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Transformative pedagogy for »education for sustainable development« competencies: The role of teachers' professional growth and personality

Abstract: Transformative pedagogy in contemporary educational discourse is becoming imperative for constructing school curricula, especially in the field of education for sustainable development (ESD). This paper presents research that examined the relationship between classroom and subject teachers' self-assessments of professional competencies, ESD competencies (thinking and acting, communication and relationships, and didactic-methodical), and personality traits (extraversion, conscientiousness, agreeableness, emotional stability, and openness), and the assessment of their training: during formal education, professional development, and self-directed learning. The research was conducted on a sample of classroom teachers ($n = 335$) and subject teachers ($n = 537$) in Croatia. The results indicate statistically significant differences in competencies between the two teacher groups. Correlation analysis results indicated predominantly positive associations between the variables. Multiregression analyses revealed that personality traits, forms of education, professional competencies, and teaching position contribute differently to the development of teachers' ESD competencies. The findings of this study confirm multiple predictors of the development of teachers' competencies in ESD while emphasising the importance of integrating personal predispositions and the necessity of lifelong professional development. In conclusion, further research and a deeper understanding of the conditions and factors that shape teachers' competencies and their readiness for practices in the field of sustainable development are necessary.

Keywords: education for sustainable development, personality traits, transformative pedagogies, primary school teachers, secondary school teachers

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Introduction

Transformative pedagogy is founded on the principle that effective learning requires a deliberate and coordinated examination of beliefs, values, and assumptions while placing students at the centre of the educational process (Mezirow 2003). This foundation establishes the theoretical basis for linking pedagogical approaches to sustainable development (SD) goals. This approach encourages critical reflection on personal and collective perspectives, fostering learner-centred practices that support both intellectual and personal growths (Barnett and Botes 2022). Farren (2016) emphasised the importance of collaborative planning between educators and students, alongside reflective practices that extend beyond the classroom. Together, these perspectives illustrate the broader societal and ethical dimensions of transformative pedagogy. Such engagement enables both teachers and learners to cultivate a robust sense of identity, agency, and social responsibility. As Farren further states:

»The conceptual framework for ‘transformative pedagogy’ is based on autonomous teaching and learning and in addition, argues for more systematic links to be developed between knowledge learnt at school and knowledge learnt by interacting in the context of wider society and for school and society living to be informed by a moral-ethical stance. It links teaching and learning with living.« (ibid., p. 2)

Within the domain of education for SD (ESD), the diversity of pedagogical approaches necessitates a comprehensive and integrative framework. Linking the principles of transformative pedagogy to ESD highlights the need for practical and holistic strategies in teaching sustainability. For SD, such pedagogy seeks to provide a holistic and actionable learning experience that aligns with the goals of ESD. It integrates multiple teaching approaches and develops through stages, including natural, interdisciplinary, transdisciplinary, and systems learning, as well as multidimensional and emotional learning, all grounded in constructivist principles.

Contemporary integral pedagogy for SD relies on four essential, interrelated dimensions (Eilam and Trop in Andić 2022) that underpin effective implementation: a personalised and contextualised approach, reflective and experiential learning, and multidisciplinary and multidimensional learning. These dimensions are mutually reinforcing, forming a cohesive framework that bridges theory, practice, and real-world relevance. They foster critical thinking, emphasise practical application, and promote collaboration with the wider community while prioritising active learner engagement, participatory learning, and the integration of diverse pedagogical methods to achieve comprehensive educational outcomes. These four key dimensions, as presented in Figure 1, provide a key foundation for operationalising transformative pedagogy in ESD.

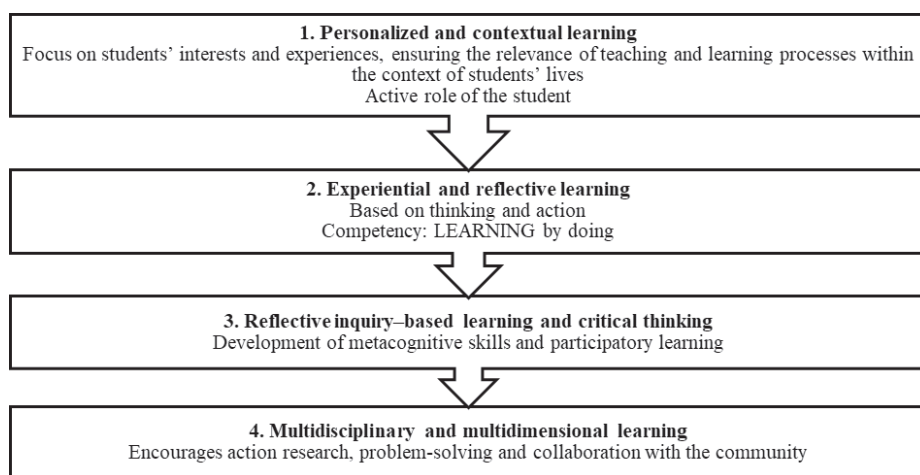


Figure 1: Overview of the four key elements of transformative pedagogy for sustainable development (Andić, according to Eilam and Trop 2010).

In ESD, this approach enables the integration of all dimensions of SD into subject-specific curricula, supports school autonomy, and necessitates ongoing professional development for educators (Andić 2022). This illustrates how transformative pedagogy operationalises ESD objectives in both teacher practice and student learning. It promotes awareness, empathy, critical thinking, and personal empowerment, aiming not only to transmit knowledge but also to transform students' learning processes and personal growths (Bedford 2022; Bonello and Pace 2022; Košmerl and Mikulec 2022; Makovec and Lepičnik Vodopivec 2025; Salonen and Siirilä 2019; Vukelić 2022). Key components include constructivist and critical pedagogical approaches, which may incorporate mindfulness and spiritual intelligence to enhance emotional, psychological, sociocultural, and cognitive developments (Tolksater 2024). Practical implementation is typically realised through cross-curricular, action-oriented projects that address issues in science, climate, health, environment, and social justice (Kubisch et al. 2022; Leal Filho et al. 2018; Ribeiro-Silva et al. 2023). While these strategies empower learners, they also present challenges for teachers in developing and applying comprehensive professional competencies.

Teacher competencies and characteristics represent critical systemic factors that influence learning outcomes (López-Martín et al. 2023). Meta-analytic research indicates that this pedagogical approach can profoundly shape students' attitudes, identities, and social practices while fostering innovative teaching strategies that cultivate critical thinking, emotional resilience, and active community engagement (Bhuttah et al. 2024; Leithwood et al. 2019). These findings underscore the central role of teacher expertise in enabling transformative pedagogy for SD. Transformative pedagogy often involves collaborative, team-based, and action-oriented projects that address SD challenges, including science, climate policy, public health, and social justice (Kubisch et al. 2022; Leal Filho et al. 2018; Ribeiro-Silva et al. 2023). Effective implementation requires skilled teachers, bottom-up approaches, and school autonomy aligned with ESD objectives (Andić 2022).

In a rapidly evolving educational landscape, continuous assessment of educational needs, conditions, and opportunities is essential alongside curriculum-driven planning for teacher professional development (Čepić 2020; Čepić and Pejić Papak 2021). Consequently, achieving ESD goals depends not only on pedagogical frameworks but also on systemic support and professional capacity building. Therefore, this approach presents both opportunities and challenges, requiring competent educators, a structured curriculum, school autonomy, and systemic support to realise the goals of ESD (Andić 2022). It also raises the following critical questions: What kind of teacher applies such a pedagogy, or what kind of teacher should they be? What competencies in ESD must such a teacher have, and how can they be effectively developed?

Teachers' personality traits, such as emotional stability and openness, along with empathy, and resilience, play a critical role in shaping their capacity to implement ESD, highlighting the need for psychosocial support and targeted professional development (UNESCO 2023). Personality is also a key determinant of the overall quality of the educational process, influencing explicit teaching practices and implicit psychological processes in the classroom (Tatalović Vorkapić 2012, 2015, 2017b). Using the widely applied Big Five model for analysing teachers' personalities, previous research has shown that teachers tend to exhibit high levels of extraversion, openness to experience, agreeableness, conscientiousness, and emotional stability (Tatalović et al., 2016; Tatalović Vorkapić 2017a; Tatalović Vorkapić and Pelóza, 2017). Moreover, it must be emphasised that a growing body of evidence suggests that specific traits, particularly conscientiousness, openness, agreeableness, and emotional stability, play a vital role in shaping environmental attitudes, values, and pro-environmental behaviours (Hirsh 2014; Milfont and Sibley 2012; Muffato et al. 2025; Roczen et al. 2014; Soutter et al. 2020; Soutter and Möttus 2021). These traits are integral components of teachers' competencies in ESD, enhancing their ability to employ innovative, ethical, and participatory teaching strategies that support SD (Lenziardi et al. 2025; Sleurs 2008) and aligning closely with the complex cognitive, social, and emotional demands of the teaching profession.

In this context, it is evident that developing teachers' competencies remains a complex challenge for research, pedagogical reflection, and the formulation of

educational policy and practice. Prior studies, particularly those that focused on the readiness and self-efficacy of prospective teachers in ESD, underscore the critical need for teachers to demonstrate not only positive attitudes towards sustainability but also comprehensive knowledge of SD issues, an understanding of the values that underpin sustainability, and the ability to translate these into sustainability-oriented behaviours (Vukelić 2022).

Prior research also highlights notable differences between primary and subject teachers regarding their attitudes, educational needs, perceptions, competencies, and pedagogical approaches to ESD (Isac et al. 2022). Primary teachers more frequently employ interdisciplinary and integrative methods, fostering holistic understandings of sustainability across ecological, social, cultural, and economic dimensions (Bassachs et al. 2020). By contrast, subject teachers, particularly those in secondary education, often approach sustainability from narrower disciplinary perspectives. For example, science teachers tend to demonstrate stronger ecological competencies, whereas other subject teachers may exhibit less developed skills in social and economic domains (Sund and Gericke 2020).

Despite these advances, systematic professional development in ESD remains insufficient, particularly in Croatia (Andić 2020). The Eurydice report on learning for sustainability in Europe (2024) confirms that while most European countries provide professional development activities on sustainability, only a few incorporate explicit sustainability learning objectives or content requirements in teacher education programmes and qualifications: »Most European countries provide professional development activities on sustainability and other support measures for employed teachers. Only a few have set learning objectives related to sustainability or content requirements for teacher education programmes and qualifications.« (Eurydice 2024, pp. 61–66)

Previous studies in Croatia and Slovenia have examined the relationships between teachers' ESD competencies, self-assessed professional development, and participation in continuous education (Andić 2017; Andić 2020). However, these studies have not fully addressed how teachers' personality traits interact with their professional competencies and engagement in professional development, nor have they systematically examined the differences between primary and subject teachers in shaping ESD competencies, leaving a gap that this study aimed to address. Recent findings further demonstrate that acquired competencies and personality traits significantly influence teachers' ESD competencies, with specific traits strongly associated with pro-environmental attitudes and behaviours (Andić and Tatalović Vorkapić 2019; Andić et al. 2025; Sleurs 2008;).

By examining the interplay between teachers' professional competencies, personality traits, and engagements in various forms of professional development for ESD, this study makes a significant scientific contribution by providing new empirical insight into the factors shaping ESD competencies, clarifying how personal and professional characteristics influence teachers' readiness to implement transformative pedagogy for SD, highlighting significant differences between classroom and subject teachers, and providing evidence-based guidance to enhance teacher education programmes and policies, thereby addressing gaps not fully investigated in previous research.

Aim and research questions

The aims of this research were to examine the relationships between classroom and subject teachers' self-assessed professional competence, competencies in ESD, and personality traits (extraversion, conscientiousness, agreeableness, emotional stability, and openness), and assessments of continuing professional development through different forms of education: during formal education, professional education, and self-directed learning.

The research questions were defined in accordance with the aims of this study:

- RQ1. How can a competency level that encompasses the described guidelines of a transformative SD pedagogy be achieved?
- RQ2. Are there differences between classroom and subject teachers in terms of initial education and professional development or other important factors?
- RQ3. What are the predictors of a teacher's competence in ESD, and how do personality traits, different forms of education, and professional competency levels affect their levels of professional development?

Methods

Measurement instruments

The following measurement instruments were used in this study:

1. The Scale of Competencies for ESD (Andić 2017) contains 21 items, and each factor represents a specific form of competence corresponding to the United Nations Economic Commission for Europe model of competencies: the »Learning for the future: The competencies in education for sustainable development (ECE) model« (UNCE 2011). To obtain a shorter scale, a confirmatory factor analysis was performed, and the short(end) scale contained 12 items describing three aspects of competencies:

1. ESD 1 Thinking and Acting (T&A, $\alpha = 0.82$) contained four items (e.g. *Formulating analytical questions and developing critical thinking in work*).
2. ESD 2 Communication and Relations (C&R, $\alpha = 0.84$) contained four items (e.g. *Democratic decision-making and implementing decisions in the classroom with students and colleagues in school*).
3. ESD 3 Didactic-methodological aspects of work practise (D&M_P, $\alpha = 0.87$) contained four items (e.g. *Planning, organising, and implementing projects and activities in school and the local community that promote SD*). The participants answered the question: »To what extent have you developed your own competencies for successful work with students in the ESD as part of your previous training and professional development?« on a Likert scale from 1 (not at all) to 5 (to a high degree).

The fit indices of the 12-item scale were as follows: $\chi^2 = 246.668$ df (51); $\chi^2/df = 4.83$; $p < 0.001$; comparative fit index (CFI) = 0.964; Tucker–Lewis index (TLI) = 0.953; root mean square error of approximation (RMSEA) = 0.066, RMSEA 90% confidence interval [CI] (0.058–0.073), $p < 0.001$; standardised root mean square residual (SRMR) = 0.033; goodness-of-fit index (GFI) = 0.996. The reliability coefficient of the new short scale was $\alpha = 0.91$.

2. The scale on which the participants rated the forms of education through which they had developed their competencies ranged from 1 («I have not developed them at all») to 5 («I have developed them very well») in three categories of self-assessment: 1. during their formal education, 2. through professional development (training), and 3. through self-directed learning. The metric characteristics of this scale are not shown.

3. The professional competencies scale (PCScale) comprised 7 items (Čepić et al. 2017), which the participants used to assess professional competency level. The exploratory analysis revealed two factors: 1. reflection, cooperation, and dialogue (RC&D) (analysis of the strengths and weaknesses of one's own educational work; establishing constructive dialogue with colleagues; mentoring students during practical training and trainee teachers; and cooperation with parents) and 2. praxis (PX; thoughtful integration of new insights into one's educational work; constructive involvement in research and development projects; constructive establishment of partnership cooperation with other schools and institutions, as well as various professionals), which explains 52% of the variance.

The confirmatory analysis revealed adequate fit indices of the model: $\chi^2 = 102.38$; df (13); $p < 0.001$; CFI = 0.969; TLI = 0.936; RMSEA = 0.088, RMSEA 90% CI (0.073–0.104), $p < 0.001$; SRMR = 0.038; and GFI = 0.969. The reliability coefficient of the scale was $\alpha = 0.836$.

4. To measure personality traits, the adapted version (Tatalović Vorkapić 2016) of the Ten-Item Personality Inventory (Gosling et al. 2003) was applied. The inventory measures the five personality traits according to the Big Five model: extraversion, conscientiousness, agreeableness, emotional stability, and openness to new experiences. It consists of 10 items (2 items for each subscale), which respondents rated using a 7-point Likert-type scale (1 – *strongly disagree*; 2 – *moderately disagree*; 3 – *slightly disagree*; 4 – *neither agree nor disagree*; 5 – *slightly agree*; 6 – *moderately agree*; 7 – *strongly agree*). Owing to the small number of items, it is recommended to calculate test-retest reliability. When checking internal consistency reliability, it is necessary to calculate the Cronbach's alpha coefficient for the entire scale, which is, for this study, at a satisfactory level, $\alpha = 0.63$.

Sample and procedure

The research involved 890 participants from Croatian schools. Of the 890 participants, 335 were primary classroom teachers and 537 were subject teachers of various subjects. In terms of gender, 726 participants were female, and 149 participants were male. The average age of the participants was between 24 and 65 years ($M = 40.51$ years). In terms of work experience, the participants had between 1 and 44 years of work experience, or an average of $M = 15.91$ years of

work experience. Fifteen participants did not provide any information on their sociodemographic data.

All participants came from primary schools in all Croatian counties. The study was conducted in accordance with the ethical principles for conducting research (GDPR). Permission was obtained from the faculty's ethics committee for scientific research, and consent was obtained from the Ministry of Science and Education, the Agency for Education and Training, school headmasters, and the participants. The survey was conducted using the paper-and-pencil method. Completion of the questionnaire was anonymous and voluntary. The statistical packages SPSS, JAMOVİ, and JASP were used for data processing. Data analysis was performed in May 2025.

Results

To answer the research questions, several statistical procedures were performed. In pursuit of answering RQ1, a non-parametric Spearman rank correlation test was performed, as preliminary analyses indicated that the sample distribution deviated from normality. The results are presented in Table 2.

Variable	1	2	3	4	5	6	7	8	9
1. Teacher	—								
2. formal_ed	-0.009	—							
3. prof_dev	-0.117***	0.557***	—						
4. self_dl	-0.161***	0.367***	0.609***	—					
5. ESD_1	-0.055	0.176***	0.284***	0.381***	—				
6. ESD_2	-0.111**	0.141***	0.269***	0.331***	0.634***	—			
7. ESD_3	-0.198***	0.291***	0.463***	0.516***	0.556***	0.613***	—		
8. RC&D	-0.136***	0.086*	0.214***	0.282***	0.448***	0.444***	0.390***	—	
9. PC	0.006	0.212***	0.234***	0.305***	0.510***	0.388***	0.397***	0.619***	—

Table 2: Results of the Spearman correlation analysis (ρ). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

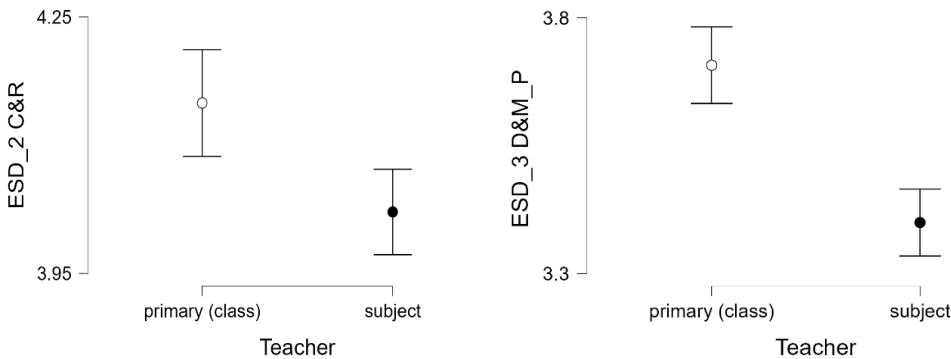
The results of the correlation analysis show mostly statistically positive and negative correlations between the key variables: teachers and professional development, self-directed learning, ESD competencies but not those related to thinking and action, and professional competencies related to intercommunication competencies. In addition, the highest values were obtained: statistically significant and positive correlations between ESD competencies and forms of learning, especially between didactic-methodical competencies and self-directed learning ($r = 0.516^{***}$), and ESD competencies related to thinking and action and practice as part of professional competencies ($r = 0.510^{***}$). Primary (class) teachers are coded as 1; and subject teachers, as 2.

To address RQ2, a Mann–Whitney test was performed to examine differences between the primary and subject teachers in terms of professional competencies, ESD competencies, and the forms of ESD-related competencies. The results are presented in Tables 3 and 4.

Variable	U	p
ESD_1 T&A	95,809.000	0.102
ESD_2 C&R	101,597.500	0.001*
ESD_3 D&M_P	110,932.500	0.001*
RC&D	104,313.000	0.001*
PX	89,288.000	0.854

Table 3: Results of the Mann–Whitney U test for differences among teachers

The results show significant differences between the primary and subject teachers in ESD competencies (Figures 1–3).



Figures 1 and 2: Differences in the arithmetic means of the primary and subject teachers for ESD competencies

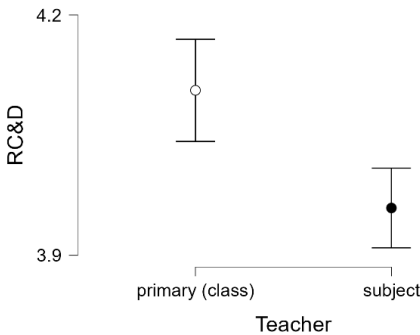


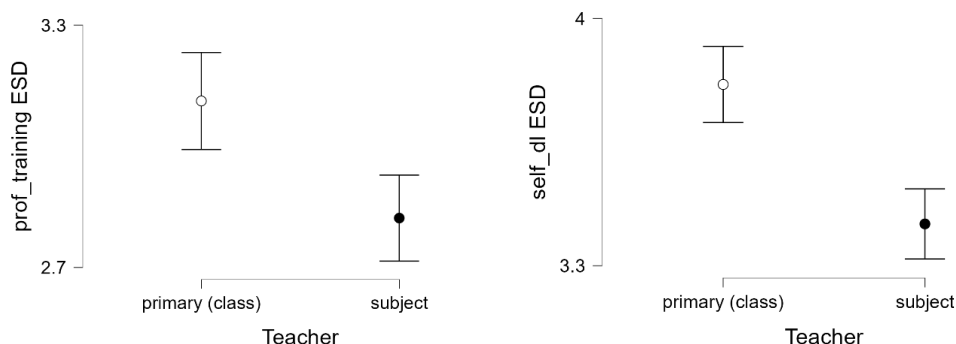
Figure 3: Differences in the arithmetic means of the classroom and subject teachers for professional competencies related to reflection, cooperation, and dialogue

The statistically significant differences identified between the primary and subject teachers in the forms of education regarding ESD competencies are shown in Table 4.

Variable	U	p
Formal education	78,014.500	0.795
Professional development	88,695.000	0.001*
Self-directed learning	94,296.500	0.001*

Table 4: Results of the Mann–Whitney U test for differences related to forms of learning among the teachers

From Figures 4 and 5, it is evident that the primary teachers achieved higher ESD competency levels than did the subject teachers in the form of professional development and self-directed learning.



Figures 4 and 5: Differences in the arithmetic means of the primary and subject teachers for forms of learning

Finally, to address RQ3, three multiple regression analyses were performed. ESD competencies were set as criterion variables, while professional competencies related to reflection, cooperation, dialogue, and praxis, forms of learning, and personality traits from the Big Five model were entered as predictors. The primary (class) teachers were coded as 1; and the subject teachers, as 2. The results are presented in Table 5.

Criterion Variable	ESD 1 T&A		ESD 2 C&R		ESD 3 D&M_P	
Predictors	β	p	β	p	β	p
Teachers (class, subject)	0.015	0.627	-0.027	0.400	-0.103	0.001***
Formal education	0.025	0.489	0.016	0.671	0.019	0.569
Professional development	0.045	0.278	0.066	0.132	0.168	0.001***
Self-directed learning	0.158	0.001***	0.127	0.002**	0.338	0.001***
Reflection, cooperation and dialogue	0.155	0.001***	0.234	0.001***	0.105	0.005*
Praxis	0.276	0.001***	0.131	0.002**	0.183	0.001***
Extraversion	0.034	0.262	0.083	0.012*	0.045	0.122
Agreeableness	0.005	0.887	0.006	0.860	0.008	0.798
Conscientiousness	0.059	0.063	0.083	0.014*	0.019	0.533
Emotional stability	0.032	0.333	0.040	0.256	-0.023	0.460
Openness	0.150	0.001***	0.072	0.048*	0.042	0.193
β - standardised regression coefficient, p- statistical significance ESD 1 $R = 0.602$, $R^2 = 0.363$, $F_{(11,786)} = 40,531$; $p = 0.001$ ESD 2 $R = 0.526$, $R^2 = 0.277$, $F_{(11,786)} = 27,383$; $p = 0.001$ ESD 3 $R = 0.657$, $R^2 = 0.432$, $F_{(11,786)} = 54,246$; $p = 0.001$						

Table 5: Results of the multiregression analysis for ESD competencies

The statistically significant predictors for the ESD competencies »Thinking and action« are self-directed learning, professional competencies, and the personality trait »openness«; »Communication and relations«, self-directed learning, professional competencies, and the personality traits extraversion, conscientiousness, and openness; and »Didactic-methodological aspects of work practise«, teachers (evidently from the prefix of coefficient are class teachers with higher values), professional development and self-directed learning, and professional competencies (reflexion, cooperation and dialogue, and praxis).

Discussion

A comprehensive series of analyses was conducted to systematically address the research questions, with the primary aim of producing findings that might provide insight into the complexity of the focused variables examined in this research.

First, regarding RQ1, the results indicate that forms of education, professional competencies, and ESD competencies are positively interrelated, suggesting that teachers' engagement in diverse learning experiences is closely associated with their capacity to implement SD principles in practice. Self-directed learning emerged as a prominent form of professional development, reinforcing its role as a key mechanism for fostering didactic-methodological competencies and ESD-related thinking and action. These patterns underscore the importance of combining formal education, structured professional development, and autonomous learning opportunities to support teachers' ongoing competence development (Gore and Rosser 2020; Ventista and Brown 2023). More broadly, this highlights that cultivating lifelong learning among teachers is not merely a professional requirement but an intrinsically motivated process, reflecting the essential role of self-directed learning in promoting reflective, adaptable, and sustainability-oriented teaching practices (Béypınar and Sivacı 2023; Rogić 2015).

Second, in response to RQ2, the analyses revealed clear differences between the primary and subject teachers in their ESD competencies, particularly in areas related to communication, relationships, and didactic-methodological practices. These differences suggest that primary teachers are more inclined to adopt interdisciplinary and holistic approaches, fostering a broader understanding of sustainability across ecological, social, cultural, and economic dimensions (Basachs et al. 2020; Isac et al. 2022). By contrast, subject teachers tend to focus on discipline-specific content, highlighting the need for professional development programs tailored to the distinct responsibilities and educational contexts of different teacher groups (Forsler et al. 2024; Sund and Gericke 2020). The observed variations in engagement with professional development and self-directed learning further indicate that teachers who actively pursue autonomous learning opportunities tend to strengthen their pedagogical competencies, including interdisciplinary and didactic skills (Su et al. 2025). This underscores that targeted professional development is essential for enhancing ESD competencies, particu-

larly considering the ongoing gaps in initial and in-service teacher education regarding sustainability themes (Eurydice 2024). Moreover, previous research emphasises that fragmented subject curricula can limit the integration of interdisciplinary and holistic teaching approaches and that teachers consistently recognise the need for continued professional development in ESD, even when their educational needs and priorities differ (Marentič Požarnik 2022; Pegalajar-Palomino et al. 2021; Rožman et al. 2023; Ventista and Brown 2023; Vukelić 2022). Specifically, primary teachers' educational demands often focus on disciplinary knowledge and holistic pedagogical strategies, whereas subject teachers require support in linking subject-specific content with interdisciplinary collaboration skills and methodologies that enable the integration of sustainability values (Forsler et al. 2024).

Finally, regarding RQ3, the analyses suggest that professional competencies – particularly self-directed learning, reflection, cooperation, dialogue, and praxis – play a central role in shaping teachers' ESD competencies, emphasising the value of an active and reflective approach to professional development (Andić 2020; Bertschy et al. 2013; Rodriguez-Gomez et al. 2024; UNESCO 2020). Collaborative professional learning, or co-learning, is especially important, as it fosters experience-sharing, reflection, dialogue, and the development of shared pedagogical strategies among teachers across different educational levels and subject areas (Gore and Rosser 2020; Isac et al. 2022). Personality traits also contribute to the development of ESD competencies. Regarding personality traits as possible predictors, the findings suggest that openness is the most significant predictor of competencies in thinking, action, communication, and relationships, whereas extraversion and conscientiousness predicted communication competencies (Andić and Tatalović Vorkapić 2019, 2020; Andić et al. 2025; Soutter et al. 2020; Tatalović Vorkapić 2017a; UNESCO 2023). This distinction aligns with the content of the ESD competencies, where thinking, action, communication, and relationships are interpersonal and reflective in nature, partially overlapping with elements of open, extraverted, and conscientious personalities, whereas didactic-methodological skills are primarily developed through practice and professional engagement.

These findings generally indicate that the development of ESD competencies is multifactorial, arising from the dynamic relationships between personal traits, professional competencies, and engagement in continuous, reflective professional development. Transformative and experiential learning, together with practical involvement in school and community contexts, appears particularly influential in fostering these competencies (Coress et al. 2020; Leal Filho et al. 2018; Su et al. 2023). Moreover, the differences between the primary and subject teachers suggest that primary teachers tend to achieve higher levels of competence, likely reflecting both the nature of their initial education and broader pedagogical practice. Understanding the key mechanisms of teachers' professional development and the conditions that foster their growth is essential for advancing educational practice (Čepić and Kalin 2017). These patterns underscore the need to account for teacher background and context when designing targeted professional development initiatives.

Overall, the findings of this research reinforce the importance of transform-

ative pedagogy, which encompasses not only knowledge acquisition but also the development of attitudes and values, personal growth, and the cultivation of reflective practices within professional development in ESD (Bedford 2022; Bourn and Soysal 2021; Mezirow 2003). They further emphasise that effective competency development requires a combination of systemic support, targeted professional learning, and attention to individual teacher characteristics.

Conclusion

In conclusion, this research confirms that the development of ESD teachers' competencies is shaped by a combination of personal characteristics – particularly specific personality traits – and engagement in diverse forms of education as integral components of professional development. Self-directed learning and professional competencies consistently emerged as predictors across all dimensions of ESD competencies, highlighting the critical role of a reflective and active approach to lifelong learning.

The differences between the primary and subject teachers emphasise the influences of initial education and professional practice. The primary teachers scored higher in communicative and didactic-methodological competencies and in the forms of professional development and self-directed learning. These patterns indicate that primary teachers are more inclined towards integrated and interdisciplinary pedagogical approaches, whereas subject teachers show a greater need to strengthen competencies that link sustainability with subject-specific content.

Personality traits, particularly openness, emerged as key predictors, with extraversion and conscientiousness further contributing to communication competencies. This confirms that personal dispositions, together with professional and didactic skills, are essential for implementing transformative pedagogy. These findings are consistent with existing research examining the relationship between personality traits and environmental attitudes, beliefs, and behaviours, which are strongly linked to ESD competencies.

From a theoretical perspective, these findings reinforce the importance of understanding how personal characteristics and professional competencies interact to shape teachers' readiness to implement transformative pedagogy for SD. They also clarify the differential development of competencies between primary and subject teachers and highlight the role of personality traits in ESD competency formation.

From a practical perspective, the results of this study indicate the necessity of fostering self-directed and experiential learning within teachers' professional practice. They also emphasise the importance of supporting teachers through professional learning communities and collaborative practices, in line with UNESCO's (2020) guidelines for 21st-century educators. Furthermore, the findings suggest that professional development should be tailored to the specific demands of primary and subject teachers to enhance their ability to integrate sustainability into subject-specific curricula and teaching practices.

Nonetheless, the limitations of this study must be acknowledged: Although

the sample was largely representative, caution is required when generalising findings to the broader population. Finally, this research does not provide definitive answers regarding the differences between primary and subject teachers or the specific contributions of personality traits, self-assessment of professional competencies, and individual forms of education in the development of ESD competencies. Thus, important questions remain: What opportunities exist to systematically enhance teachers' competencies for ESD? To what extent are teachers willing to implement transformative pedagogy for sustainability? Which factors most strongly contribute to their professional development in the field of SD and, more broadly, to their ongoing professional growth? Further research is necessary to determine the extent to which and under what conditions personality traits and different forms of professional development influence the level of teachers' competencies and their willingness to engage in ESD.

Statement on access to research data

The data are not digitized.

The research data used in this article are not digitized. They are stored in analogue form by the authors and are available upon justified request.

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Literature

Andić, D. (2017). Profesionalni razvoj i kompetencije učitelja u odgoju i obrazovanju za održivi razvoj. In: R. Čepić and J. Kalin (eds.). *Profesionalni razvoj učitelja: Status, ličnosti, transverzalne kompetencije*. Rijeka: Učiteljski fakultet Sveučilišta u Rijeci, pp. 87–118.

- Andić, D. and Tatalović Vorkapić, S. (2019). Proekološki stavovi i osobine ličnosti budućih učitelja. In: M. Orel (ed.). *EDUvision 2019 – Sodobni pristopi poučevanja prihajajočih generacij*. Ljubljana: EDUvision, Stanislav Jurjevčič s.p., pp. 1402–1414.
- Andić, D. (2020). Continuing professional development of teachers in education for sustainable development – Case study of the Republic of Croatia. *Teacher Development*, 24, issue 2, pp. 1–22.
- Andić, D. and Tatalović Vorkapić, S. (2020). What is the relationship between personality traits and pro-environmental attitudes among future early childhood educators? In: L. Gómez Chova, A. López Martínez and I. Candel Torres (eds.). *INTED2020 Proceedings, 14th International Technology, Education and Development Conference, 2nd–4th March*. Valencia: IATED Academy, pp. 7694–7702.
- Andić, D. (2022). *Play, nature and sustainable development: How to foster connectedness to nature in children of early and (pre)school age?* Rijeka: Faculty of Teacher Education, University of Rijeka.
- Andić, D., Tatalović Vorkapić, S. and Čepić, R. (2025). Education for sustainable development and personality traits: Correlational and predictive insights into primary school teachers' professional development. In: V. Chiou, L. Geunis, O. Holz, N. Oruç, J. Ratkowska-Pasikowska and F. Shelton. (eds.). *Research and evidence-based perspectives in education: Diverse discourse, connected conversations*. Berlin: Waxman Verlag GmbH, pp. 17–26.
- Barnett, E. and Botes, W. (2022). Transformative pedagogy adoption by Natural Sciences pre-service teachers in a South African university. *Issues in Educational Research*, 32, issue, 4, pp. 1290–1305.
- Bassachs, M., Cağbate, D., Serra, T. and Colomer, J. (2020). Interdisciplinary cooperative educational approaches to foster knowledge and competencies for sustainable development. *Sustainability*, 12, issue 20, pp. 1–17.
- Bedford, T. (2022). Constructing a transformative sustainability pedagogy: Teacher empowerment for a sustainable future. *Journal of Teacher Education for Sustainability*, 24, issue 1, pp. 5–18.
- Bertschy, F., Künzli, C. and Lehmann, M. (2013). Teachers' competencies for the implementation of educational offers in the field of education for sustainable development. *Sustainability*, 5, issue 12, pp. 5067–5080.
- Béypınar, D. and Sivacı, S. Y. (2023). Relationship between lifelong learning tendencies and self-directed learning skills of teacher candidates. *Theory and Practice in Language Studies*, 13, issue 6, pp. 1267–1276.
- Bhuttah, T. M., Xusheng, Q., Abid, M. N. and Sharma, S. (2024). Enhancing student critical thinking and learning outcomes through innovative pedagogical approaches in higher education: The mediating role of inclusive leadership. *Scientific Reports*, 14, issue 1, pp. 1–13.
- Bonello, C. and Pace, P. (2022). Transformative pedagogies — a useful theoretical framework for promoting ESD. In: J. Pánek, M. Fabián and P. Rabušic (eds.). *EduChange methodology*. Olomouc: Palacký University Olomouc, pp. 56–62.
- Bourn, D. and Soysal, N. (2021). Transformative learning and pedagogical approaches in education for sustainable development: Are initial teacher education programmes in England and Turkey ready for creating agents of change for sustainability? *Sustainability*, 13, issue 16, article 8973.

- Corres, A., Rieckmann, M., Espasa, A. and Ruiz-Mallén, I. (2020). Educator competencies in sustainability education: A systematic review of frameworks. *Sustainability*, 12, issue 23, article 9858.
- Čepić, R. and Kalin, J. (eds.) (2017). *Profesionalni razvoj učitelja: Status, ličnost i transverzalne kompetencije*. Rijeka: Učiteljski fakultet Sveučilišta u Rijeci.
- Čepić, R., Kalin, J. and Šteh, B. (2017). Profesionalni razvoj učitelja: kontekst, perspektive i izazovi. In: R. Čepić and J. Kalin (eds.). *Profesionalni razvoj učitelja: status, ličnost i transverzalne kompetencije*. Rijeka: Učiteljski fakultet Sveučilišta u Rijeci, pp. 21–44.
- Čepić, R. (2020). Considering the educational needs, conditions, and opportunities in the context of teachers' professional development. In: L. Gómez Chova, A. López Martínez and I. Candel Torres (eds.). *EDULEARN20 Proceedings*. Valencia: IATED Academy, pp. 4068–4074.
- Čepić, R., and Pejic Papak, P. (2021). Challenges of Curriculum Planning and Achieving Learning Outcomes: A Case Study of Croatian Elementary School Teachers' Experiences. *Revista Romaneasca Pentru Educatie Multidimensionala*, 13, issue 1Sup1, pp. 78–100.
- Eurydice – European Commission (2024). *Learning for sustainability in Europe: Building competences and supporting teachers and schools* (Eurydice Report). Retrieved from: <https://op.europa.eu/en/publication-detail/-/publication/dc327457-f875-11ee-a251-01aa75ed71a1/language-en> (accessed on 3 February 2026).
- Farren, P. (2016). Transformative pedagogy in context: Being and becoming. *World Journal on Educational Technology: Current Issues*, 8, issue 3, pp. 190–204.
- Forsler, A., Nilsson, P. and Walan, S. (2024). Collective pedagogical content knowledge for teaching sustainable development. *International Journal of Science and Mathematics Education*, 22, issue 6, pp. 1197–1214.
- Gore, J. and Rosser, B. (2020). Beyond content focused professional development: Powerful professional learning through genuine learning communities across grades and subjects. *Professional Development in Education*, 46, issue 2, pp. 218–232.
- Gosling, S. D., Rentfrow, P. J. and Swann, W. B., Jr. (2003). A Very Brief Measure of the Big Five Personality Domains. *Journal of Research in Personality*, 37, issue 6, pp. 504–528.
- Hirsh, J. B. (2014). Environmental sustainability and national personality. *Journal of Environmental Psychology*, 38, pp. 233–240.
- Isac, M. M., Sass, W., Pauw, J. B. De, De Maeyer, S., Schelfhout, W., Van Petegem, P. and Claes, E. (2022). Differences in teachers' professional action competence in education for sustainable development: The importance of teacher co-learning. *Sustainability*, 14, issue 2, article 767.
- Košmerl, T. and Mikulec, B. (2022). Adult Education for Sustainable Development from the Perspective of Transformative Learning Theories. *Journal of Contemporary Educational Studies*, 73, issue 2, pp. 164–179.
- Kubisch, S., Krimm, H., Liebhaber, N., Oberauer, K., Deisenrieder, V., Parth, S., Frick, M., Stötter, J. and Keller, L. (2022). Rethinking quality science education for climate action: Transdisciplinary education for transformative learning and engagement. *Frontiers in Education*, 7.

- Leal Filho, W., Raath, S., Lazzarini, B., Vargas, V. R., de Souza, L., Anholon, R., Quelhas, O. L. G., Haddad, R., Klavins, M. and Orlovic, V. L. (2018). The role of transformation in learning and education for sustainability. *Journal of Cleaner Production*, 199, pp. 286–295.
- Leithwood, K., Harris, A. and Hopkins, D. (2019). Seven strong claims about successful school leadership revisited. *School Leadership and Management*, 40, issue 1, pp. 5–22.
- Lenziardi, R., Picinini Méxas, M., Lucas, M. and Sá, P. (2025). Enhancing teacher competences in education for sustainable development (ESD): A value-oriented framework. *Journal of Teacher Education for Sustainability*, 27, issue 1, pp. 6–32.
- López-Martín, E., Gutiérrez-de-Rozas, B., González-Benito, A. M. and Expósito-Casas, E. (2023). Why do teachers matter? A meta-analytic review of how teacher characteristics and competencies affect students' academic achievement. *International Journal of Educational Research*, 120, article 102199.
- Makovec, N. and Lepičnik Vodopivec, J. (2025). Izzivi visokošolskih učiteljev pri spodbujanju kritičnega mišljenja – sistematični pregled literature. *Sodobna pedagogika*, 76, issue 2, pp. 10–28.
- Marentič Požarnik, B. (2022). Vzgoja in izobraževanje za trajnostni razvoj – izkušnje, dileme in perspektive. *Sodobna pedagogika*, 72, issue 2, pp. 8–25.
- Mezirow, J. (2003). Transformative learning as discourse. *Journal of Transformative Education*, 1, issue 1, pp. 58–63.
- Milfont, T. L. and Sibley, C. G. (2012). The big five personality traits and environmental engagement: Associations at the individual and societal level. *Journal of Environmental Psychology*, 32, issue 2, pp. 187–195.
- Muffato, V., Miola, L., Pazzaglia, F. and Meneghetti, C. (2025). Are explorers greener? Investigating the role of personality traits, connectedness to nature and attitudes toward exploring in various pro-environmental behaviors. *Frontiers in Psychology*, 15.
- Pegalajar-Palomino, M. d. C., Burgos-García, A. and Martinez-Valdivia, E. (2021). What does education for sustainable development offer in initial teacher training? A systematic review. *Journal of Teacher Education for Sustainability*, 23, issue 1, pp. 99–114.
- Ribeiro-Silva, E., Amaral-da-Cunha, M. and Batista, P. (2023). Educating teachers for sustainability and social justice: A service-learning project in physical education initial teacher education. *Education Sciences*, 13, issue 12, article 1173.
- Roczen, N., Kaiser, F. G., Bogner, F. X. and Wilson, M. (2014). A competence model for environmental education. *Environment and Behavior*, 46, issue 8, pp. 972–992.
- Rodriguez-Gomez, D., Muñoz-Moreno, J. L., and Ion, G. (2024). Empowering teachers: Self-regulated learning strategies for sustainable professional development in initial teacher education at higher education institutions. *Sustainability*, 16, issue 7, article 3021.
- Rogić, A. M. (2015). Povezanost oblika cjeloživotnoga učenja nastavnika i njihove motivacije, stavova i zadovoljstva poslom. *Školski vjesnik*, 64, issue 1, pp. 64–90.
- Rožman, H., Fiel'ardh, K., Košak Babuder, M., Javornik, K., Fujii, H. and Torkar, G. (2023). Izobraževanje učiteljev za trajnostni razvoj: Analiza kurikula dveh študijskih programov Pedagoške fakultete Univerze v Ljubljani. *Sodobna pedagogika*, 74, issue 3, pp. 71–89.

- Salonen, A. O. and Siirilä, J. (2019). Transformative pedagogies for sustainable development. In: W. Leal Filho (ed.). *Encyclopedia of Sustainability in Higher Education*. Cham: Springer, pp. 1–7.
- Sleurs, W. (2008). Competencies for ESD (Education for Sustainable Development) teachers. In: W. Sleurs (Ed.). *A framework to integrate ESD in the curriculum of teacher training institutes* (Comenius: Vol. XXXIII, Issue 11). Retrieved from: https://unece.org/fileadmin/DAM/env/esd/inf.meeting.docs/EGC/CSCT_Handbook_11_01_08.pdf (accessed on 3 February 2026).
- Soutter, A. R. B., Bates, T. C. and Möttus, R. (2020). Big Five and HEXACO personality traits, proenvironmental attitudes, and behaviors: A meta-analysis. *Perspectives on Psychological Science*, 15, issue 4, pp. 913–941.
- Soutter, A. R. B. and Möttus, R. (2021). Big Five facets' associations with pro-environmental attitudes and behaviors. *Journal of Personality*, 89, issue 2, pp. 203–215.
- Su, C. S., Díaz-Levicoy, D., Vásquez, C. and Hsu, C. C. (2023). Sustainable development education for training and service teachers teaching mathematics: A systematic review. *Sustainability*, 15, issue 10, article 8435.
- Su, W., Fadzil, H. M. and Rauf, R. A. A. (2025). Bridging self-directed learning and competency in interdisciplinary teaching among STEM lecturers: How psychological capital connects. *PloS One*, 20, issue 6, article e0319305.
- Sund, P. and Gericke, N. (2020). Teaching contributions from secondary school subject areas to education for sustainable development – a comparative study of science, social science and language teachers. *Environmental Education Research*, 26, issue 6, pp. 772–794.
- Tatalović Vorkapić, S. (2012). The significance of preschool teacher's personality in early childhood education: Analysis of Eysenck's and Big Five dimensions of personality. *International Journal of Psychology and Behavioral Sciences*, 2, issue 2, pp. 28–37.
- Tatalović Vorkapić, S. (2015). How much personality is important in educational context? In: M. Orel (ed.). *International Conference EDUvision 2015: Modern Approaches to Teaching Coming Generation*. Ljubljana: EDUvision, pp. 75–83.
- Tatalović Vorkapić, S. (2016). Ten Item Personality Inventory: A validation study on a Croatian adult sample. In: Z. Bekirogullari, M. Y. Minas and R. X. Thambusamy (eds.). *The European Proceedings of Social & Behavioural Sciences. The 4th icCSBs Abstract Book: The Annual International Conference on Cognitive-social, and Behavioural Sciences, Cyprus, 07-10. May*. London: ISO London Limited, pp. 192–202.
- Tatalović Vorkapić, S., Čepić, R. and Šekulja, I. (2016). Are there any differences in personality traits and life satisfaction between preschool and primary school teachers? *Journal of Research in Childhood Education*, 30, issue 3, pp. 361–373.
- Tatalović Vorkapić, S. (2017a). Osobine ličnosti i profesionalne kompetencije hrvatskih i slovenskih učitelja. In: R. Čepić and J. Kalin (eds.). *Profesionalni razvoj učitelja: status, ličnost i transverzalne kompetencije*. Rijeka: Učiteljski fakultet Sveučilišta u Rijeci, pp. 67–86.
- Tatalović Vorkapić, S. (2017b). Personality and education: Contemporary issues in psychological science about personality in teacher education. In: C. Martin and D. Polly (eds.). *Handbook of Research on Teacher Education and Professional Development*. Hershey: IGI Global, pp. 163–186.

- Tatalović Vorkapić, S. and Peloza, I. (2017). Exploring the personality traits and well-being among pre-school and primary school teachers in Croatia. *Current Issues in Personality Psychology*, 5, issue 1, pp. 21–31.
- Tolksater, M. (2024). Exploring pedagogical competencies for transformative teaching and the role of transformative pedagogy in higher education: Fostering reconnection to self, others, and nature. *Glocality*, 7, issue 1, pp. 1–15.
- UNESCO International Commission on the Futures of Education. (2020). *Education in a post-COVID world: Nine ideas for public action*. Retrieved from: https://eco4science.org/uploads/files/UNESCO_9.pdf (accessed on 3 February 2026).
- UNESCO (2023). December 4. *Empowering Teachers: UNESCO introduces psychosocial support online course*. Retrieved from: <https://www.unesco.org/en/articles/empowering-teachers-unesco-introduces-psychosocial-support-online-course> (accessed on 3 February 2026).
- Ventista, O. M. and Brown, C. (2023). Teachers' professional learning and its impact on students' learning outcomes: Findings from a systematic review. *Social Sciences & Humanities Open*, 8, issue 1, article 100565.
- Vukelić, N. (2022). Akcijska kompetenca učiteljev v vzgoji in izobraževanju za trajnostni razvoj. *Sodobna pedagogika*, 72, issue 2, pp. 26–41.

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TRANSFORMATIVNA PEDAGOGIKA ZA KOMPETENCE TRAJNOSTNEGA RAZVOJA: VLOGA STROKOVNEGA RAZVOJA IN OSEBNOSTI UČITELJEV

Povzetek: Transformativna pedagogika v sodobnem izobraževalnem diskurzu postaja imperativ pri oblikovanju šolskih učnih načrtov, zlasti na področju izobraževanja za trajnostni razvoj (TR). Članek predstavlja raziskavo, ki je proučevala povezavo med samooceno strokovnih kompetenc učiteljev razrednega in predmetnega pouka, kompetencami TR (razmišljanje in delovanje, komunikacija in odnosi, didaktično-metodične), osebnostnimi lastnostmi (ekstravertnost, vestnost, prijetnost, čustvena stabilnost in odprtost) ter oceno njihovega usposabljanja skozi različne oblike izobraževanja: med študijem, s strokovnim razvojem in samostojnim učenjem. Raziskava je bila izvedena na vzorcu učiteljev razrednega pouka (N = 335) in učiteljev predmetnega pouka (N = 537) na Hrvaškem. Rezultati kažejo na statistično značilne razlike v kompetencah med tema dvema skupinama. Korelacijske analize so pokazale pretežno pozitivne povezave med spremenljivkami, multiregresijske analize pa so razkrile, da osebnostne lastnosti, oblike izobraževanja, strokovne kompetence in delovno mesto različno prispevajo k razvoju kompetenc učiteljev na področju TR. Ugotovitve potrjujejo več napovedovalcev razvoja učiteljevih kompetenc za izobraževanje in TR, hkrati pa poudarjajo pomen vključevanja osebnih predispozicij in nujnost vseživljenjskega strokovnega razvoja. Skratka, potrebne so nadaljnje raziskave in globlje razumevanje pogojev ter dejavnikov, ki oblikujejo učiteljeve kompetence in njegovo pripravljenost za prakse na področju TR.

Ključne besede: izobraževanje za trajnostni razvoj, osebnostne lastnosti, transformativna pedagogika, učitelji osnovnih in srednjih šol

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