and Lubienski, 2011).

Together, these findings provide a deeper understanding of how teacher mediation, linguistic complexity, curricular transitions, and sociocultural factors influence the recognition of everyday mathematical concepts. The results highlight the importance of instructional approaches that explicitly bridge everyday and mathematical discourse and ensure that scaffolding aligns with students' developmental levels within their ZPD.

Suggestions

A primary recommendation is for educators to cultivate a profound awareness of the linguistic challenges inherent in mathematics. It is essential for teachers to explicitly address the linguistic ambiguities, modelling precise vocabulary and providing clear distinctions between the colloquial and the technical uses of terms.

Furthermore, leveraging students' existing knowledge is critical for effective teaching. According to Vygotsky's framework, students first develop spontaneous

concepts from their practical, day-to-day experiences. Teachers should use these informal ideas as a bridge to introduce and develop scientific concepts acquired through formal instruction. By grounding abstract mathematical ideas in students' lived experiences, educators can help them transition from concrete understandings to the more formal and systematic knowledge required for higher-level mathematics. The correct and appropriate use of mathematical concepts is fundamental, as these concepts allow learners to organize information effectively (Dinçer and Ulutaş, 1999). Mathematical concepts form the foundation of instruction and are interconnected in a sequential, hierarchical order (Dede and Argün, 2004). Furthermore, these concepts are vital for the development of fundamental mathematical thinking (Toumasis, 1995).

Finally, instructional practices should prioritize mathematical discourse to foster fluency in the mathematical register. Teachers should create opportunities for students to actively engage with mathematical language by encouraging them to see, hear, say, and write mathematical vocabulary in context. This active participation helps students become more comfortable and confident in communicating their reasoning and ideas, allowing teachers to better assess their conceptual understanding. By becoming facilitators of this process, educators can empower students to navigate the complexities of mathematical language and thinking.

In this study, students' grade level and gender were considered as independent variables. In different studies, other variables such as socioeconomic status or parents' education level could be considered, and a broader study could be conducted with different participant groups.

Limitations

While contextual factors such as the centralized curriculum play a role, we acknowledge that the magnitude of the observed teacher effect may also be constrained by how teacher performance was operationalized in this study. The variable used to assess teacher performance—scores obtained from recognizing mathematical concepts—primarily measures the teachers' cognitive content knowledge rather than their actual instructional quality or classroom practices. While content knowledge is a prerequisite for effective teaching, it does not guarantee it. A teacher may demonstrate high performance in conceptual recognition tasks but may face challenges in pedagogical transmission or classroom management.

In addition to that, regarding the data collection tool, the scoring method adopted by Umay (2003) is based on the number of correctly identified concepts without penalizing incorrect markings. Within the scope of this study, the response sheets were qualitatively examined, and since no tendency toward random marking or guessing was observed, the original scoring system used in the development of the data collection tool was retained. However, in future studies, if a pattern such as random marking is detected in the answer sheets, it will be necessary to apply a corrective formula for estimates to strictly control potential bias arising from false positives.

Furthermore, it is important to consider statistical limitations related to model specification and sample size. The HLM analysis was conducted with 17 teachers at Level-2. While sufficient for estimating fixed effects, this sample size may limit the statistical power to detect smaller effect sizes. Furthermore, it is acknowledged that small cluster sizes can lead to biased standard errors for Level-2 variance components, potentially affecting the precision of teacher-level random effects. Additionally, if the participating teachers share similar educational backgrounds, a potential range restriction in the performance scores might have suppressed the correlation, naturally constraining the measurable variance attributable to teachers

Data Availability Statement

The article is based on data fully presented and discussed within the article itself; therefore, no additional data archiving is required.

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Appendix: A snapshot of daily life

When Ali opened his eyes in the morning, he looked around with suspicious eyes for a moment to understand where he was. They had worked with the people at the office until late at night and were very tired. He had only been able to get home in the early morning. He immediately looked at his watch: 9:30. He was late. He jumped up and rushed out of the house without even brushing his teeth. As he ran down the stairs three steps at a time, he heard his mother calling from behind, "Son, where are you going without eating a bite? What's the hurry?"

At the bus stop, there were only three people. He handed a 5-million banknote to the clerk at the kiosk next to the stop and said, "One ticket…" As he took the ticket the clerk handed him, the bus pulled up to the stop. The clerk shouted after him, "Sir, you didn't take your change!" while he quickly jumped onto the bus. *If I don't make it to the auction, how many five million would I lose, if only they knew,* he thought to himself, laughing.

Half of the bus was empty. His astonishment gradually increased. "I have at least 10 km to go, it looks like I can sit," he thought happily. Soon, a man in his mid-to-late 30s to 40s, shorter than him and with dark skin, sat next to him and opened his newspaper to read. Ali glanced at the headlines out of the corner of his eye. Then his gaze fell on the TV screen on the man's lap. At that moment, he suddenly understood why the bus stop and the bus were so empty. TODAY WAS SATURDAY, AND IT WAS A HOLIDAY!!!!

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REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
JOURNAL OF ELEMENTARY EDUCATION
Vol. 19, No. 1, pp. 77–91, March 2026

INTEGRATING GENERATIVE AI IN PRIMARY ENGLISH MATERIAL DESIGN: INSIGHTS FROM INDONESIAN TEACHERS' PERCEPTIONS

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Potrjeno/Accepted
15. 12. 2025

Objavljeno/Published
18. 3. 2026

Abstract/Izvleček

This study explored primary school teachers' perceptions of Generative AI (GenAI) in English material design. Data from 20 certified Indonesian teachers were collected through interviews and document analysis. Findings indicate GenAI is valued for enhancing efficiency and personalization, especially in creating worksheets, reading texts, grammar tasks, and vocabulary lists. However, concerns emerged regarding pedagogical integration, ethical use, and lack of training. Teachers' perceptions were shaped by their professional development experiences. The study underscores the urgent need for continuous, practice-based teacher training to develop AI literacy and ensure that GenAI supports, rather than replaces, instructional decision-making.

Integracija generativne umetne inteligence v oblikovanje učnih gradiv za angleščino v osnovni šoli: ugotovitve iz raziskav stališč indonezijskih učiteljev

V študiji smo raziskovali zaznave učiteljev osnovnih šol o uporabi generativne umetne inteligence (GUI; angl. Generative Artificial Intelligence – GenAI) pri oblikovanju učnih gradiv za pouk angleščine. Podatke dvajsetih učiteljev iz Indonezije smo zbrali z intervjuji in analizo dokumentov. Ugotovitve kažejo, da učitelji GUI cenijo zaradi povečanja učinkovitosti in personalizacije, zlasti pri ustvarjanju delovnih listov, bralnih besedil, slovničnih vaj in seznamov besedišča. Kljub temu so se pojavile skrbi glede pedagoške rabe, etične rabe in pomanjkanja tovrstnega usposabljanja. V študiji poudarjamo nujnost stalnega, na praksi temelječega usposabljanja učiteljev za razvoj tovrstne pismenosti in podporo pri pedagoških odločitvah.

Keywords:
Artificial Intelligence, English Material Design, Generative AI, Primary Education, Teacher Perception.

Ključne besede:
umetna inteligenca, oblikovanje učnih gradiv za angleščino, generativna umetna inteligenca, osnovnošolsko izobraževanje, zaznava učiteljev.

UDK/UDC:
[37.091.3:811.111]:004.8

DOI https://doi.org/10.18690/rei.5409

Introduction

Developing English learning materials for primary school education is crucial in supporting children's holistic growth. Early exposure to English significantly contributes to children's cognitive development and social skills, including communicative perspective-taking (Lucas, 2023). This foundational stage in language acquisition is closely linked to broader literacy gains and future academic success. Moreover, early English learning can nurture motivation and engagement, essential for sustained language learning progress (Tong et al., 2021). Teachers are key agents in this process, serving as designers who create and adapt materials to suit their students' developmental needs (Li et al., 2023). By tailoring content to their learners, teachers address diverse learning needs and enhance their pedagogical competence through the design process. Additionally, involving students in material development can boost their sense of ownership and increase their active participation in learning (Silvola et al., 2021).

The characteristics of instructional materials are central to facilitating effective language learning. To maintain learner interest and increase motivation, resources should be interactive and incorporate multimedia components, such as animated videos (Tugtekin and Dursun, 2022). For vocabulary development, meaningful repetition, dialogic reading, and integration of multimedia elements are effective (Chow et al., 2023). The most impactful resources offer a holistic approach by integrating language with content from other subjects, thereby enriching the educational experience. However, producing such tailored materials presents challenges. Recent advances in Artificial Intelligence (AI), particularly Generative AI (GenAI), offer new possibilities for overcoming these challenges.

GenAI tools, including ChatGPT, Bard, and Copilot, represent a significant innovation in AI. These tools use advanced machine learning to generate human-like text and visuals, making them adaptable for various educational applications (Rudolph et al., 2023). Within the context of English language learning, GenAI enables the development of personalized and context-sensitive materials. It can generate content that aligns with individual student needs, increasing engagement and supporting improved learning outcomes (Hu and Shao, 2025). GenAI also facilitates adaptive learning paths by adjusting content difficulty and pacing. Furthermore, it produces materials that reflect diverse cultural contexts and supports interaction through intelligent tutoring and real-time feedback systems (Eguchi et al., 2021).

AI is increasingly being integrated into educational practices due to its potential to enhance teaching and learning processes. It supports teachers in lesson planning, developing simulations, and designing adaptive assessments, which can improve instructional quality (Yeh, 2025). AI also assists in modifying curricula based on student performance, thereby maintaining relevance and effectiveness. In addition, AI helps with administrative duties such as grading, reducing the burden on teachers (Ahmad et al., 2022). Despite these benefits, several challenges remain. Algorithmic bias, where AI replicates social and cultural inequalities in its training data, must be addressed (Massala, 2023). Data privacy and security concerns also require attention, with strong safeguards necessary to protect student information (Al-Abdullatif & Gameil, 2020). Ethical considerations are equally important to ensure AI supports rather than undermines equity in education or the professional roles of teachers.

The academic literature on AI in education has grown significantly, focusing primarily on secondary and tertiary education contexts. Much of this research highlights general applications of AI, particularly GenAI, in teaching and learning (Moorhouse et al., 2024). A central focus has been on adaptive systems that personalize learning to increase engagement and outcomes (Hastomo et al., 2025). Studies often examine machine learning, data mining, and learning analytics to enhance educational practices, showing that AI-based tools can provide personalized feedback that improves student achievement (Chang et al., 2023). Intelligent tutoring systems and automated assessments have also been found to increase student participation and reduce teacher workload (Liu and Xiao, 2025).

In language learning, research has explored areas such as grammar and vocabulary, utilizing tools like chatbots and natural language processing to create more adaptive learning experiences (Marzuki et al., 2023). Despite the increasing body of literature, there are two notable gaps. First, there is a predominant focus on higher and secondary education. Second, limited attention has been given to the use of AI, particularly GenAI, in the development of instructional materials (Darwin et al., 2024; Mohamed, 2024; Safitri and Fithriani, 2024; Taşçı and Tunaz, 2024). Specifically, no existing studies have examined how primary school teachers perceive and apply GenAI in designing English learning materials. Understanding these perspectives is essential, as teachers' views influence the successful integration of new technologies into educational practice. To address this gap in the Indonesian context, the current study aims to investigate the following research questions:

1. How do primary school teachers perceive the integration of GenAI in designing English language learning materials?

2. What English learning materials are commonly developed by primary school teachers using GenAI?

Teachers' perceptions and technology adoption

Understanding teacher perceptions is essential for the successful adoption of educational technology. These perceptions significantly influence teachers' willingness to embrace and implement new tools. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) provide valuable frameworks for analysing this relationship (Lin et al., 2025). According to these models, perceptions of a technology's usefulness and ease of use are key predictors of teachers' behavioural intentions. Specifically, TAM identifies perceived usefulness and ease of use as the core determinants of technology acceptance, shaping attitudes and intentions (Ibrahim and Shiring, 2022). UTAUT builds upon this by incorporating additional constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions, collectively influencing actual usage behaviour (Al-Adwan et al., 2025).

In addition to these theoretical perspectives, teacher self-efficacy is a crucial factor. Teachers who believe in using technology effectively are more likely to develop positive attitudes and integrate it into their practice. This confidence can be enhanced through targeted training and institutional support. However, even when technology is available, several obstacles may hinder integration. These include inadequate infrastructure, limited training opportunities, and pedagogical misalignment (Cahyono et al., 2016; Gozali and Cahyono, 2022). Overcoming these challenges requires adequate resources and strong administrative and technical support. A supportive school environment can reinforce teacher confidence and foster the positive attitudes that are essential for successful implementation. While these models offer a general understanding of technology adoption, they gain renewed significance in dynamic contexts marked by rapid innovation. This is especially relevant for the emergence of GenAI. Despite its growing relevance, current research has not explored how these established frameworks apply to primary school teachers' perceptions of using GenAI to design English language learning materials. This gap highlights the need for further investigation in this specific context.

Methods

Research Design

This study employed an interpretivist-constructivist paradigm to explore the nuanced interaction between teachers and GenAI in educational settings (Lincoln and Guba, 1985). This paradigm views reality as a subjective construct shaped by individual experiences, making it suitable for examining teachers' perceptions, challenges, and concerns. In this context, perception is understood as a personal interpretation shaped by professional and contextual factors. Rather than seeking universal conclusions, the study aimed to understand participants' varied and lived experiences, following the qualitative tradition of prioritizing depth over generalizability (Creswell and Poth, 2018). To apply this paradigm, the study adopted a phenomenological case study design. This combined approach allowed for detailed exploration of individual experiences while situating them within a defined institutional and geographical context (Yin, 2018). The phenomenological aspect focused on understanding teachers' first-hand interactions with GenAI, capturing the meaning they assign to these experiences. The case study component framed the investigation within the specific realities of a group of elementary English teachers. These elements provided a comprehensive analytical perspective, revealing the essence of the participants' experiences and the contextual conditions that shaped them.

Context of the Study and Participants

This research was conducted in elementary schools across Lampung Province, Indonesia, which was purposefully selected for its diverse educational settings. The area includes both urban centres such as Bandar Lampung and more suburban and rural districts, encompassing public and private institutions with varying levels of technological infrastructure, curricular flexibility, and student demographics. This diversity enhances the transferability of findings, which is essential in qualitative research (Lincoln and Guba, 1985). Participants were chosen through purposive maximum variation sampling to capture a wide range of perspectives rather than achieve statistical generalization (Patton, 2015). The sample consisted of 20 certified elementary English teachers from different school types, all with some experience using GenAI for material development. The selection also accounted for differences in teaching experience and self-reported familiarity with GenAI.

Instruments

To obtain rich and layered data, this study employed semi-structured interviews as the primary method and document analysis as a secondary tool for triangulation (Bowen, 2009). The interview guide combined core open-ended questions with the flexibility to pursue follow-up inquiries, allowing the researcher to explore emerging issues while maintaining consistency across participants. This flexible format was particularly suited to investigating evolving teacher perspectives on GenAI (Kvale and Brinkmann, 2009). The interviews explored teachers' initial and developing views of GenAI, the types of instructional materials they created, and the processes they followed. Participants provided two to three examples of GenAI-generated English teaching materials to complement the interview data, including original prompts, raw outputs, and final versions. This supplementary data addressed the potential "say-do gap" by offering concrete artifacts to confirm or elaborate on interview responses. Agreement between interview content and document evidence reinforced the credibility of the findings, while discrepancies prompted further analytical inquiry. This triangulation process enhanced the study's trustworthiness, a key standard in qualitative research (Denzin, 2017). The collected materials were examined for suitability for the intended grade level, the degree of teacher modification from the original GenAI output, and the creativity reflected in their classroom application.

Data Collection

The data collection process was structured and ethical, beginning with formal approval from the university's research ethics board. Following this, permission was obtained from school principals who served as institutional gatekeepers. Participants meeting the purposive sampling criteria were identified and invited to participate. Before data collection, each participant participated in an individual informed consent session, which explained the study's purpose, procedures, confidentiality protocols, and voluntary involvement. Participants then signed a consent form to confirm their agreement. Data collection sessions were held in quiet, private settings and lasted 45 to 60 minutes. With consent, interviews were audio-recorded, and at the end of each session, participants submitted two to three examples of GenAI-generated teaching materials. All audio recordings were transcribed verbatim to ensure the accuracy and completeness of the dataset, which was essential for rigorous qualitative analysis.

Data Analysis

The data were analysed using reflexive thematic analysis, which was selected for its structured yet adaptable approach suitable for exploratory research (Braun and Clarke, 2006). The process was supported by NVivo, a qualitative data analysis software, to enhance analytical rigor and manage data efficiently. Using such tools represents a methodological advance that helps maintain consistency and reduces the potential for error often found in manual coding, particularly with large datasets (Saldana, 2021). The analysis followed Braun and Clarke's six-phase process. It began with familiarization, during which the researcher thoroughly read transcripts and reviewed documents to develop a deep understanding of the data. This was followed by open coding, where descriptive labels were systematically applied to meaningful segments. Related codes were then organized into preliminary themes based on recurring patterns. These themes were critically evaluated and refined to ensure internal consistency and clear distinctions between categories, aligning with principles of sound thematic development (Patton, 2015). Each theme was defined and named to capture its core meaning. In the final phase, the themes were integrated into a coherent analytical narrative, supported by illustrative data excerpts, to address the research questions comprehensively.

Results

Primary school teachers' perception of the integration of GenAI in designing English language learning materials

Table 1 presents key themes derived from participant data regarding the benefits and drawbacks of GenAI integration in educational contexts.

The findings reveal a complex and often dualistic set of perceptions among primary school English teachers regarding integrating GenAI in material design. There is a strong and widely held positive view of GenAI's potential to enhance job performance, as one teacher noted, "*It helps me create personalized materials for my students much faster*" (Participant 1). This aligns with the PU construct within the TAM. Teachers consistently recognized GenAI's capacity to increase efficiency, save significant preparation time, and facilitate the creation of personalized content for diverse learner groups. This positive perception is often driven by an acknowledgment that GenAI can automate repetitive and time-consuming tasks, freeing teachers to focus on more direct instructional activities.

Table 1
Analysis of Teacher Perceptions of GenAI

Perception Dimension	Key Themes from Participant Data
Perceived Benefits (Usefulness)	Efficiency and Time Saving: Rapid lesson plans, texts, and activity generation.
	Personalization of Learning: Creating differentiated materials for varied proficiency levels.
	Enhanced Creativity: Generating novel ideas for lessons and story prompts.
	Access to Information: Quick access to a wide range of content and explanations.
Perceived Drawbacks (Barriers to Ease of Use)	Pedagogical Uncertainty: Lack of clarity on how to integrate GenAI effectively into lesson flow.
	Lack of Confidence and Skills: Feeling unprepared to use the tools without formal training.
	Fear of Over-reliance: Concern that both teachers and students will become dependent on the tools.
	Accuracy and Data Privacy: Concerns about content reliability and the safety of users' data.

However, this enthusiasm is substantially moderated by a significant degree of apprehension and a lack of confidence in these tools' practical and pedagogical application. This reflects a low PEoU, a construct that extends beyond simple user interface navigation in the context of GenAI. For these teachers, PEoU encompasses a broader set of competences, including the ability to integrate the technology into pedagogical practice in a sound manner, trust AI output, and navigate its ethical complexities. As one participant expressed, "*I'm not sure if I'm using it correctly for teaching, even if it seems easy to get an answer*" (Participant 9). Many participants were confused about the full range of possible applications, which research suggests can lead to a reduced intention to integrate such tools into their practice.

A key finding is that perception is not static. Teachers who participated in structured and collaborative professional development, such as lesson study formats, reported a notable improvement in their attitudes and perceptions. One teacher remarked, "*After the lesson study session, I felt much more confident and saw more possibilities for my classroom*" (Participant 7). This experiential use appeared to enhance their sense of the tool's usefulness and their confidence, which motivated a stronger intention for future integration.

Overall, the prevailing sentiment is cautious optimism. Teachers embrace the potential of GenAI to support academic achievement and student engagement, but simultaneously express a clear desire for the technology to function as a supportive assistant, firmly under the control of their professional judgment, rather than as a replacement for their pedagogical expertise. This was succinctly captured by a senior teacher who stated, "*The tool is a great assistant, but I must always be the one in control of the final material*" (Participant 14).

Types of English learning materials commonly developed by primary school teachers using GenAI

Table 2 presents the types of English learning materials frequently developed by primary school teachers using GenAI.

Table 2
Findings of Types of English learning materials commonly developed by primary school teachers using GenAI

Material Category	Specific Material Type
Foundational Content & Texts	Reading passages (short stories, factual texts)
	Worksheets (fill-in-the-blank, matching)
	Vocabulary lists with definitions
	Lesson plan outlines
Skill-Specific Practice	Grammar exercises
	Role-play dialogues and scripts
	Story starters and writing prompts
	Pronunciation practice sentences
Assessment & Evaluation	Multiple-choice quiz questions
	Open-ended comprehension questions

According to thematic analysis, this study identified the specific types of English language teaching materials that primary school teachers commonly develop using GenAI. The findings indicate that usage is heavily concentrated on tasks that reduce the administrative and preparatory workload associated with teaching. The primary motivation for using GenAI in material design is to increase efficiency and produce a wide variety of resources quickly, with one teacher stating, "*My main reason for using it is to get my preparation done more quickly*" (Participant 5). GenAI is predominantly viewed and utilized as an educational support tool for generating human-like content across different modalities.

The most frequent applications involve the generation of foundational, text-based content. This includes creating customized worksheets, reading passages tailored to specific topics or reading levels, and vocabulary lists with definitions. One participant shared, "*I mostly use it to generate simple reading passages and grammar exercises*

for my students" (Participant 13). Teachers also regularly use GenAI to produce skill-specific practice materials, such as grammar exercises targeting particular linguistic structures, simple dialogues for role-playing activities, and creative story starters to inspire student writing. Generating these materials quickly allows teachers better to address diverse learner needs within a single classroom.

A smaller group of teachers reported higher levels of technological confidence and described experimenting with more complex and interactive material types. One advanced user mentioned, "*I've started using it to create prompts for pictures and to generate quiz questions for Kahoot*" (Participant 10). These included generating prompts for visual aids, such as asking the AI to describe an image that could then be created or found, and developing questions for interactive quizzes and assessments. Across all use cases, the pattern is clear: teachers leverage GenAI as a fast and versatile assistant for content creation, enabling them to produce a greater volume and variety of materials than would be possible through manual methods alone.

Discussion

This study's exploration of teacher perceptions is closely aligned with established models of technology acceptance, particularly the TAM and UTAUT. Teachers reported a high level of PU, echoing common discussions of GenAI's potential to automate tasks, reduce workload, and personalize instruction (Kong et al., 2024). However, the primary obstacle to adoption emerged around PEoU. For GenAI, PEoU encompasses more than user interface simplicity; it includes teachers' technical ability, pedagogical confidence, and trust in the tool's output. Many participants noted that technical knowledge alone was inadequate without the capacity to evaluate whether the AI-generated content aligned with sound instructional practices. This expanded view of PEoU helps explain the "widespread confusion on the possible applications" observed in previous studies (Petrucco et al., 2025).

The data further revealed that teachers currently use GenAI primarily for instrumental purposes, mainly for generating worksheets, reading texts, and other preparatory materials. These uses are consistent with findings highlighting GenAI's role in saving time and supporting classroom management tasks (George and Wooden, 2023). However, this reliance on efficiency risks long-term consequences, including a potential decline in teacher creativity and the standardization of instructional content. To mitigate this, teachers must develop a new professional

competency: crafting pedagogically sound prompts. As Leung (2024) explains, this "pedagogical prompt engineering" skill allows educators to convert instructional goals and learner needs into clear instructions that guide the AI in producing appropriate content. By cultivating this skill, teachers can move from passive users to active co-designers of meaningful learning experiences (Zulianti et al., 2024).

A unifying theme in these findings is the importance of fostering teacher agency in the age of AI. Teacher agency refers to making informed, reflective, and pedagogically sound decisions about how and when to use GenAI tools (Lee and Tseng, 2025). Building this capacity requires rethinking professional development. Rather than focusing solely on basic digital skills, training should aim to develop a comprehensive form of AI literacy. This includes technical knowledge, ethical reasoning, critical evaluation of AI output, and instructional creativity (Eguchi et al., 2021). The study suggests that one-time training sessions are insufficient. Effective professional development should be ongoing, collaborative, and embedded in authentic teaching practice. Ultimately, empowering teachers to lead technological integration ensures that GenAI serves educational purposes while reinforcing the teacher's central role in guiding student learning.

Conclusion

The findings of this study revealed that primary school teachers perceived GenAI as both promising and challenging in the context of English material development. In response to the first research question, teachers valued GenAI for its ability to improve efficiency and support the creation of personalized materials. However, their perceptions were shaped by a mixture of enthusiasm and uncertainty. Many teachers reported limited confidence in integrating the technology into pedagogical practice. Barriers such as ethical concerns, lack of training, and technical limitations influenced their readiness to adopt GenAI meaningfully. These mixed views reflect the importance of considering perceived usefulness and ease of use when introducing AI tools into primary education.

The study identified the most common materials developed using GenAI regarding the second research question. These included reading texts, worksheets, vocabulary lists, grammar tasks, and simple writing prompts. Teachers with more confidence also used GenAI to create interactive quizzes and visual aids. These findings suggest that GenAI is currently used in a practical and supportive role, focused on content generation rather than instructional innovation.

The study implies that teacher training programs must prioritize hands-on experience and critical thinking about AI-generated content. As a qualitative study with a limited sample size from a single region, its findings are not generalizable. Future research should include larger populations and examine how professional development shapes long-term adoption patterns.

Data Availability Statement

The article is based on data fully presented and discussed within the article itself; therefore, no additional data archiving is required.

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REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
JOURNAL OF ELEMENTARY EDUCATION
Vol. 19, No. 1, pp. 93–108, March 2026

TEACHER EXPECTATIONS, SOCIAL-EMOTIONAL SKILLS AND ACADEMIC ACHIEVEMENT IN PRIMARY SCHOOL: THE ROLE OF MEDIATOR

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Potrjeno/Accepted
7. 12. 2025

Objavljeno/Published
18. 3. 2026

Abstract/Izvleček

This study investigates the mediating role of primary school students' socioemotional skills, such as goal-achievement skills, collaboration, and emotional management in the relationship between teachers' expectations and students' academic achievement. The study is based on data from the START-PROGRESS longitudinal study, which includes Russian schoolchildren and teachers. Structural equation modelling was used to model complex relationships between variables, including direct and indirect pathways of effect. The findings revealed that among the three socioemotional skills examined, only goal-achievement skills weakly mediated the relationship between teachers' expectations and students' academic achievement in the middle of primary school, and only in mathematics.

Keywords:
teacher expectations, socioemotional skills, academic achievement, mathematics literacy, reading literacy.

Učiteljeva pričakovanja, socialno-čustvene veščine in šolski uspeh osnovnošolcev: vloga mediatorja

V študiji smo raziskovali vlogo mediatorja (posrednika) pri povezavi med učiteljskimi pričakovanji in šolskim uspehom učencev v osnovni šoli. Pri tem smo kot posredniške dejavnike obravnavali socialno-čustvene sposobnosti učencev, to so sposobnosti *doseganja ciljev, sodelovanje* in *upravljanje čustev*. Študija temelji na podatkih longitudinalne raziskave START-PROGRESS, ki vključuje ruske osnovnošolce in učitelje. Za modeliranje zapletenih odnosov med spremenljivkami, vključno z neposrednimi in posrednimi učinki, je bila uporabljena strukturna enačba modeliranja (SEM). Ugotovitve so pokazale, da se je med tremi preučenimi socialno-čustvenimi sposobnostmi le pri sposobnosti *doseganja ciljev* pokazala šibka povezava med učiteljevimi pričakovanji in učnim uspehom učencev na sredini osnovne šole, in sicer le pri matematiki.

Ključne besede:
učiteljeva pričakovanja, socialno-čustvene sposobnosti, učni uspeh, matematična pismenost, bralna pismenost.

UDK/UDC
373.3.091.26

DOI https://doi.org/10.18690/rei.5044

Introduction

Teacher expectations are significantly associated with student outcomes through the phenomenon of self-fulfilling prophecies (Rosenthal and Jacobson, 1968). High teacher expectations are positively associated with academic success, often referred to as the Pygmalion effect (Wang, Rubie-Davies, and Meissel, 2018; Rosenthal and Jacobson, 1968), and tend to strengthen over time (Jamil, Larsen, and Hamre, 2018; Jamil, Stephan, and Bennett, 2024). Conversely, low teacher expectations can hinder academic achievement, particularly in elementary school settings (the Golem effect) (Gentrup, Lorenz, and Kogan, 2020; Babad, Inbar, and Rosenthal, 1982; Reynolds, 2007). While the direct impact of teacher expectations on student achievement is well-documented, the underlying mechanisms that explain *how* these expectations translate into academic results are less understood. This study argues that socio-emotional skills (SES) are a key mediating pathway in this process.

There is evidence indicating that the effect of teacher expectations is not purely direct but is mediated by various student psychological characteristics. In a comprehensive review of studies between 2008 and 2018, Johnston, Wildy, and Shand (2019) claim that students' reactions to teacher treatment are an important step in the expectation–effect process, yet they have seldom been "directly empirically linked with teacher expectations". Building on this, previous research, including another major review by Wang, Rubie-Davies, and Meissel (2018), has quantitatively established that psychological constructs such as students' self-concept (Friedrich et al., 2015; Szumski and Karwowski, 2019), attributional style (Zhou and Urhahne, 2013), feelings of academic futility and perceptions of teacher support (Agirdag, van Avermaet, and van Houtte, 2013; Demanet and van Houtte, 2012), as well as motivation and engagement (Zhu, Urhahne, and Rubie-Davies, 2018) can act as significant mediators. While this line of research is invaluable, attention has mainly focused on broad internal dispositions. Less attention has been paid to specific, learnable behavioural skills that translate those internal beliefs into effective academic action.

In this study, such skills are conceptualized as socio-emotional skills (SES), that is, patterns of thought, feeling, and behaviour that enable students to regulate their emotions, build relationships, and pursue goals valued in the school context (CASEL, 2008; OECD, 2015). SES are related to academic achievement, engagement, and long-term educational trajectories (OECD, 2015; Moeller, Theiler, and Wu, 2012). Based on OECD's taxonomy, we focus on three domains of SES

that are particularly relevant in Russian elementary school: goal-achievement skills (e.g., persistence and planning in learning tasks), collaboration (e.g., working effectively with peers and teachers), and emotion management (e.g., regulating frustration and staying calm in challenging tasks) (Orel and Kulikova, 2020). These domains represent concrete, observable competences that can be shaped by classroom experiences and teaching practices.

Theoretically, SES are well positioned to function as a key mediating pathway connecting teacher expectations and academic outcomes. It is presumed that teachers who have high expectations offer challenging tasks, richer feedback, and explicit guidance on how to set and pursue academic goals; all these things allow students to develop their goal-attainment skills, collaborate, and manage their emotions (Rubie-Davies, 2008; Wang, Rubie-Davies, and Meissel, 2018). This guidance is particularly important in elementary school, where children's self-regulation is not fully developed, and in several educational systems, including the Russian national curriculum, such personal learning outcomes are explicitly required (Orel and Kulikova, 2020; https://fgos.ru/). In turn, students who can manage their emotions, collaborate productively, and persevere toward goals feel better equipped to cope with academic demands and produce better results (OECD, 2015; Moeller, Theiler and Wu, 2012; Urgo and Arguello, 2023). Simultaneously, students' socio-emotional behaviours may also shape how teachers perceive and evaluate them, which can result in reinforcing higher or lower expectations.

Despite this strong theoretical rationale, there is limited empirical research that jointly examines the mediating role of specific SES domains within the teacher expectations-achievement link, especially in elementary school. The present study addresses this gap by investigating whether three socio-emotional skills, goal-achievement skills, collaboration and emotion management, mediate the longitudinal association between teacher expectations and students' academic outcomes in mathematics and reading. By adopting a skills-based perspective on the mechanisms of teacher expectations, this study aims to contribute to a more nuanced understanding of how self-fulfilling prophecies unfold in the classroom.

Methodology

Sample

This study uses data from two linked longitudinal projects in a large Russian region: the START study (Grades 1-2) and the PROGRESS study (Grade 3).

The initial sample for the START project was established via a two-stage stratified cluster random design, encompassing 288 classrooms from 195 schools at the beginning of first grade (2019) and was maintained through the beginning of second grade (2020). The follow-up data collection for the PROGRESS study in the fall of 2021 was restricted to the regional capital because of challenges related to the COVID-19 pandemic. The final analytical sample was created by merging these datasets and filtering for participants with complete data from both the Grade 2 (START) and Grade 3 (PROGRESS) waves. This procedure yielded a sample of 1901 students nested within 90 classrooms.

The student sample was gender-balanced (49.9% girls) with a mean age of 9 years (SD = 0.41). These students were from public schools, and their performance data was collected using computer-based tests and questionnaires at the beginning of Grade 3 (fall, 2020). The 90 teachers were the students' main instructors, averaging 22 years of experience (SD = 11), with 84% holding a university degree in education. Teacher expectations for each student were collected using a standardized online questionnaire at the beginning of Grade 2 (fall, 2020).

All students had parents sign informed consent to participate in the study.

Assessment Tool

The START and PROGRESS tools, developed at the Institute of Education of the Higher School of Economics, were used in the START-PROGRESS longitudinal study based on the international performance indicators in primary schools (iPIPS) (Tymms, Merrell, and Wildy, 2015).

START is aimed at diagnosing a child upon entry to the school and assessing his academic progress during the first year of study; the tool has good psychometric properties and validity (Kardanova et al., 2018; Orel et al., 2018). The tool measures the basic starting skills in mathematics and reading. Additionally, the study can collect contextual information through questionnaires from teachers and parents.

PROGRESS (Federiakin, Larina, and Kardanova, 2021) is an extension of the START tool and assesses the basic literacy of elementary school students (reading, mathematical, and language), and some socioemotional skills. To be able to measure students' development, PROGRESS can have some tasks in common with START. Thus, START was conducted at the beginning of the first and the beginning of the second grade, and PROGRESS was conducted at the beginning of the third grade.

Data from all measurements were used to construct a single scale using psychometric methods of vertical alignment of tests via a common–item design (Kolen and Brennan, 2013).

Socioemotional Skills

PROGRESS assesses the following socioemotional skills of students through questionnaires: goal achievement, collaboration, and emotion management (Orel and Kulikova, 2018; Kulikova and Orel, 2021).

Goal-achievement skills were assessed with items capturing students' persistence with and effort in schoolwork, for example: "I feel like I complete tasks thoroughly and to the end" and "I feel like I keep working on a task until I finish it". Emotion management was measured with items describing how students regulate their feelings in challenging situations, for example: "I feel like I stay calm in stressful situations" and "I feel like it is difficult to make me lose my temper". Collaboration (working with others) was assessed with items about students' typical behaviour in social and learning interactions, for example: "I feel like I am sociable and like being with other people" and "I feel like I am kind and considerate to almost everyone". The scales "Goal Achievement" consisted of 7 statements, "Collaboration" had 8 statements, and the scale "Emotion Management" consisted of 5 statements with response categories presented by the Likert scale: from 1 - "completely disagree" to 4 - "completely agree".

The raw scores for each of the scales were analysed using confirmatory factor analysis (Babyak and Green, 2010). The models for each scale showed significant unidimensionality and high data compliance with the model (see Table 1).

Table 1

Confirmatory factor analysis model fit statistics for scales

Scale	CFI[a]	TLI[b]	RMSE[c] (90%CI)	SRMR[d]
Goal achievement	0.988	0.981	0.044 (0.034-0.055)	0.036
Collaboration1	0.995	0.993	0.033 (0.024-0.043)	0.031
Emotional management1	0.991	0.977	0.040 (0.0220-0.061)	0.027

[1] When constructing the "Collaboration" and "Emotional management" scales, two items were highly correlated with each other. To improve the model quality, the presence of correlation was explicitly indicated in the model specification; [a] should be greater than 0.95; [b] should be greater than 0.95; [c] should not exceed 0.08, preferably not greater than 0.05; [d] should be lower than 0.08.

Conducting Tests and Surveys of Students

The START and PROGRESS studies were conducted in the format of computer testing in game form using an adaptive algorithm. The adaptive algorithm ensured that students were not presented with tasks that were too difficult for them. Testing within the framework of START and PROGRESS is individual, meaning that each student completes their test under their ID.

The students were surveyed using the same software that was used for PROGRESS testing. Students also had access to the survey using an ID. For each parameter, students were asked to read a series of statements and evaluate their attitude toward these statements or the degree of their agreement.

Teacher Expectations

Teacher expectations were measured at the beginning of the second grade. Teacher expectations were assessed for each student and were measured using a questionnaire that included four questions: two questions about the teacher's expectations for children's performance in mathematics and two questions about reading. The questionnaire asked the teacher to estimate the likelihood (from 0 to 100%) that he or she believed a particular child would demonstrate high academic achievement and be successful in elementary school in mathematics or reading. The questions were as follows:

Please estimate with what probability (from 0 to 100%), in your opinion, this child will do the following:

1. achieve only excellent or good grades in math in the 2nd and 3rd grades,
2. be able to solve advanced math problems,
3. achieve only excellent or good grades in reading in the 2nd and 3rd grades,
4. independently read books not included in the school curriculum (Yusupova, 2023).

Initially, two variables were planned: "teacher expectations for mathematics" and "teacher expectations for reading". However, given the strong correlation (Spearman's $r = 0.82$, $p < 0.001$), a single variable "teacher expectations regarding children's academic success" was created. Thus, teacher expectations were measured as the average score of responses to all questions.

Teacher Survey Procedure

The teacher survey was also conducted in computer form. Teachers filled out electronic questionnaires using individual links.

Analytical Approach

The data were analysed using structural equation modelling (SEM). To provide the most effective estimation of the model based on all available observations, we used the maximum likelihood method, with robust estimation of standard errors (MLR) and the full information maximum likelihood estimation method (FIML) (Enders and Bandalos, 2001).

The following recommendations were used as criteria for assessing the fit of the model to the data (Mueller and Hancock, 2018): the value of the standardized root mean square residual (SRMR) should be less than 0.08; the value of the root mean square error of approximation (RMSEA) and the boundaries of its confidence interval should not exceed 0.08 (preferably not greater than 0.05); the value of the comparative goodness of fit index (CFI) and the Tucker-Lewis goodness of fit index (TLI) should be at least 0.95. Bootstrap analysis (5000 samples) was used to assess the statistical significance of the model parameters.

Variables used in the analysis

Dependent variables:

- academic indicators: reading and math scores at the beginning of grade 3 (logits).

Predictors:

- teacher expectations as measured at the beginning of grade 2 (on a 100-point scale).

Mediators:

- goal achievement (latent estimates obtained by Maximum Likelihood);
- collaboration (latent estimates obtained by Maximum Likelihood);
- emotion control (latent estimates obtained by Maximum Likelihood).

Covariates:

- academic indicators: reading and math scores at the beginning of grade 2 (logits).

In addition to regression relationships, the models also included correlations between the socioemotional skills scale and between academic indicators (for grade 2) in mathematics and reading.

RStudio version 2024.04.2+764 (R version 4.2.2 (https://www.r-project.org/)) was used for statistical analysis. Analysis was performed using the lavaan (https://lavaan.ugent.be/tutorial/), lavaanPlot (https://lavaanplot.alexlishinski.c–

om/) packages. The dplyr (https://dplyr.tidyverse.org/) package was used to load data into RStudio.

Results

Descriptive statistics and correlations are presented in Table 2.

Table 2
Means, standard deviations, and correlations with confidence intervals

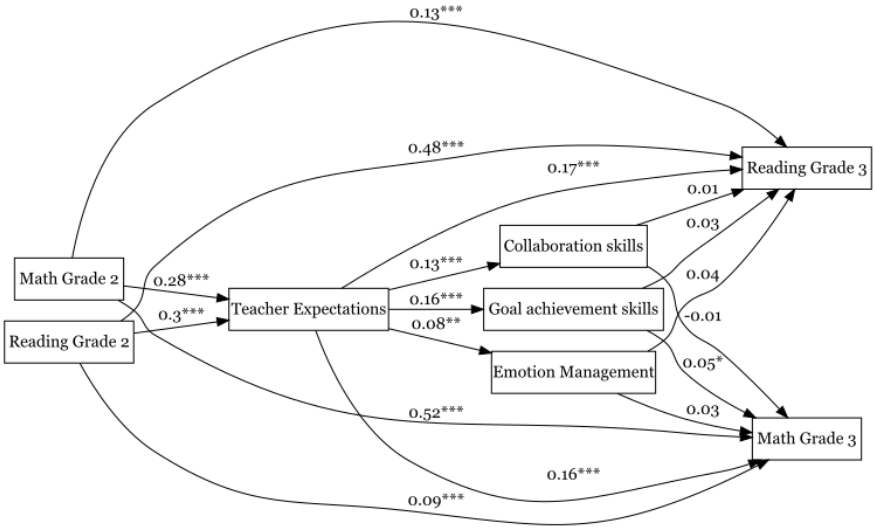
Variable	*M*	*SD*	1	2	3	4	5	6	7
1. Mathematics (Grade 2)	1.58	1.37							
2. Reading (Grade 2)	3.91	1.75	.59**						
3. Mathematics (Grade 3)	2.96	1.31	.66**	.48**					
4. Reading (Grade 3)	4.99	1.38	.50**	.64**	.58**				
5. Teacher expectations (Grade 2)	60.91	23.53	.46**	.46**	.45**	.46**			
6. Goal achievement skills (Grade 3)	0.28	2.04	.11**	.15**	.15**	.15**	.15**		
7. Collaboration skills (Grade 3)	0.56	2.69	.06*	.07**	.08**	.10**	.13**	.41**	
8. Emotion management (Grade 3)	0.19	1.70	.05	0.05	.08**	.09**	.08**	.45**	.39**

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. * $p < .05$; ** $p < .01$.

Figure 1

The structural equation model of teacher expectations with academic performance

* p < .05; ** p < .01; *** p < .001



The resulting model (Figure 1) showed a good fit to the data: $\chi 2 = 11.423$; df = 6; p = 0.076; CFI = 0.999; TLI = 0.994; SRMR = 0.016; RMSEA = 0.022; 90% confidence interval for RMSEA: [0.000, 0.041]; N = 1901 (missing = 38). This means that the model is suitable for interpreting the parameters.

The results show that the direct relationship between teacher expectations and children's third-grade results in mathematics and reading is stronger than the indirect relationship through the mediators "goal achievement", "collaboration" and "emotion management" (for math (grade 2) β=0.16, p<0.001 and for reading (grade 2) β=0.17, p<0.001).

Teacher expectations are also positively related to socioemotional skills (for goal achievement skill β=0.16, p<0.001, for work with others skill β=0.13, p<0.001, and emotion control β=0.08, p<0.01).

Among the socioemotional skills, only the goal achievement skill is related to third-grade math scores (β=0.05, p<0.05), although the magnitude of the relationship is small. Thus, a statistically significant indirect relationship between teacher expectations and academic outcomes is found only for math.

Goal-achievement skills mediate this relationship. However, the indirect relationship is small, and the direct relationship remains stronger.

Discussion

This study examined whether elementary school students' socioemotional skills mediate the relationship between teachers' expectations and their academic performance using data from the START-PROGRESS longitudinal study on a sample of students from Russian schools. Students' academic performance was measured at the beginning of the second and beginning of the third grades, and their socioemotional skills at the beginning of the third grade. Teacher expectations were measured at the beginning of the second grade. The data was analysed using structural equation modelling, a method that allows the modelling of complex relationships between variables, including both direct and indirect pathways of effect.

The study showed that of the three socioemotional skills considered in the analysis, namely goal-achievement skills, collaboration, and emotion management, only goal-achievement skills mediate the relationship between teachers' expectations and students' academic performance in the middle of elementary school and only in mathematics. This finding complements previous research demonstrating that internal psychological constructs, such as academic self-concept, can mediate teacher expectation effects on mathematics achievement (e.g., Szumski and Karwowski, 2019), by adding a behavioural dimension to this model. In other words, our results suggest that teacher expectations may shape not only what students believe about their mathematical abilities, but also how persistently and strategically they act when engaging with mathematical tasks.

Although teacher expectations are positively related to the level of social-emotional skills analysed, collaboration skills and emotion management are not related to academic outcomes. Goal achievement skills weakly predict children's scores in mathematics and are not at all related to reading. Thus, the magnitude of the indirect relationship of teacher expectations with mathematics scores through goal achievement skills was very small, and the direct relationship of teacher expectations with academic performance is still strong.

The indirect relationship through goal achievement skills somewhat extends the results of some qualitative studies. For example, a study by Rubie-Davies (2008)

demonstrates that teachers with high expectations say that they try to develop children's planning and goal-achievement skills. Thus, teacher expectations can improve children's results through goal-achievement skills. This study provides empirical evidence. However, such an indirect effect was found for mathematics, but not for reading.

The presence of an indirect connection only for mathematics can be explained by the specificity of the subject. Longitudinal studies have similarly shown that teacher expectation effects are often stronger and more persistent in mathematics than in reading during the early school years (Hinnant O'Brien, and Ghazarian, 2009), which is consistent with the idea that mathematics is particularly sensitive to students' self-regulatory and goal-directed behaviours. Teacher expectations may be more clearly understood in mathematics lessons. In this area, there are clear criteria for success or failure. Reading success is intricately linked to various cognitive processes, like decoding efficiency, vocabulary knowledge, prior knowledge, and intrinsic motivation (Liebfreund, 2015). Nevertheless, the indirect effect for mathematics is small, and the direct effect is much stronger.

The negligible indirect effect could be explained by a small correlation between goal-achievement skills and mathematics achievements. Children in elementary school, with an average age of 9 years in the study sample, may be just beginning to develop their goal-achievement skills. As a result, the connections between these skills might be weak in the short term; however, the long-term effects could be more significant. Research indicates that feedback from teachers is crucial for the effective development of these skills (Ponomariovienė and Jakavonytė-Staškuvienė, 2024). Unfortunately, the ability to provide effective feedback to children is a skill that is not adequately emphasized in Russia (Kholmanskaya, 2024).

The lack of association between collaboration skills or emotional management skills and academic achievement may be explained by the age-specifics of the cohort. It is possible that these skills, especially emotion management, may have a more significant effect in the long term, for example, during adolescence. During adolescence, students are more likely to encounter more complex social situations and demands on self-regulation, the academic workload increases, and previously developed collaboration and emotion management skills may be critical for successful group work and maintaining positive relationships (Pellegrino, 2024). This opens up space for further research that could examine these correlations in older age groups.

Practical Implications

This study found that goal-achievement skills help students perform better in mathematics. Previous research has shown that students of high expectation teachers report higher perceived teacher support and more positive academic beliefs (Rubie-Davies et al., 2020), suggesting that expectations are most beneficial when they are communicated through supportive instructional practices rather than pressure alone. Therefore, teachers can improve student performance not merely by believing in them or setting high standards, but also by supporting their self-regulation and goal-setting behaviours. In math classes, teachers should provide feedback that emphasizes persistence and strategic planning, rewarding effort over just accuracy. Making learning goals clear and breaking down complex tasks into smaller goals help students understand expectations. By fostering a culture that values effort and strategic thinking, teachers can help students meet high standards and improve their learning.

Taken together, these findings support contemporary views that teacher expectations operate through multiple, partly overlapping psychological and behavioural pathways, and they highlight goal-directed self-regulation as one such pathway in the context of elementary school mathematics.

Conclusion

This study aimed to uncover the mechanisms underlying the teacher expectation effect by examining the mediating role of students' socio-emotional skills. Our results highlight that among the skills examined; goal-achievement skills play a unique role in mediating the link between teacher expectations and academic achievement in mathematics among elementary school students. This finding extends the "Pygmalion effect" theory by identifying specific, learnable behavioural mediators that translate teacher beliefs into student outcomes.

The study has several limitations. First, the study design does not allow for any causal inferences, since socioemotional skills were not measured at the beginning of the second grade. Second, socioemotional skills were measured in a self-report format. This approach is sensitive to subjectivity, especially in young children (Duckworth and Yeager, 2015). An alternative would be to use combined assessment methods, including surveys of teachers or observation of students in the learning environment,

or the use of scenario-based tasks. Finally, teachers in our sample were highly experienced (on average, more than 20 years of teaching). Prior research suggests that experienced teachers tend to form relatively accurate expectations that closely reflect students' prior performance and behaviour (Seidel, Schnitzler, and Kosel, 2021; Jussim and Harber, 2005), which leaves less room for strong self-fulfilling prophecy effects. This may partly explain why the indirect effects observed in our study were small, and it also means that the findings should be replicated with more diverse, including less experienced, teacher samples.

Despite these limitations, the study underscores the importance of intentionally developing students' self-regulation and goal-setting skills as a practical strategy for teachers to maximise the positive impact of their expectations on student learning. In future research, to obtain a more complete picture, studies are needed on other age samples of children or an age-balanced sample of teachers, and studies using different methodologies for assessing socioemotional skills.

Data Availability Statement

The article is based on data fully presented and discussed within the article itself; therefore, no additional data archiving is required.

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REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
JOURNAL OF ELEMENTARY EDUCATION
Vol. 19, No. 1, pp. 109–132, March 2026

PRIDOBIVANJE JEZIKOVNEGA ZNANJA IN ODNOSA DO OKOLJA OB LITERARNEM BESEDILU *MADU S PRIJATELJI POMAGA REŠITI MORJE*

Potrjeno/Accepted
8. 12. 2025

Objavljeno/Published
18. 3. 2026

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Abstract/Izvleček

Namen prispevka je osvetliti, kako se učenci (danes otroci, jutri odrasli) soočajo z okoljsko problematiko tukaj in zdaj ter kako komunicirajo o podnebnih/okoljskih spremembah. Jezikovno znanje in odnos do okolja pridobivajo ob literarnem besedilu *Madu in njegovi prijatelji pomagajo rešiti morje* (Gračner, 2021). Primer didaktizacije zgodbe predstavlja cilje, ki so z obravnavo ekoloških problemov (tj. onesnaženost morja) upoštevani na eni strani in jezikovnih vidikov (strokovni izrazi o ekologiji, jezikovni priročniki ...) na drugi strani.

Keywords:
slovenščina, ekološko znanje, komuniciranje podnebne/okoljske krize, morje, osnovna šola.

Acquiring Linguistic Knowledge and Environmental Attitudes through the Literary Text *Madu and His Friends Help Save the Sea*

The purpose of the article is to highlight how pupils (today's children, tomorrow's adults) face current environmental issues and how they communicate about climate/environmental change. Pupils can acquire both linguistic knowledge and environmental attitudes with the help of the literary text *Madu and His Friends Help Save the Sea* (Gračner, 2021). To make optimum didactic use of the story, the lesson can take into consideration the goals of addressing ecological problems (i. e., ocean pollution), on the one hand, and linguistic aspects (professional terms from ecology), on the other.

Ključne besede:
slovene, ecological knowledge, communicating the climate/environmental crisis, sea, primary school.

UDK/UDC
81:502/504:37.091.3

DOI https://doi.org/10.18690/rei.5382

Uvod

V sodobni družbi, ki se vse bolj sooča z okoljskimi in podnebnimi spremembami, je šola prostor, kjer se oblikujejo ključne kompetence za razumevanje tovrstnih izzivov in za soočanje z njimi. Otroci, današnji učenci (v prispevku je povsod kot generičen uporabljen moški spol, vključujoč tudi ženskega), bodo kot odrasli sprejemali odločitve, pomembne za prihodnost planeta. Zato je nujno, da šola spodbuja kritično razmišljanje, okoljsko odgovornost in zmožnost jasnega komuniciranja o okoljskih temah. Pri tem ima slovenščina kot učni predmet, zlasti pa kot učni jezik, posebno vlogo: omogoča razvijanje jezikovnih zmožnosti in spodbuja refleksijo o družbenih vprašanjih – tudi s pomočjo literarnih besedil.

Raziskava izhaja iz tematskega okvira projekta *ZELEN.KOM – Komuniciranje podnebne krize za uspešen prehod v zeleno družbo* (NOO, 3330-22-3514 (PP5), trajanje: 1. 12. 2022–30. 11. 2025, financer: Ministrstvo za visoko šolstvo, znanost in inovacije Republike Slovenije (*ZELEN.KOM*)); osnovnih teoretičnih vidikov ekolingvistike; komuniciranja, uspešnega glede na različne dejavnike, namen sporazumevanja, jezikovni kod; gradnikov bralne pismenosti; različnih (uspešnih) praks pridobivanja jezikovnega znanja in odnosa do okolja. Osrednji del predstavlja didaktizacija literarnega besedila *Madu in njegovi prijatelji pomagajo rešiti morje* (Gračner, 2021), ki tematizira onesnaženost morja in skupnostno iskanje rešitev, poudarja možnosti razvijanja jezikovnega znanja (npr. strokovno izrazje, iskanje informacij v priročnikih) in vzpostavljanja odnosa do narave, ob tem pa tudi oblikovanje jezika, s katerim učeči se reflektirajo in izražajo okoljsko problematiko.

Teoretični vpogled v obravnavano tematiko

V teoretičnem okviru bomo obravnavali: pismenost in gradnike bralne pismenosti; osnovna izhodišča ekolingvistike in jezik kot indikator družbenih sprememb – zeleni diskurz.

Številna znanstvena, strokovna srečanja, raziskave in druge aktivnosti, izvedene predvsem v tujini, kažejo, da je pri ozaveščanju podnebne krize ključno prav uspešno komuniciranje. Sporazumevalna zmožnost je v slovenskem prostoru opredeljevana na različne načine, skupno večini pa je, da je sporazumevalna zmožnost (Bešter Turk, 2011, str. 115) »[…] to, kar človek zna (ima na razpolago) za sporazumevanje (za opravljanje govornih dejanj) v raznih sporazumevalnih okoliščinah«. Je skupek jezikovne (slovnične, pomenoslovne, pravorečne, pravopisne), sociolingvistične in

pragmatične zmožnosti (zmožnost izbrati ustrezno jezikovno sredstvo glede na namero in okoliščine), zato je kot ena ključnih človekovih zmožnosti vključena v kurikulum za vrtce in v učne načrte posameznih učnih predmetov (zlasti slovenščine) v osnovnošolskem in srednješolskem izobraževanju, nadgradnjo pa ima tudi (vsaj) v nekaterih študijskih programih.

Bralna pismenost

Zmožnost uspešnega komuniciranja je v veliki meri odvisna od usvojene zmožnosti bralne pismenosti. Leta 2018 je bila v okviru *Ključnih kompetenc za vseživljenjsko učenje: evropski referenčni okvir* (*Priporočilo*, 2018) pismenost definirana poenoteno za evropski prostor:

»Pismenost je sposobnost prepoznati, razumeti, izraziti, ustvariti in razlagati koncepte, čustva, dejstva in mnenja v ustni in pisni obliki z uporabo vizualnega, zvočnega in digitalnega gradiva na vseh področjih in v vseh okoliščinah. Pomeni sposobnost uspešnega sporazumevanja in povezovanja z drugimi na ustrezen in ustvarjalen način.«

V *Nacionalni strategiji za razvoj bralne pismenosti za obdobje 2019–2030* (*NACIONALNA* 2019: 10) predstavljajo več vrst pismenosti, to so *matematična, naravoslovna ali digitalna, funkcionalna, informacijska in medijska*, bralna pismenost je le ena izmed teh, ki:

»[…] je stalno razvijajoča se zmožnost posameznika in posameznice za razumevanje, kritično vrednotenje in uporabo pisnih informacij. Ta zmožnost vključuje razvite bralne veščine, (kritično) razumevanje prebranega in bralno kulturo (pojmovanje branja kot vrednote in motiviranost za branje). Zato je temelj vseh drugih pismenosti in je ključna za razvijanje posameznikovih in posameznicinih sposobnosti ter njuno uspešno sodelovanje v družbi.«

Bralno pismenost opredelimo z devetimi gradniki, pri čemer je pomembno, da v izobraževalnem procesu razvijamo elemente posameznega gradnika skupaj z drugimi gradniki bralne pismenosti v povezavi s cilji in z vsebinami pri vseh predmetih oz. na vseh predmetnih področjih (Haramija, 2020, str. 2). Izpostavljamo *5. gradnik, tj. besedišče*, saj se človek (večinoma) sporazumeva z besednim jezikom: razumevanje pomena besed in njihova uporaba pri sprejemanju in tvorjenju besedil; širjenje in usvajanje besedišča za uspešno branje z razumevanjem; raba jezikovnih virov in priročnikov. Jezikovni sistem ima dve vlogi: poimenovalno in urejevalno, s temeljno poimenovalno enoto leksemom (ne besedo); Vidovič Muha (2000, str. 17) izpostavlja, da je »[l]eksem kot poimenovalna enota […] širši od besede, saj zajema tudi stalne besedne zveze«. Po Pečjak, Bucik, Peštaj, Podlesek in Pirc (2010) sodi

besedišče med ključne kognitivne dejavnike, ki neposredno napovedujejo razumevanje prebranega. Obseg besedišča napoveduje otrokovo bralno pismenost, a velja, da traja razvoj besedišča vse življenje.

Ekolingvistika – križišče jezika in ekologije

Ekolingvistika (Stibbe, 2015, str. 1) združuje področji jezika in ekologije ter raziskuje vpliv jezika na dojemanje narave in okolja. Jezik ni nevtralno orodje, temveč soustvarja družbene predstave o svetu, bodisi s krepitvijo potrošniških ideologij bodisi z oblikovanjem diskurzov, ki spodbujajo okoljsko odgovornost. Analizira jezikovne prakse, ki legitimirajo okoljsko destruktivne dejavnosti, ter razvija alternativne jezikovne strukture in zgodbe, ki prispevajo k trajnostnemu razmišljanju.

Konceptualne temelje pristopa je zasnoval (vsaj že) Einar Haugen (*The Ecology of Language*, 1972; Stibbe, 2015) z uvedbo pojma *ekologija jezika*, ki jezik umešča v njegov družbeni in naravni kontekst. Na tej osnovi Stibbe (2015, str. 7) razvije celovit metodološki okvir za analizo, presojo in preoblikovanje jezikovnih praks z ekološkega vidika.

V slovenski prostor je tovrstne pristope uvedla Jožica Čeh Steger z monografijo *Ekokritika in literarne upodobitve narave* (2015), ki (Čeh Steger, 2015, platnica):

»[…] prinaša teoretska izhodišča ekokritike, sorodnih disciplin ekološke literarne vede in reprezentacije človekovega odnosa do narave/okolja v izbrani slovenski pripovedni prozi od druge polovice 19. do sredine 20. stoletja […]. Književnost skozi fiktivne zgodbe, posamezne žanre, refleksije, meditacije, metaforične, groteskne, simbolne, idilične, utopične in druge podobe zrcali različne koncepte narave, občutljivost ali neobčutljivost za ekološka vprašanja ter v estetsko zakodirani obliki ponuja različne možnosti preseganja v zahodni kulturi utrjenih prevladnih dualizmov (človek/narava, kultura/narava, subjekt/objekt).«

V nadaljnjih delih Čeh Steger (2024, str. 151–163) opozarja, da so podnebne spremembe poleg ekološkega problema tudi pomemben kulturni in družbeni problem, kar zahteva pozornost do okoljskih narativov v različnih družbenih sferah.

Zgodbe, po katerih živimo – strukture, ki oblikujejo realnost

Osrednji koncept ekolingvistike so t. i. *zgodbe, po katerih živimo* (Stibbe, 2015, str. 2, 6, 16). Gre za kulturno razširjene kognitivne sheme, ki strukturirajo naše mišljenje, zaznavanje in delovanje ter pomembno vplivajo na oblikovanje prevladujočih diskurzov v družbi. Stibbe (2015, str. 17) razvršča zgodbe v osem tipov, in sicer z

vidika socialnega zaznavanja (socialne kognicije), tj. je posameznikove sposobnosti razumevanja socialnega sveta in odnosov v njem, in glede na njihove jezikovne upodobitve/realizacijo:

Tabela 1

Osem oblik, ki jih zavzemajo zgodbe, in njihove jezikovne upodobitve (Stibbe, 2015, str. 17).

	Tip zgodbe	Razlaga z vidika socialne kognicije. Zgodba, ki ...	Upodobitev/realizacija z vidika jezikovnih elementov:
1.	Ideologija	si jo deli skupina ljudi o tem, kakšen je in kakšen naj bi bil svet;	pogovori, tj. skupek jezikovnih karakteristik, ki so značilne za neko skupino;
2.	Uokvirjanje	uporabi besedišče nekega področja (okvira), da skonstruira neko drugo področje življenja;	specifične besede, ki spomnijo na okvir, področje, t. i. sprožilne besede (angl. trigger words);
3.	Metafora (tip uokvirjanja)	uporabi okvir, da izrazito prikaže čisto drugačno področje življenja;	specifične besede, ki spomnijo na nek specifičen okvir, področje, t. i. sprožilne besede (angl. trigger words);
4.	Vrednotenje	razpravlja, ali je neko področje dobro ali slabo;	vzorci vrednotenja, tj. jezikovni vzorci, ki predstavijo področje življenja na pozitiven ali negativen način;
5.	Identiteta	predstavi vpogled v določen tip ljudi;	struktura uporabljenega jezika, ki definira karakteristike različnih tipov ljudi;
6.	Prepričanje	razpravlja, ali je določen opis sveta resničen, lažen ali vprašljiv;	vzorci dejanskosti, tj. vzorec značilnosti jezika, ki opišejo svet, kot je, lažen ali vprašljiv;
7.	Izpust	obravnava področje življenja, nepomembno ali nevredno obravnave;	jezikovni vzorci, ki slabo predstavljajo ali izkrivljajo neko področje življenja ali njegovo ozadje;
8.	Pomembnost	obravnava področje življenja, pomembno in vredno obravnave.	jezikovni vzorci, ki izpostavijo neko področje življenja.

Tipologija zgodb po Stibbeju (2015) kot okvir za analizo besedila *Madu in njegovi prijatelji pomagajo rešiti morje* (Gračner, 2021): ideologija – svet je onesnažen zaradi človeške brezbrižnosti; zgodba spodbuja okoljsko odgovornost, kolektivno delovanje in sožitje z naravo; uokvirjanje – otroško prijateljstvo in igra kot dostopen način za obravnavo resne okoljske teme (onesnaženje morja); metafora – morje kot skoraj živo bitje; narava ima subjektno vlogo, kar vzbuja empatijo in odgovornost; vrednotenje – jasno izražena okoljska etika prek pozitivnih in negativnih vrednotenj; identiteta – otroci, zlasti Madu, predstavljeni kot odgovorni, dejavni posamezniki – "okoljski varuhi"; prepričanje – okoljski problemi niso postavljeni pod vprašaj;

onesnaženje je dejstvo, ki zahteva ukrepanje; izpust – narava je v ospredju, izpuščena pa je sistemska odgovornost (industrija, politika); pomembnost – zgodba poudarja varovanje narave, skupnosti in aktivnega državljanstva kot ključne vrednote za prihodnost.

Ekolingvistika in pouk jezika – pedagoški potenciali

V številnih raziskavah je poudarjen pedagoški potencial ekolingvistike, zlasti v kontekstu vključevanja okoljskih vsebin v pouk jezika, kar je vplivalo na razmišljanje o obravnavani problematiki tudi v slovenskem šolskem sistemu in možnostih njene didaktizacije za pričujoči prispevek. Luardini in Sujiyani (2018) izpostavita pomen vključevanja lokalnih vsebin v učne načrte in opolnomočenje učiteljev. Prednosti uvedbe ekolingvistike sta po njunem tako dve: jezikovna (učenje v znanem okolju, višja motivacija, ohranjanje jezika in kulture) in ekološka (spodbujanje okoljskega zavedanja). Neves idr. (2020) so pri pouku v 4. razredu OŠ uporabili otroško literaturo z ekološko tematiko ter ugotovili napredek v besednem zakladu, rabi znanstvenih izrazov in razumevanju ekoloških konceptov. Damico idr. (2020) ponujajo model za razvoj podnebne pismenosti z analizo zgodb in osnovnimi vprašanji kritične pismenosti (npr. *Komu zgodba (ne) koristi?*). Učitelji s tem postajajo usmerjevalci pri razvijanju podnebne pravičnosti. Cencič in Horvat (2021) opozorita na pomen učenja izven učilnic, zlasti na prehodu iz vrtca v šolo, na medpredmetno povezovanje in dneve dejavnosti ter šolo v naravi, ki jih predvidevajo učni načrti. Roe idr. (2023) poudarijo, da ekolingvistika presega akademske kroge, saj je razumevanje odnosa med jezikom, naravo in družbo ključno. Ponujajo pet tehnik za analizo besedil, vključno s prepoznavanjem govorcev, metafor ter pojmov ekocentrizem in antropocentrizem. Ekasiwi in Bram (2023) ugotavljata pomanjkanje ekolingvističnih vsebin v srednješolskih učbenikih angleščine, kar predstavlja neizkoriščen potencial za okoljsko vzgojo. Svobodová (2023) potrjuje, da aktivnosti v naravi pozitivno vplivajo na okoljsko pismenost učencev. Skupna ugotovitev raziskav je, da ima ekolingvistika pomembno vlogo pri razvoju okoljsko ozaveščenih in jezikovno suverenih učencev.

Zeleni diskurz – jezik kot indikator družbenih sprememb

Kulturnoekološko funkcijo književnosti z medsebojno prepletenimi vlogami, torej s kulturnokritičnim metadiskurzom, z imaginativnim protidiskurzom in z reintegrativnim interdiskurzom, teoretično in s konkretnimi primeri literarnih besedil natančno predstavlja Čeh Steger (2015, str. 95–99). O okoljskem diskurzu

pišeta tudi Stramljič Breznik in Plemenitaš (2023, str. 133–139), opozarjata na kritično funkcijo jezika pri odzivanju na družbeno-ekološke izzive, kot so podnebne spremembe, onesnaževanje in izguba biotske raznovrstnosti. Jezik postaja hkrati orodje za ozaveščanje in za manipulacijo – kar zahteva razvijanje kritične ekolingvistične pismenosti. Kot protiutež okoljskim in podnebnim spremembam se postavljata potreba po spremenjenem človekovem odnosu do okolja in potreba po vse večji povezanosti z naravo, od katere so ljudje danes vse preveč odtujeni (Evropska komisija, 2022, str. 29).

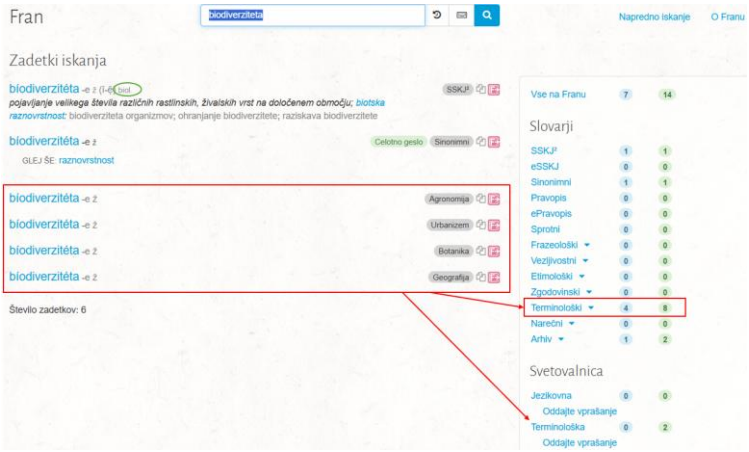
Preplet pedagoškega (tj. usvajanja strokovnega izrazja in zgodnjega ozaveščanja o naravi) in jezikoslovnega vidika (tj. teoretične podlage in usmeritve za dosledno, normativno rabo strokovnega izrazja) z namenom kritične refleksije jezikovne norme ter vertikalne povezanosti med teorijo in prakso pri izgradnji učinkovite trajnostne okoljske komunikacije ter družbene odgovornosti v prispevku prikažeta tudi Valh Lopert in Zemljak Jontes (2025, str. 401–446). Ob primeru čebelarske terminologije podata aktivnosti za usvajanje besedišča (terminologije) pri delu s predšolskimi otroki; pregled terminološkega kvalifikatorja *čebelarski* v *Slovarju slovenskega knjižnega jezika*[2], v *Slovenskem pravopisu* in *Čebelarskem terminološkem slovarju* ter opozorita na pravopisne težave.

Za vsakdanjo rabo je dobrodošel glosar terminov o podnebnih spremembah *Climate change: key terms in 23 languages* (Leta 2011 ga je izdal prevajalski oddelek Sveta EU.). Glosar vsebuje ključne izraze o podnebnih spremembah ter njihove prevode v (takrat) 23 uradnih jezikih EU. Gre za izraze, povezane s podnebjem v političnih in regulativnih besedilih EU, izhajajoč predvsem iz angleščine, ki se prej niso uporabljali v drugih jezikih EU.

Eden izmed ključnih ciljev projekta *ZELEN.KOM* je skrb za terminologijo. Kot rezultat je nastal *Glosar* z vključenimi 100 eno- in večbesednimi termini (*GLOSAR*). Ti predstavljajo smiselno izhodišče pri iskanju pomena termina, v drugih priročnikih pa tudi terminološke rabe (npr. na portalu *Fran.si* (*Fran*): v *SSKJ*[2] (*SLOVAR*), v terminoloških slovarjih, *Terminološki svetovalnici*, v slovarjih na portalu *Termania*).

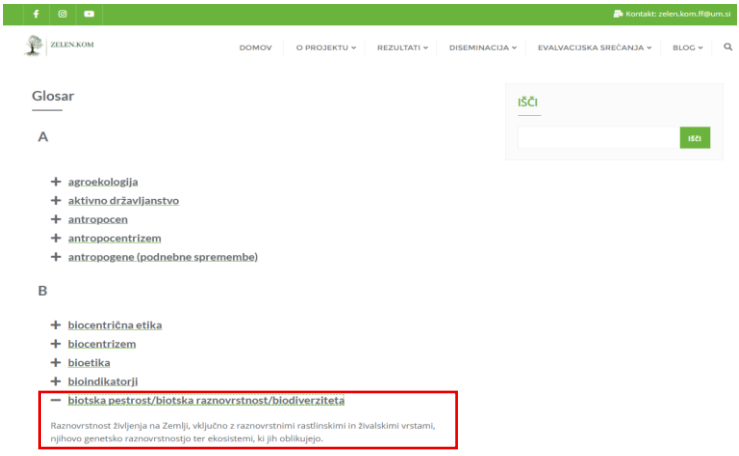
Slika 1

Termin biodiverziteta v *Glosarju* projekta *ZELEN.KOM*



Slika 2

Termin biodiverziteta v splošnih in terminoloških slovarjih na spletnem portalu Fran



Empirični del

V empiričnem delu bomo predstavili: obravnavo terminologije ob primeru literarnega besedila; gradivo *Madu s prijatelji pomaga rešiti morje* (Gračner, 2021); namen in metode dela, ciljno skupino; izvedbene cilje izdelanega gradiva; didaktizacijo izbranega besedila.

Obravnava terminologije ob primeru izbranega literarnega besedila

Obravnava terminologije ob primeru literarnega besedila *Madu s prijatelji pomaga rešiti morje* (Gračner, 2021) je bila v šolskem letu 2024/2025 že predstavljena okviru 8-urnega Programa profesionalnega usposabljanja (PPU) *Kam nas lahko pripeljejo zgodbe za čas podnebne krize?,* razpisanega v katalogu KATIS, in sicer na Filozofski fakulteti Univerze v Mariboru. Obravnava terminologije je bila izvedena kot 2-urni sklop z naslovom *Kako s komunikacijo očistiti morje?* in je bila namenjena učiteljem v osnovni šoli in učiteljem splošnoizobraževalnih predmetov v strokovni oz. poklicni šoli ter gimnaziji. Učitelji so izrazili potrebo po tovrstnih ciljno usmerjenih gradivih, sklop PPU-ja pa so s predlogom didaktizacije ocenili kot zelo dober in uporaben.

Gradivo

Avtorica Maja Gračner je rojena v Sloveniji, kjer je tudi doktorirala iz biologije, nato pa se je preselila v Čile, kjer nadaljuje svojo raziskovalno pot, sicer pa tudi poučuje naravoslovje. Svoje strokovno znanje prenaša tudi na otroke, s pravljicami in pesmimi (tudi uglasbenimi), nastajajočimi na osnovi avtoričine predanosti varstvu okolja, vse v povezavi s potovanji s svojim kužkom Madujem. Otrokom skuša približati naravoslovje (*Založba*):

»[…] hkrati pa zbuja željo po raziskovanju na zanimiv, igriv in kreativen način. V pravljicah predstavlja različne naravoslovne teme ter tehnike in pripomočke pri naravoslovnem raziskovanju, ki jih obogati s pesmicami, ki dodatno pomagajo pri usvajanju novega besedišča.«

Objavila je zbirko štirih zgodb v obliki slikanic, v katerih sta glavna junaka deklica Ota in njen psiček Madu: *Madu in bolšja družina* (2021)*, Madu s prijatelji pomaga rešiti morje* (2021)*, Madu spozna koronavirus* (2021) in *Madu obišče jamo* (2022). Vse štiri knjige so dostopne tudi kot elektronski viri oz. zvočne knjige. Dela so bila najprej objavljena v španščini, nato pa je bila zbirka *Madujeve dogodivščine* izdana tudi v slovenskem jeziku. Kljub temu da so besedila namenjena mlajšim, so ravno takšne *zgodbe* tiste, s katerimi lahko nagovarjamo ciljne skupine katere koli starosti.

Namen in metode dela, ciljna skupina

Izpostavljena bo aktualna tema povezanosti narave in jezika v človekovem vsakdanu s poudarkom na pomembni vzpostavitvi ustreznega odnosa do morja, vodá nasploh, že od predšolske, še posebej pa osnovnošolske dobe. Tema je namreč ključna za uzaveščanje pomena strokovnega izrazja v jeziku, usmerjeno od predšolskega do univerzitetnega izobraževanja s ciljem vzpostavitve ustreznega strokovnega jezika.

Na osnovi zastavljenih raziskovalnih vprašanj je namen prispevka: predstaviti vlogo jezika (z izborom besed in načinom komuniciranja lahko okoljsko tematiko, varstvo okolja, posebej morja, predstavimo ne le kot pereč problem, ampak lahko z njim pripomoremo k reševanju/rešitvi okoljskih problemov); predstaviti uporabnost različnih jezikovnih virov (pravopisa; splošnih enojezičnih slovarjev, spletišča *Fran.si*, terminoloških slovarjev (na spletiščih *Fran.si* in *Termania.net*)); predstaviti uporabnost drugih, spletnih in knjižnih, virov za ozaveščanje o možnih rešitvah z vidika posameznika : skupnosti in lokalnega : globalnemu.
V raziskavi so bile uporabljene naslednje metode: deskriptivna metoda za predstavitev projekta *ZELEN.KOM*, gradnikov bralne pismenosti, ekolingvistike, zelenega diskurza, gradiva, značilnosti in pomena slovenskega strokovnega jezika v splošnih normativnih slovarskih priročnikih na portalih *Franček* in *Fran* v teoretičnem (in deloma empiričnem) delu prispevka; študija primera za prikaz možnosti za usvajanje strokovnega izrazja, povezanega z naravo in s trajnostnim razvojem, s čimer se krepita identifikacija z naravo in želja po njenem varovanju, kar je temelj učinkovite okoljske komunikacije z analizo gradiva in sintezo ugotovitev že od predšolskega obdobja.
Gračner literarnega dela ne opredeljuje (zgolj) za določeno starostno obdobje, je pa na spletni strani Založbe Obzorja Maribor (kjer je delo izšlo) uvrščeno v literaturo za otroke v starosti od 5 do 9 let. Glede na količino besedila v literarnem delu, zastopanost raznovrstnega, zahtevnejšega besedišča in glede na zapletenost stavčnih struktur v povedih lahko ciljno skupino predstavljajo tudi mladi drugega ali tretjega vzgojno-izobraževalnega obdobja osnovne šole. S tem namenom so bile pripravljene tudi aktivnosti, s pomočjo katerih lahko učitelji prilagajajo zahtevnost obravnave okoljske problematike.

Izvedbeni cilji izdelanega gradiva
Zastavljenih je bilo osem izvedbenih ciljev, pri katerih učenci:
1: na osnovi lastnih poletnih prostočasnih aktivnosti prepoznavajo in ozaveščajo številne danosti v različnih okoljih na Zemlji;
2: ob predvajanju skladbe Vile Eksene z naslovom *Naš planet* izluščijo ključne besede oz. besedne zveze *zrak, gozdovi, voda, reke, gore, morja, modri planet* in jih pojasnijo. Prav tako prepoznajo nevarnosti, grozeče planetu Zemlja: onesnaženost zraka, preveč smeti …;
3: na osnovi enobesednega termina *planet* in besednozveznega termina *modri planet* spoznajo spletna portala *Franček* in *Fran* ter pojasnijo oba termina;

4: na osnovi definicije o vodi uzavestijo pomen te za planet Zemlja;
5: spoznajo zgodbo *Madu s prijatelji pomaga rešiti morje* (Gračner, 2021) in se seznanijo s težavami morskih živali, rastlin zaradi onesnaževanja morja (in voda nasploh: plastične mreže, plastične vrečke, plastika, ki jo živali pojedo);
6: pri delu v skupinah z besedili o onesnaženosti okolja iz različnih medijev spoznavajo sebi bližje okolje (Jadransko morje, reka Mura) in tudi širše (oceani sploh);
7: pri delu v skupinah z besedili o onesnaženosti okolja oblikujejo smernice za rešitev omenjene problematike;
8: pri delu v skupinah z besedili o onesnaženosti okolja oblikujejo aktivnosti tako z vidika posameznika kot skupnosti ter jih ponotranjijo.

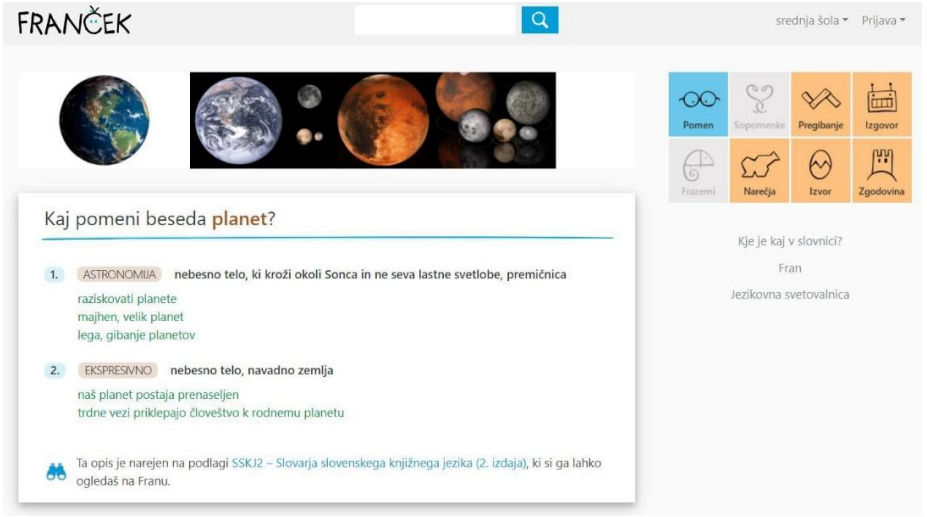
Didaktizacija besedila
Delo je namenoma zastavljeno po ciljih, korakih, in ne kot učna ura s klasično pripravo na pouk. Tako je učitelju morda laže katerega od osmih ciljev izpustiti, ga skrčiti ali razširiti, morda zamenjati njihovo zaporedje.

Uvodna motivacija (cilja 1–2)
Sestavljajo jo štirje koraki:
1: Prepoznavanje poletnih prostočasnih aktivnosti
Učenci od doma prinesejo vsak po eno fotografijo svoje najljubše aktivnosti med zadnjimi poletnimi počitnicami. Ob prihodu v razred jo pritrdijo na za to vnaprej pripravljen prostor (magnetna tabla/plakat/stranska tabla ipd.). Ogledajo si fotografije sošolcev.
2: Prepoznavanje aktivnosti v različnih okoljih
Učitelj na podlagi fotografij učencev vodi pogovor o okoljih, v katerih so potekale poletne prostočasne aktivnosti učencev: doma (v hiši/bloku ipd.), na dopustu (na morju/v gorah/v gozdu/v mestu ipd.). Na tablo sproti zapisuje poimenovanja različnih okolij.
3: Prepoznavanje aktivnosti v različnih časih
Učitelj izpostavi različnost preživljanja prostega časa glede na letni čas. S pomočjo vodenega pogovora učenci primerjajo prostočasne aktivnosti glede na letni čas (poletje : jesen, zima, pomlad) ter jih povezujejo z različnimi okolji.
4: Prepoznavanje okolij v skladbi

Učitelj pred predvajanjem skladbe *Naš planet* (*VILA*) učence usmeri k aktivnemu poslušanju besed o okoljih. Učenci si jih med poslušanjem zapišejo v zvezek.
Po predvajani skladbi skupaj: izpostavijo ključne besede oz. besedne zveze in jih pojasnijo: zrak, gozdovi, voda, reke, gore, morja, modri planet; pogovorijo se o vsem, kar se z okolji dogaja, in kaj se dogaja z Zemljo kot s celoto, s planetom (onesnažen zrak; preveč je smeti; Zemlja trpi: »Vidimo, da zares / tvoje srce trpi.«, »Vem, da te to boli, / za gozdove te skrbi.«; izpostavijo poosebitve: »Reke, gore, morja, / duša so tega sveta. Vsaka rastlina ima / svoje srce.«, »Voda je naše zlato / …«).
Spoznavanje s spletnima portaloma *Franček* in *Fran* ob terminu *planet* in ob besednozveznem terminu *modri planet* (cilj 3)
Učitelj izpostavi besedno zvezo *modri planet*. Učenci na spletnih portalih *Franček* in *Fran* poiščejo:

- pomen besede *planet*:

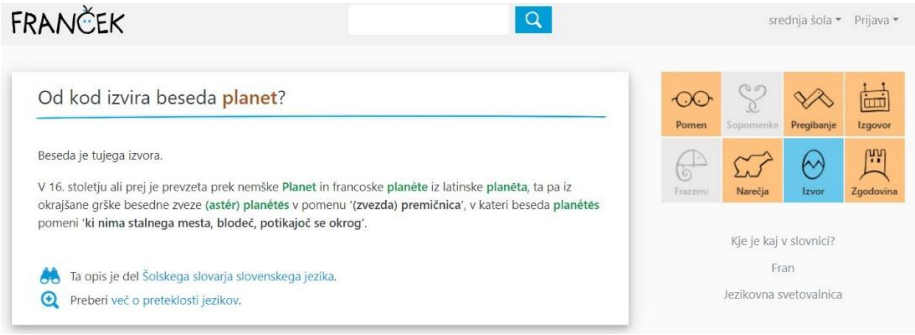
Slika 3
Pomen besede planet na spletnem portalu Franček



– izvor besede *planet*:

Slika 4

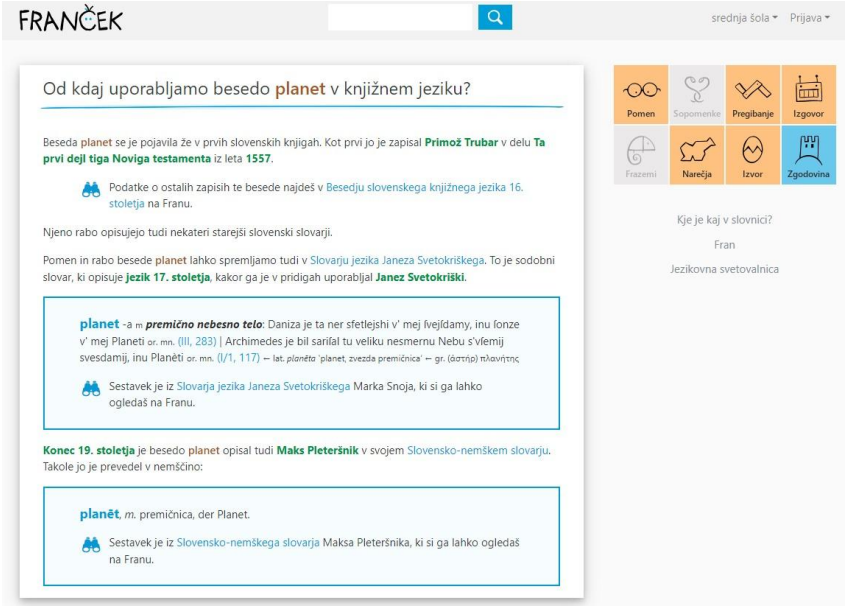
Izvor besede planet na spletnem portalu Franček



– zgodovino besede *planet*:

Slika 5:

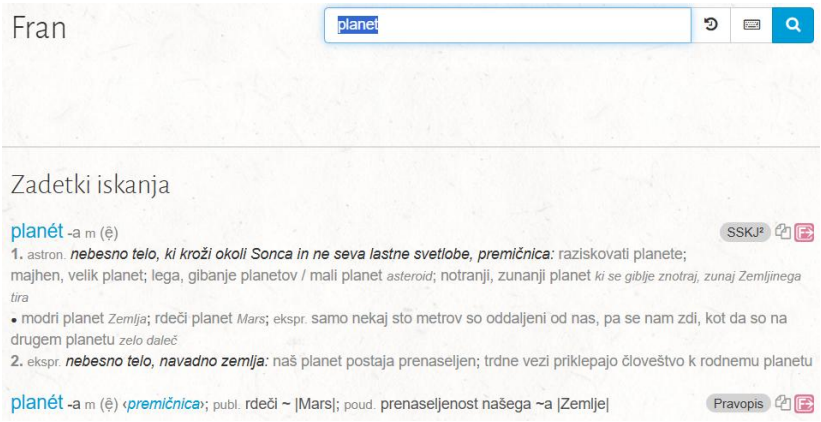
Zgodovina besede planet na spletnem portalu Franček



- pomensko povezavo besede *planet* z besedno zvezo *modri planet* (v frazeološkem gnezdu):

Slika 6

Pomen besede planet na spletnem portalu Fran

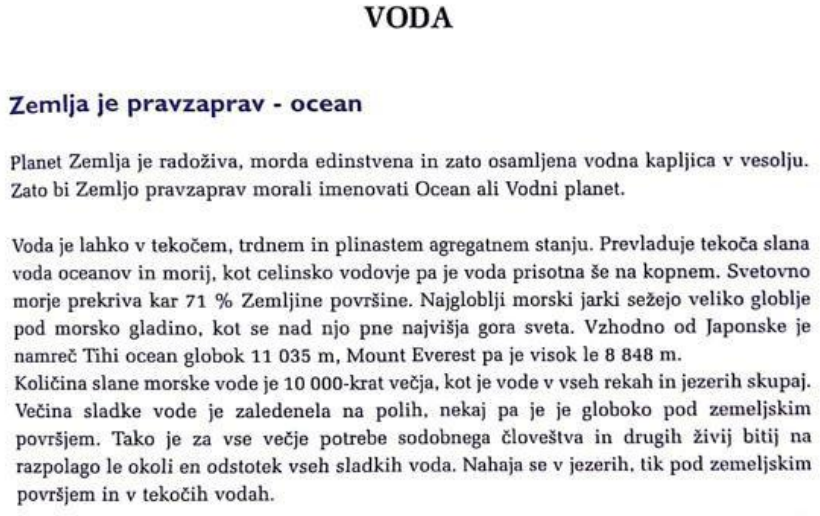


Uzaveščanje pomena vode za planet Zemlja (cilj 4)

Učitelj na tablo projicira del besedila o vodi in ob tem utemelji poimenovanje *modri planet*. Skupaj z učenci izpostavi pomen vode za planet.

Slika 7

Voda (Šorgo idr. 2002: 41)



VODA

Zemlja je pravzaprav - ocean

Planet Zemlja je radoživa, morda edinstvena in zato osamljena vodna kapljica v vesolju. Zato bi Zemljo pravzaprav morali imenovati Ocean ali Vodni planet.

Voda je lahko v tekočem, trdnem in plinastem agregatnem stanju. Prevladuje tekoča slana voda oceanov in morij, kot celinsko vodovje pa je voda prisotna še na kopnem. Svetovno morje prekriva kar 71 % Zemljine površine. Najgloblji morski jarki sežejo veliko globlje pod morsko gladino, kot se nad njo pne najvišja gora sveta. Vzhodno od Japonske je namreč Tihi ocean globok 11 035 m, Mount Everest pa je visok le 8 848 m.
Količina slane morske vode je 10 000-krat večja, kot je vode v vseh rekah in jezerih skupaj. Večina sladke vode je zaledenela na polih, nekaj pa je je globoko pod zemeljskim površjem. Tako je za vse večje potrebe sodobnega človeštva in drugih živij bitij na razpolago le okoli en odstotek vseh sladkih voda. Nahaja se v jezerih, tik pod zemeljskim površjem in v tekočih vodah.

Spoznavanje zgodbe biologinje dr. Maje Gračner *Madu s prijatelji pomaga rešiti morje* (2021) in seznanjanje s težavami morskih živali in rastlin zaradi onesnaževanja morja (cilj 5)

Učitelj z učenci sede v krog, na glas prebere slikanico *Madu s prijatelji pomaga rešiti morje* (Gračner, 2021). Ob tem je pozoren, da vsi vidijo tudi ilustracije**.**

Sledi vodeni pogovor o vsem, kar se v zgodbi dogaja (dežuje, zato pobira odpadke, ob lepem vremenu opazuje sinjega kita, spozna druge morske živali, sreča se z morsko levinjo), učence seznani s težavami morskih živali in rastlin zaradi onesnaževanja, pripravi se načrt, kako rešiti morje.

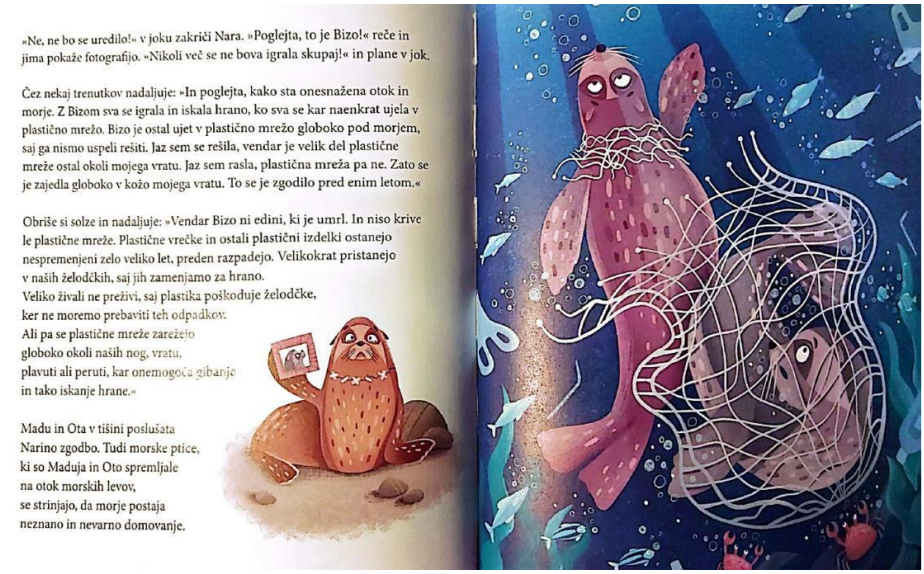
Učitelj posebej izpostavi problematiko onesnaženja morja s plastiko: plastične mreže, plastične vrečke in drugi plastični izdelki, plastika, ki jo živali pojedo (»Velikokrat pristanejo v naših želodčkih, saj jih zamenjamo za hrano. Veliko živali ne preživi, saj plastika poškoduje želodčke, ker ne moremo prebaviti teh odpadkov.« (Gračner, 2021)).

Slika 8

Madu s prijatelji pomaga rešiti morje (Gračner, 2021, str. [15–16])

Slika 9

Madu s prijatelji pomaga rešiti morje (Gračner, 2021, str. [17–18])



Ozaveščanje o možnih rešitvah – globalno : lokalno, skupnost : posameznik (cilja 6–7)

Eden izmed učencev še enkrat prebere načrt, kako rešiti morje (Gračner, 2021, str. [19]), skupaj se pogovorijo o možnostih, ponujenih v zgodbi (skulptura iz odpadkov na morski obali, na vidna mesta prilepljene prošnje morskih živali).

Učitelj izpostavi, da najdemo napotke za reševanje problematike tudi v drugem gradivu. Učenci se razdelijo v več skupin in iz izbranih gradiv s pomočjo delovnih listov poiščejo podane možnosti rešitev. Razmislijo, ali je te možnosti mogoče uporabiti tudi v domačem okolju in kako ukrepati kot posameznik, ne glede na starost, ali kot skupnost.

Pripravljeni predlogi nalog za delo v skupinah:

1. skupina

Slika 10

Naloga 1. skupine

Vir	
Greta Osredkar, Matej Lavrenčič, 2019: *12 korakov za okolje za velike spremembe z malimi dejanji*. Ljubljana: Založba Vida.	
Možnosti rešitev, napotki	Kako pa doma? Posameznik in/ali skupnost?
Kaj uporabnega še najdem:	

2. skupina

Slika 11

Naloga 2. skupine

Vir	
Mikroplastika (TV Koper, 5. 5. 2018): – video prispevek: https://www.facebook.com/tvkoper/videos/mikroplastika/10155526097458008/	
Možnosti rešitev, napotki	Kako pa doma? Posameznik in/ali skupnost?
Kaj uporabnega še najdem:	

3. skupina

Slika 12

Naloga 3. skupine

Vir	
Snaga, d. o. o. – spletna stran: https://www.snaga-mb.si/objava/388708	
Možnosti rešitev, napotki	Kako pa doma? Posameznik in/ali skupnost?
Kaj uporabnega še najdem:	

4. skupina

Slika 13

Naloga 4. skupine

Vir	
Jadransko morje ni tako čisto, kot mislimo: eno najbolj onesnaženih s plastiko – prispevek: https://www.caszazemljo.si/podnebne-spremembe/nase-morje-ni-tako-cisto-kot-mislimo-jadransko-morje-med-najbolj-onesnazenimi-morji.html	
Možnosti rešitev, napotki	Kako pa doma? Posameznik in/ali skupnost?
Kaj uporabnega še najdem:	

5. skupina

Slika 14

Naloga 5. skupine

Vir	
Plastika v oceanih: dejstva, posledice in novi predpisi EU – prispevek: https://www.europarl.europa.eu/news/sl/headlines/society/20181005STO15110/plastika-v-oceanih-dejstva-posledice-in-novi-predpisi-eu	
Možnosti rešitev, napotki	Kako pa doma? Posameznik in/ali skupnost?
Kaj uporabnega še najdem:	

6. skupina

O ugotovitvah poročajo sošolcem.

Slika 15

Naloga 6. skupine

Vir	
Svetovna prvaka na naravoslovnem tekmovanju – prispevek: https://www.24ur.com/novice/preverjeno/svetovna-prvaka-v-naravoznanstvenem-tekmovanju.html; Rezultati vsebnosti mikroplastike v ribah porečja Mure vse popolnoma osupnili. Največ delcev so vsebovale ribe iz Krapja. – prispevek: https://www.prlekija-on.net/lokalno/28573/rezultati-vsebnosti-mikroplastike-v-ribah-porecja-mure-vse-popolnoma-osupnili-najvec-delcev-so-vsebovale-ribe-iz-krapja.html	
Možnosti rešitev, napotki	Kako pa doma? Posameznik in/ali skupnost?
Kaj uporabnega še najdem:	

Ozaveščanje skrbi za zdravo okolje (cilj 8)
Učitelj ponovno predvaja skladbo *Naš planet* (*VILA*) in skupaj z učenci sklene, da je treba: spoštovati naš planet in ga čuvati; se močno zavedati, da nas Zemlja sliši; nekaj *narediti*: posaditi drevo, pobrati smeti, ne pustiti, da gozd gori; verjeti, da zmoremo nekaj narediti *skupaj*; verjeti, da zmore biti *vsak od nas* junak, ki se bori za naravo.

Sklep

Okri (po Stibbe, 2015, str. 1) piše: »Zgodbe so prikriti vir načel: spremeni zgodbe, po katerih se posamezniki ali narodi ravnajo, in boš spremenil posameznike in narode same.« V tem duhu ekolingvistika ni le akademska veda, temveč orodje za spremembo mišljenja, jezika in končno – delovanja. S prepoznavanjem in širjenjem zgodb, ki krepijo zavest o soodvisnosti ljudi in narave, lahko jezik postane ključno orodje za ohranjanje življenja.
V priročniku o poučevanju podnebnih sprememb mladostnikov, o branju, pisanju in ustvarjanju sprememb – *Teaching Climate Change to Adolescents Reading, Writing, and Making a Difference* – (Beach, R., Share, J., Webb, A., 2017, prvo poglavje; prevod avtorici prispevka) se nagovarjajo učitelji ("mi") sicer angleškega jezika in književnosti v srednjih šolah, vendar zapisano velja tudi – ali celo predvsem – za učitelje materinščine, zato naj s to mislijo sklenemo prispevek:
»Mi in naši učenci lahko nekaj spremenimo in to tudi moramo. Imamo priložnost in dolžnost, da svoje učence izobražujemo o podnebnih spremembah, da spodbudimo njihovo domišljijo, talente in energijo, da obveščamo našo lokalno in širšo skupnost ter da se pridružimo drugim po vsem svetu z zahtevo po sodelovanju v enem največjih in najnujnejših prehodov v človeški zgodovini.«

Summary

The paper investigates how students in contemporary educational settings perceive and communicate about environmental and climate change, focusing on the development of language competence and environmental awareness. Using the literary text *Madu s prijatelji pomaga rešiti morje/Madu and His Friends Help Save the Sea* (Gračner, 2021) as a didactic tool, the study demonstrates how environmental objectives can be effectively integrated with language learning to promote a holistic pedagogical approach. The research questions and associated findings are as follows:

1) *How can the acquisition of terminology related to environmental issues, starting in preschool and especially in primary school, contribute to the development of language competence and environmental awareness*? We find that understanding nature and sustainable coexistence begins in early childhood, with language playing an important role in naming, describing, and explaining the world around us. The literary text *Madu s prijatelji pomaga rešiti morje* offers a rich foundation for introducing specialized vocabulary. Acquiring this terminology is not only a pedagogical challenge but also a linguistic process that requires attention to the meaning, form, and correctness of technical terms; 2) *What role do Slovene language resources (orthography, dictionaries) play in the effective and linguistically appropriate use of professional terminology for communicating environmental issues?* We emphasize the role of the Slovene language. We highlight professional registers, the availability of general dictionaries with terminological labels, specialized terminological dictionaries, language corpora, and the Glossary of One Hundred Terms; 3) *What role do other online and printed sources play in raising awareness of possible solutions from the individual to the community level, and from local to global?* We show that awareness of the availability of linguistic online resources significantly contributes to the development of language competence and a positive attitude towards the environment, while also promoting the effective and correct use of specialized terminology in communication about environmental issues.

This case study can serve as an example of good practice, as we find that the text can be fully evaluated and confirmed using Stibbe's (2015:17) story types criteria: ideology–positive environmental ideology; selflessness, cooperation, and respect for the natural world are key values; framing–the story uses the framework of children's friendship and play to address a serious issue–environmental disaster (sea pollution); metaphor–the sea is portrayed almost as a "living person" in need of help, evoking empathy and ethical responsibility; evaluation–the story positively portrays cooperation, care for nature, cleanup actions, and solidarity, while negatively portraying pollution and indifference; identity–the children, especially Madu, are depicted as environmental guardians, shaping the identity of an active, compassionate citizen who thinks globally and acts locally; conviction–the story does not question the existence of environmental problems — the polluted sea is presented as a reality; omission–nature is central; the omission is seen in the lack of emphasis on systemic responsibility (e.g., industry, politics); salience–the story clearly highlights the importance of protecting nature, community, and active citizenship.

The analysis shows that the text *Madu s prijatelji pomaga rešiti morje* consistently expresses environmental responsibility, ethical sensitivity, and a positive relationship with nature, confirming its didactic and ecolinguistic value–all in support of a positive ecolinguistic narrative. These qualities of the text facilitate the acquisition of language knowledge and the ability to communicate climate and environmental topics.

Prispevek je nastal v okviru pilotnega projekta na Filozofski fakulteti Univerze v Mariboru (NRP 3330-22-3514) Komuniciranje podnebne krize za uspešen prehod v zeleno družbo – ZELEN.KOM (2022–2025), ki ga financira Ministrstvo za visoko šolstvo, znanost in inovacije R Slovenije; vodji red. prof. dr. Alja Lipavic Oštir, izr. prof. dr. Danijel Ivajnšič, koordinatorica red. prof. dr. Irena Stramljič Breznik.

Zahvali

Avtorici dr. Maji Gračner in direktorici Založbe Obzorja (Maribor) gospe Nevenki Richter Peče se zahvaljujeva za soglasje za uporabo gradiva za potrebe projekta in prispevka.

Avtorju skladbe, aranžmaja in avdio produkcije skladbe Vile Eksene z naslovom *Naš planet*, SoulGreg Artistu, ter avtorjema besedila, SoulGreg Artistu in Ajdi Bezenšek Špetič, se zahvaljujeva za soglasje za javno predvajanje v izobraževalne namene in za uporabo delov besedila za potrebe projekta.

Izjava o dostopnosti raziskovalnih podatkov

Članek temelji na podatkih, ki so v celoti predstavljeni in obravnavani v besedilu prispevka, zato njihovo dodatno arhiviranje ni potrebno.

Temeljni vir

Gračner, M. (2021). *Madu s prijatelji pomaga rešiti morje*. Maribor: Založba Obzorja Maribor, d. d.

Drugi viri

Osredkar, G., Lavrenčič, M. (2019). *12 korakov za okolje za velike spremembe z malimi dejanji*. Ljubljana: Založba Vida.

VILA Eksena: Naš planet. Avtor skladbe, aranžmaja in avdio produkcija: SoulGreg Artist Avtor besedila: SoulGreg Artist in Ajda Bezenšek Špetič Video produkcija: MediaVibre. Snemanje: Tomi Šenveter Editiranje: SoulGreg Artist in Tomi Šenveter Drone posnetki Slovenije: Boris Branovič. https://vila-eksena.si/; https://www.youtube.com/watch?v=7b5CmmfdWJs

MIKROPLASTIKA (TV Koper, 5. 5. 201): video prispevek. https://www.faceb ook.com/tvkoper–/videos/mikroplastika/101555260974500/

SNAGA, d. o. o. https://w w w.snaga-mb.si/objava/370

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Planinšec, J. (2002). Športna vzgoja in medpredmetne povezave v osnovni šoli. *Šport*, *50*(1), 11–15.

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Fošnarič, S. (2002). Obremenitve šolskega delovnega okolja in otrokova uspešnost. V M. Juričič (ur.), *Šolska higiena: zbornik prispevkov* (str. 27–34). Ljubljana: Sekcija za šolsko in visokošolsko medicino SZD.

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