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STTUDENT TEACHERŚ ENGAGEMENT IN HUNGARIAN INITIAL TEACHER EDUCATION: ATTITUDES, COMPETENCES AND PERCEIVED PROFESSIONAL IMPACT

ZAPOJENIE ŠTUDENTOV UČITEĽSTVA DO MAĎARSKÉHO POČIATOČNÉHO VZDELÁVANIA UČITEĽOV: POSTOJE, KOMPETENCIE A VNÍMANÝ PROFESIONÁLNY VPLYV

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Abstract: This study examines student teachers' research engagement in the context of one Hungarian initial teacher education programme and its relationship to attitudes, self-assessed competences, and perceived professional development. Using questionnaire data from 122 student teachers, the study found generally positive attitudes toward research and moderate to high perceived research-related competences. Students with prior research experience reported significantly stronger attitudes, competences, and inquiry-oriented orientation. Research engagement was perceived as contributing more strongly to research competences than to teaching competences. The findings highlight the importance of integrating research engagement more closely with pedagogical practice in teacher education.

Keywords: initial teacher education, student teachers, teachers as researchers, research engagement, research-based teacher education

Abstract (Slovakian): Táto štúdia skúma výskumnú angažovanosť študentov učiteľstva v maďarskom počiatočnom vzdelávaní učiteľov a jej vzťah k postojom, sebahodnoteným kompetenciám a vnímanému profesijnému rozvoju. Na základe dotazníkových údajov od 122 študentov učiteľstva výskum preukázal všeobecne pozitívne postoje k výskumu a strednú až vysokú úroveň vnímaných výskumných kompetencií. Študenti s predchádzajúcou výskumnou skúsenosťou vykazovali výrazne pozitívnejšie postoje, vyššie kompetencie a silnejšiu bádateľsky orientovanú profesijnú orientáciu. Výskumná angažovanosť bola vnímaná ako významnejší prínos pre rozvoj výskumných než pedagogických kompetencií. Zistenia zdôrazňujú význam užšieho prepájania výskumnej angažovanosti s pedagogickou praxou vo vzdelávaní učiteľov.

Keywords (Slovakian): počiatočné vzdelávanie učiteľov, študenti učiteľstva, učitelia ako výskumníci, výskumná angažovanosť, výskumne orientované vzdelávanie učiteľov

Main work

Introduction and context

Student teachers' engagement in research is frequently associated with competence development, identity-related outcomes, and pedagogical change (Baan et al., 2023; Böttcher-Oschmann et al., 2021; Blomsø et al., 2023). At the same time, several important limitations can be observed in existing literature. Research engagement is most often examined through qualitative or small-scale case studies (Livingston & Flores, 2017; Munthe & Rogne, 2015), quantitative evidence with larger samples remains limited, and Central and Eastern European contexts are underrepresented (Kowalczuk-Walędziak et al., 2019; Chrappán et al., 2021). Moreover, competence-related and identity-related outcomes of student teachers' research engagement are usually discussed separately rather than as interconnected dimensions of professional development (Beijaard et al., 2004; Beijaard, 2019).

The empirical study presented here examines student teachers' research engagement in an integrated way. More specifically, it addresses three issues that emerged from the literature review: the lack of larger-sample evidence on the prevalence and forms of research engagement, the limited international visibility of the Hungarian context, and the insufficient empirical exploration of how research engagement relates simultaneously to competence development, as well as identity-relevant dimensions of professional development.

The study is situated in Hungarian initial teacher education, a context that has received relatively little systematic attention in the international literature despite recent transformations in curriculum design, teacher professionalism, and digitally mediated pedagogy (Redecker & Punie, 2017; Caena & Redecker, 2019; Chrappán et al., 2021). In this sense, the study contributes not only nationally relevant evidence but also a broader comparative perspective by extending the knowledge base beyond the Anglo-American, Nordic, and Western European settings that dominate the field (Darling-Hammond, 2017; Livingston & Flores, 2017).

Hungarian initial teacher education provides a particularly relevant context for examining research engagement, given its distinctive combination of strong institutional structures and ongoing reforms. Over recent decades, the system has undergone multiple structural transformations, which, while presenting continuous challenges and tension for participants, have also created opportunities for renewal and redefinition of teacher professionalism. Since 2022, initial teacher education has been organised as an undivided, five-year programme leading to a dual-subject qualification, characterised by an explicitly practice-oriented design that integrates school-based experiences from the early stages of training. Collaboration between universities and partner schools has been intensified, involving both university-based and school-based teacher educators in the preparation process.

At the same time, student teachers' research engagement occupies an ambivalent position within the curriculum. While student teachers typically complete one or two research methodology courses and are required to produce a thesis as an exit requirement of their studies, these are

predominantly disciplinary rather than pedagogical in focus, and opportunities for practice-based inquiry remain uneven. Although national teacher education requirements explicitly discuss the ability to interpret research and apply basic research methods, and participation in initiatives such as the Scientific Students' Associations (TDK) and related scholarship programmes has increased, engagement in research often remains concentrated in selective or academically oriented pathways. More broadly, Hungarian teacher education continues to reflect a strong disciplinary tradition, with a persistent separation between university-based knowledge and school-based practice, and a comparatively limited tradition of practitioner research.

These characteristics make the Hungarian context particularly suitable for examining how student teachers' research engagement is structured, experienced, and interpreted within a system where formal curricular design, policy expectations, and lived professional development may not fully align.

Taken the above mentioned into consideration, the purpose of the empirical study is twofold: (1) it provides a quantitative overview of student teachers' research engagement within initial teacher education, including the forms of research activity they report, the supports and barriers they experience; (2) it examines student teachers' attitudes toward research, their self-assessed research-related competences, and the perceived professional impact of research engagement, with particular attention to differences between those with and without prior research experience.

1. Literature review

Student teachers' research engagement has become an increasingly important dimension of initial teacher education: research-based teacher education approaches emphasise that future teachers should not only apply existing knowledge but also critically interpret educational practice and engage with evidence-informed inquiry (e.g. Darling-Hammond, 2017; Zeichner, 2010). In this context, research engagement refers to student teachers' participation in research-related activities during teacher education, including methodology courses, thesis work, classroom inquiry, conference participation, and digitally mediated research practices. The literature suggests that research engagement may contribute to the development of methodological competence, reflective thinking, and inquiry-oriented professional learning (Baan et al., 2023; Böttcher-Oschmann et al., 2021; Blomsø et al., 2023). At the same time, engagement is implemented unevenly across teacher education systems. In many programmes, research remains concentrated in academically structured activities such as coursework and thesis writing rather than being fully integrated into school-based practice (Livingston & Flores, 2017).

To address the above-mentioned, one should consider the teacher-as-researcher paradigm, which positions teachers as active interpreters and producers of professional knowledge rather than passive recipients of externally generated research (Cochran-Smith & Lytle, 2009). Closely connected to this perspective is the concept of inquiry stance, which refers to a

professional orientation characterised by reflection, questioning, and evidence-informed decision-making. Within initial teacher education, research engagement may support the development of such an inquiry-oriented stance by helping student teachers connect theory and practice and view teaching as a profession open to systematic investigation (Zeichner, 2010). However, the literature also indicates that positive attitudes toward research do not automatically lead to active participation. Student teachers may recognise the value of research while perceiving it as overly academic, time-consuming, or weakly connected to classroom practice (Avalos, 2011).

Student teachers' research engagement is most frequently associated with competence development. Studies report gains in methodological knowledge, critical thinking, literature processing, reflective skills, and analytical ability (Böttcher-Oschmann et al., 2021; Blomsø et al., 2023). Nevertheless, research-related competences develop unevenly. Student teachers often report stronger confidence in literature search and understanding methods than in formulating research questions, conducting data analysis, or using digital research tools. The relationship between research engagement and teaching competence is more complex. Although research is often assumed to improve teaching practice, this connection is not automatic. The perceived pedagogical relevance of research depends on whether student teachers experience inquiry as meaningfully connected to classroom practice and professional reflection (Korthagen, 2017). Research engagement may also contribute to identity-related dimensions of professional development. Professional identity refers to how teachers understand themselves as professionals and how they interpret their roles, values, and professional agency (Beijaard et al., 2004; Beijaard, 2019). Through inquiry experiences, student teachers may increasingly perceive themselves as reflective practitioners and active professional learners. However, competence-related and identity-related outcomes are often examined separately in the literature. This creates a fragmented understanding of research engagement, despite the likelihood that competence, attitudes, and inquiry-oriented professional identity are closely interconnected.

However, to fully understand the phenomenon, we shall consider that student teachers' research engagement is strongly shaped by institutional and personal factors. The literature identifies teacher educator support, peer collaboration, methodological guidance, and access to research opportunities as important supports (Livingston & Flores, 2017). At the same time, lack of time, heavy workload, limited methodological confidence, and weak integration between university-based research and school practice are frequently reported barriers.

Despite growing international interest in research-based teacher education, Central and Eastern European contexts remain underrepresented in the literature (Kowalczuk-Walędziak et al., 2019; Chrappán et al., 2021). The Hungarian context is particularly relevant because teacher education has undergone major structural reforms in recent years, and as described in the Introduction, student teachers in Hungary may experience research primarily as a formal academic requirement rather than as an integrated professional tool for examining teaching and learning.

2. Methodology

2.1 Research aims and research questions

The overarching aim of this empirical study is to explore how student teachers experience and interpret their engagement in research activities during initial teacher education, and how this engagement relates to their research-related attitudes, self-assessed competences, and emerging identity-relevant aspects of professional development. Rather than treating research engagement as a uniform or isolated activity, the study conceptualises it as a multifaceted professional experience shaped by contextual conditions, forms of participation, and individual meaning-making. The following research questions were formulated to capture patterns, relationships, and variations:

- RQ1. What forms of research engagement do student teachers report during initial teacher education, and in what curricular, practicum-based, or digital contexts do these activities take place?
- RQ2. How do student teachers perceive research and inquiry as part of their professional preparation, and what attitudes do they express toward research-based learning in teacher education?
- RQ3. How do student teachers evaluate their own research-related competences, including methodological, reflective, collaborative, and digital competences?
- RQ4. Are there significant differences in attitudes, self-assessed competences, and perceived professional impact between student teachers with and without prior research experience?
- RQ5. How do student teachers perceive the contribution of research engagement to their teaching competence development and identity-related dimensions of professional development?

2.2 Research design and methodological approach

The empirical study adopts a quantitative, questionnaire-based research design to examine student teachers' engagement in research during initial teacher education and its perceived contribution to competence development and identity-related dimensions of professional development. A cross-sectional design is employed to capture student teachers' experiences and perceptions at a specific point in time. This approach is appropriate for the exploratory aims of the study, as it allows for the identification of patterns and relationships across a relatively large sample, without aiming for causal inference or developmental analysis.

The questionnaire enables the simultaneous examination of multiple dimensions: research engagement forms, attitudes toward research, self-assessed competences, perceived professional impact, and contextual factors such as digital tools and support structures.

2.3 Instrument: questionnaire development and structure

The empirical study is based on a self-administered questionnaire developed specifically for this research (Pesti & Bodonyi, 2026a; Pesti & Bodonyi, 2026b). Rather than adopting an existing standardized instrument, a purpose-built questionnaire was considered more appropriate for the following reasons: (1) the literature revealed considerable variation in how research engagement is conceptualized and operationalized across studies, with no single instrument covering the combined dimensions of engagement, competence, identity, and digital context; (2) the study aims to reflect the specific institutional and curricular features of Hungarian initial teacher education, while remaining comparable to international research. The questionnaire therefore integrates established constructs from the literature with context-sensitive items tailored to the research aims.

The questionnaire was constructed around four core conceptual domains:

1. Research engagement: understood as active participation in research-related activities during initial teacher education, including coursework-based inquiry, practicum-related research, thesis or capstone projects, and digitally mediated research practices.
2. Research-related attitudes and inquiry stance: reflecting student teachers' perceptions of the value, relevance, and personal meaning of research for teaching and professional learning, closely aligned with the notion of inquiry as a professional stance.
3. Research-related competences: encompassing methodological competences, reflective and analytical skills, collaborative abilities, and digital research-related competences.
4. Perceived professional impact: focusing on student teachers' perceptions of how research engagement contributes to their teaching competence and identity-relevant aspects of professional development.

Most closed-ended items were formulated as statements rated on five-point Likert scales, allowing respondents to express degrees of agreement or self-assessed competence. This format was chosen for its familiarity, ease of use, and suitability for capturing attitudinal and self-perception data in educational research. Multiple-response formats were used where research engagement, supports, or barriers could not reasonably be reduced to a single choice. Item wording was informed by recurring concepts and formulations in the international literature but adapted to ensure clarity and accessibility for student teachers. Care was taken to avoid overly technical language and to frame research-related activities in terms familiar from teacher education practice.

Several steps were taken to support the content validity of the instrument. The structure and item pool were derived systematically from the literature review (Pesti & Bodonyi, 2026b) and the conceptual framework, ensuring alignment between theoretical constructs and empirical indicators. The questionnaire was reviewed iteratively to check the coherence of blocks, the clarity of items, and the balance between breadth and respondent burden. Rather than aiming

for full standardisation or psychometric validation at this stage, the instrument was designed as a research tool appropriate for exploratory analysis. Reliability and internal consistency of the Likert-scale blocks are addressed empirically in the data analysis phase through scale construction and reliability testing.

2.4 Sample and data collection

The target population consisted of student teachers enrolled in the so-called "undivided" (long cycle) initial teacher education programmes at one Hungarian higher education institution. Participants represented different stages of their studies, including both early- and advanced-stage students with varying levels of exposure to research-related activities (e.g., coursework-based inquiry, practicum research, thesis work).

Participation was voluntary, resulting in a convenience sample shaped by accessibility and willingness to participate. While this limits generalizability, it is appropriate for the study's focus on patterns, relationships, and perceived meanings. Background variables (e.g. year of study, programme characteristics, prior research experience) were collected to enable detailed sample description and subgroup analyses.

Participants were recruited through institutional channels with the support of teacher educators and programme coordinators. Students were informed about the purpose of the study and invited to participate on a voluntary basis. The invitation emphasised anonymity and the exclusive use of data for research purposes. Participation was independent of course requirements, and no incentives were provided.

Data were collected via an online questionnaire (Microsoft Forms) during November and December 2025. The online format enabled efficient access across programmes and allowed participants to complete the questionnaire flexibly.

2.5 Data preparation and analysis procedures

Following data collection, responses were exported from the online platform and prepared for analysis using statistical software. The dataset was screened for completeness and consistency. Cases with substantial missing data were excluded, while isolated missing values were handled using pairwise deletion. Categorical background variables (e.g. year of study, prior research experience) were coded numerically. Multiple-response items (e.g. forms of research engagement, supports, barriers) were coded as dichotomous variables (0 = not selected, 1 = selected), enabling both descriptive analysis and group comparisons.

Likert-scale items were examined for internal consistency using Cronbach's alpha. Where reliability reached acceptable levels, composite variables were created by averaging item scores within each block. When internal consistency was weaker, analyses were conducted at the item level, as reported in the results section. Single-item measures of perceived impact were analysed descriptively and in relation to other variables, with appropriate caution.

The analysis was conducted in three stages:

1. Descriptive statistics were used to summarise the sample and the main variables of the study (e.g. forms and characteristics of student teachers' research engagement, attitudes and competences). Frequencies and percentages were calculated for categorical and multiple-response items, while means and standard deviations were calculated for Likert-scale items and composite variables (RQ1-RQ3).
2. Group comparisons were conducted to examine differences between student teachers with and without prior research experience (RQ4). Depending on the measurement level and the distribution of the variables, independent-samples t-tests or nonparametric alternatives were used.
3. Descriptive and relational analyses of perceived professional impact were conducted within the subgroup of student teachers with prior research experience. These included descriptive statistics and correlation analyses examining the relationships between attitudes, self-assessed competences, and perceived impact (RQ5).

3. Results and analysis

3.1 Sample overview and research engagement background

A total of 122 student teachers completed the questionnaire, representing all stages of the teacher education programme. The largest proportion of respondents were second-year students (27.9%, n = 34), followed by sixth-year students (22.1%, n = 27). First-year and third-year students each accounted for 19.7% of the sample (n = 24 in both cases). Smaller proportions were enrolled in the fifth year (7.4%, n = 9) and fourth year (3.3%, n = 4). Overall, the sample includes both early-stage and advanced student teachers, allowing for a broad overview of experiences across the programme.

The gender distribution reflects the typical composition of teacher education programmes, with a clear predominance of female respondents. A total of 105 participants (86.1%) identified as female and 17 (13.9%) as male.

Regarding prior research experience, 54 respondents (44.3%) reported prior or current engagement in research activities in an active researcher role; this variable serves as a key grouping factor in subsequent analyses examining differences in attitudes, self-assessed competences, and perceived professional impact.

3.2 Forms and characteristics of research engagement (RQ1)

To address RQ1, this subsection provides a descriptive overview of how student teachers in the sample reported their engagement in research activities. Results are reported as per cent of cases (i.e., the proportion of respondents who selected a given option). Because these items were multiple-response questions, the percentages do not sum to 100%. The number of valid cases (i.e., those student teachers who have previously engaged in research activities as researchers) varies across item sets (N = 52-54), reflecting item nonresponse and/or skip patterns.

Type and focus of research: To examine the types and foci of research activities reported by student teachers, participants were asked to indicate the broader field their research focused on (e.g. disciplinary topics, teaching and learning, educational theory, etc.), participants most frequently indicated “Other” (55.6%), suggesting that many projects did not fit neatly into the predefined categories or were specified via open-ended responses. Among the predefined options, disciplinary knowledge was the most common (37.0%). Regarding research focus (topic areas), the largest share again selected “Other” (57.7%). Among the listed foci, learner motivation/attitudes, student wellbeing, and students with special needs were each reported by 15.4% of cases.

Methodological characteristics: Among student teachers who reported prior research experience, the most frequently reported methodological approach was literature review (44.4%), followed by “Other” (40.7%). Document analysis was selected in 22.2% of cases, while questionnaire-based research was less frequently selected (7.4%). A small proportion selected “I do not know/prefer not to answer” (7.4%). The predominance of literature reviews as reported methods suggests that student teachers’ research engagement is often oriented toward academically structured forms of inquiry. Compared to methods that involve direct data collection in classroom contexts, literature-based work may reflect the stronger institutional embedding of research within coursework and thesis-related activities. This pattern provides an initial indication that research engagement may be more closely aligned with academic requirements than with practice-based inquiry.

Purpose of engagement: Responding student teachers’ research engagement was most connected to the so-called TDK activities (“Tudományos Diákköri Konferencia” or TDK is a university-level research programme and competition where students conduct academic work and present it in a formal conference setting) (73.6%) and special university requirements (“Szakkollégium” – college for talented students) (58.5%). Voluntary participation was also relatively frequent (34.0%), followed by scholarship requirements (30.2%). Thesis-related research was least commonly indicated (7.5%).

Support, barriers, and the digital dimension: The strongest reported support was from university lecturers (72.2%). Digital tools/platforms were also frequently mentioned as supportive (50.0%). Financial support (38.9%) and peer support (33.3%) were reported in roughly one-third to two-fifths of cases, while time allowance was the least common (20.4%). The dominant obstacle was lack of time/overload (79.6%), followed by lack of methodological knowledge (44.4%). Use of online databases was nearly universal among those responding (92.6%). Tools related to analysis and collaboration were used at moderate levels (reference managers: 27.8%; videoconferencing: 20.4%; collaborative platforms: 20.4%; statistical software: 20.4%). AI tools were reported by 16.7%. Online questionnaire systems were the least common (7.4%). Digital tools were primarily used for data collection (68.5%), followed by presenting results (38.9%). Research planning and data analysis were each reported by 31.5%, collaboration by 27.8%, and interpretation by 20.4%.

Perceived skill development: Participants most frequently reported gains in critical thinking (83.3%) and research methodology (77.8%). A substantial share also indicated improvement in

analysis (59.3%), digital competencies (48.1%), and data collection (42.6%). Reported development in collaboration (11.1%) and reflective thinking (20.4%) was less common.

3.3 Attitudes toward research and inquiry (RQ2)

In line with RQ2, this subsection examines pre-service teachers' attitudes toward research using the five questionnaire items. The analysis proceeded in two steps: (1) internal consistency testing and (2) descriptive analysis of both individual items and the composite scale.

The five items were subjected to reliability analysis using Cronbach's alpha. Based on listwise deletion, 110 valid cases were included in the analysis (90.2% of the total sample). The internal consistency of the scale was high: Cronbach's α = .872, Cronbach's α (standardised) = .893. These values indicate strong internal consistency, exceeding the commonly accepted threshold of .70. All corrected item-total correlations were satisfactory (ranging from .566 to .865), indicating that each item contributed meaningfully to the overall construct. Moreover, the "alpha if item deleted" values (.804-.878) did not suggest that removing any item would substantially improve reliability. Therefore, all five items were retained.

On a five-point scale (1 = strongly disagree, 5 = strongly agree), all items yielded means above the neutral midpoint (3.00), indicating generally positive attitudes toward research (Table 3). The strongest agreement was observed for the statement that research supports reflective thinking (M = 4.27, SD = 0.63), followed by the belief that research contributes to professional development (M = 4.07, SD = 1.13). The importance of teachers conducting research on their own practice also received relatively high agreement (M = 3.92, SD = 1.10). Agreement was somewhat lower regarding whether a research-oriented approach constitutes an integral part of a teaching career (M = 3.66, SD = 1.07). The lowest mean was found for the item expressing willingness to take an active role in research during teacher education (M = 3.39, SD = 1.45), which also displayed the greatest variability.

Table 3. Descriptive statistics for each attitude item

Item	N	Mean	SD
It is important for a teacher to be able to conduct research on their own work	**122**	**3.92**	**1.1**
Research contributes to teachers' professional development	**122**	**4.07**	**1.13**
A research approach can be an integral part of a teaching career	**122**	**3.66**	**1.07**
Research helps develop my reflective thinking	**114**	**4.27**	**0.63**

I would like to take an active role in research during teacher training	**114**	**3.39**	**1.45**

The composite attitude scale was calculated as the mean of the five items. Descriptive statistics for the scale were as follows: N = 118, Mean = 3.83, SD = 0.88, Observed range: 2.20-5.00. The overall mean of 3.83 indicates a moderately positive orientation toward research among the respondents. The standard deviation suggests moderate dispersion around the mean.

3.4 Self-assessed research-related competences (RQ3)

To address RQ3, this subsection examines pre-service teachers' self-assessed research-related competences. The analysis followed the same procedure as in the attitudes section: internal consistency was tested, followed by item-level and composite descriptive statistics.

A reliability analysis was conducted using Cronbach's alpha. Based on listwise deletion, 114 valid cases (93.4% of the total sample) were included. The scale demonstrated strong internal consistency: Cronbach's α = .871, Cronbach's α (standardised) = .877. These values indicate high reliability, exceeding the commonly accepted threshold of .70. Corrected item-total correlations ranged between .608 and .839, suggesting that all items contributed adequately to the overall construct. The "alpha if item deleted" values (.810-.872) did not indicate any substantial improvement if an item were removed. Although the digital competence item showed the lowest corrected item-total correlation (.608), it remained well above the acceptable threshold and was therefore retained. Given the satisfactory internal consistency, a composite mean scale was computed. On a five-point scale (1 = not at all characteristic of me, 5 = completely characteristic of me), the results indicate moderate to moderately high perceived research competence overall (Table 4).

Table 4. Descriptive statistics for each competence item

Item	N	Mean	SD
I am able to formulate a research question	**114**	**3.66**	**1.18**
I know what data collection methods exist	**122**	**4.17**	**0.9**
I am capable of collecting and analysing data in a small research project	**118**	**3.86**	**1.05**
I am able to search for and process specialised literature	**122**	**3.95**	**1.07**
I am able to use digital tools for research	**122**	**3.2**	**1.34**

The highest mean was observed for knowledge of data collection methods (M = 4.17, SD = 0.90), suggesting relatively strong conceptual familiarity with research methodologies. Competence in literature search and processing (M = 3.95, SD = 1.07) and data collection and analysis in small-scale research (M = 3.86, SD = 1.05) also received relatively high ratings. Confidence in formulating a research question was somewhat lower (M = 3.66, SD = 1.18), indicating a more moderate level of perceived ability in this foundational research skill. The lowest mean was observed for digital research tool use (M = 3.20, SD = 1.34), which also showed the highest variability. This suggests that while some students feel confident using digital tools for research, others report substantially lower levels of confidence.

The composite competence scale yielded the following descriptive statistics: N = 118, Mean = 3.78, SD = 0.90, Observed range: 2.00-5.00. The overall mean of 3.78 indicates a moderately positive self-assessment of research-related competences among the participants. The dispersion suggests moderate variability within the cohort.

3.5 Differences by research experience (RQ4)

To answer RQ4, this section intends to examine whether prior research experience is associated with differences in attitudes and perceived competences, independent samples t-tests were conducted comparing students with and without research experience (0 = no experience, 1 = experience).

Attitudes toward research: A significant difference emerged in overall research attitudes, $t(116) = -3.75$, $p < .001$. Students with research experience reported higher attitude scores than those without experience (mean difference = 0.58 points on a five-point scale). The effect size was medium-to-large (Cohen's $d = 0.69$), indicating a practically meaningful difference. Thus, prior engagement in research is associated with a more positive orientation toward research within teacher education.

Self-perceived research competence: A significant difference was also found for the competence scale, $t(116) = -4.54$, $p < .001$. Students with research experience reported substantially higher levels of perceived research competence (mean difference = 0.70). The effect size was large (Cohen's $d = 0.84$), suggesting a strong association between prior research experience and competence self-assessment. This indicates that students who have participated in research activities perceive themselves as considerably more capable in research-related tasks.

Willingness to take an active inquiry-oriented professional stance: The largest difference appeared for willingness to take an active inquiry-oriented professional stance during teacher training, $t(112) = -5.11$, $p < .001$. The mean difference between groups was 1.26 points, representing a substantial gap on the five-point scale. The effect size was very large (Cohen's $d = 0.96$). This suggests that research engagement is particularly strongly associated with students' readiness to actively participate in research, beyond general attitudes or competence perceptions.

Perceived impact of research engagement (experienced group): To complement the between-group comparisons, the perceived developmental impact of research engagement was examined descriptively within the subgroup of students who reported prior research experience (n = 54). Participants evaluated the extent to which their involvement in research contributed to the development of their research-related competences and teaching competences on a five-point Likert scale. The results indicate a clear divergence between the two domains. Students reported a very strong perceived impact on research-related competences (M = 4.70, SD = 0.72), with responses ranging from 3 to 5. This indicates a consistently strong perception that research engagement contributes to the development of methodological and inquiry-related skills. In contrast, the perceived impact on teaching competences was considerably lower (M = 2.48, SD = 1.24), with responses spanning the full-scale range (1-5). This indicates substantial variability in how students relate research engagement to their pedagogical development.

The pattern suggests that while research engagement is clearly experienced as enhancing research-related skills, its contribution to teaching competences is perceived as more limited or less direct. This differentiation aligns with the findings reported earlier, where competence gains were strongest in research-methodological domains. Importantly, as these items were only answered by students with research experience, no between-group comparison was conducted. The results therefore reflect within-group evaluations of perceived developmental benefits rather than causal effects.

3.6 Perceived professional impact of research engagement (RQ5)

In line with RQ5, this subsection examines how students with research experience perceive the professional impact of their participation and how these perceptions relate to their attitudes and self-assessed competences. Analyses were conducted within the subgroup of students who reported prior research experience (n = 54).

Competence and perceived impact: A moderate positive correlation emerged between the competence scale and the perceived impact on research-related competences (r = .381, p = .004). This indicates that students who report higher overall research competence also tend to perceive stronger developmental gains from their participation. However, perceived research competence was not significantly related to perceived impact on teacher competences (r = –.026, p = .851), suggesting that self-assessed research ability does not directly translate into perceived pedagogical benefits.

Attitudes and perceived impact: The attitude scale showed no significant relationship with perceived impact on research-related competences (r = .066, p = .634). Thus, holding positive views about research is not necessarily associated with perceiving stronger research-related developmental gains. In contrast, a strong positive correlation was found between attitudes toward research and perceived impact on teacher competences (r = .505, p < .001). This suggests that students with a more positive inquiry-oriented stance are more likely to perceive research engagement as beneficial for their teaching development.

Relationship between impact domains: The perceived impact on research-related and teaching competences was not significantly correlated ($r = .163$, $p = .238$), suggesting that students tend to differentiate between these domains rather than viewing them as overlapping outcomes.

4. Discussion

4.1 Interpreting the findings

4.1.1 Research engagement as an academically structured activity

The descriptive findings indicate that research engagement among student teachers is primarily embedded within structured academic pathways, particularly institutional programmes such as "TDK" and special university requirements (Cochran-Smith & Lytle, 2009; Zeichner, 2010). Voluntary engagement is present but secondary. This mirrors the dominance of academically structured forms of inquiry identified in the literature (Pesti & Bodonyi, 2026a), in which research engagement was frequently embedded in coursework and thesis-related activities rather than in sustained, practice-based inquiry.

This finding further aligns with the patterns, where literature-based and academically oriented forms of inquiry were more prominent than classroom-based or practice-integrated research designs. This suggests that student teachers' research engagement is primarily embedded in academically structured activities rather than being predominantly oriented toward systematic investigation of classroom practice (Darling-Hammond, 2017; Korthagen, 2017). While this aligns with the academic orientation of research-based teacher education, it may also limit the extent to which research is experienced as a tool for pedagogical inquiry. The frequent selection of "Other" categories further suggests that research engagement is more heterogeneous than emerging/existing classifications may capture.

The high frequency of "Other" responses in the description of research fields and topics further supports this interpretation. It indicates that research engagement is often structured in ways that do not fit neatly into standard categories, suggesting a degree of conceptual and practical heterogeneity. This finding resonates with earlier findings (Pesti & Bodonyi, 2026a), which highlighted the fragmented and context-dependent nature of student teachers' research engagement in initial teacher education. In this sense, the empirical data not only describe local variation but also reinforce the broader observation that the field lacks a fully consolidated conceptual framework (Beijaard et al., 2004). The findings indicate that research is structurally present, but its integration into everyday pedagogical preparation remains partial.

4.1.2 Positive attitudes and uneven willingness

Student teachers generally expressed positive attitudes toward research. They strongly endorsed its contribution to reflective thinking and professional development and moderately agreed that a research-oriented mindset can form part of the teaching profession. However, willingness to take an active inquiry-oriented professional stance was lower and more variable (Borg, 2010; Avalos, 2011).

This pattern also reflects the results of an earlier literature review (Pesti & Bodonyi, 2026a), which reported positive attitudes toward research, yet evidence of sustained or intensive engagement remained more limited. It suggests that research enjoys conceptual legitimacy among student teachers, yet behavioural readiness is less uniformly distributed. The inquiry stance is broadly accepted at the level of principle but not consistently translated into personal commitment (Cohran-Smith & Lytle, 2009). This echoes findings in the international literature, showing that approval of research-based education does not automatically lead to sustained research engagement.

4.1.3 A differentiated competence structure

Self-assessed research-related competences were moderate to moderately high overall among the participants. Students reported the highest confidence in knowledge of data collection methods and literature processing, while research question formulation and the use of digital research tools were rated somewhat lower. This confirms the observation from earlier systematic review (Pesti & Bodonyi, 2026a) that competence-related outcomes (particularly methodological and reflective skills (Böttcher-Oschmann et al., 2021; Blomsø et al., 2023)) are among the most consistently reported effects of research engagement in initial teacher education. The comparatively weaker digital competence is particularly noteworthy considering the ongoing digital transformation in both research and education (Caena & Redecker, 2019).

Rather than indicating a deficit, this differentiated profile reflects a layered competence structure. Research competence does not appear as a uniform construct, but as a constellation of related yet unevenly developed capacities.

4.1.4 Research experience as a differentiating factor

The most pronounced findings concern differences between students with and without research experience. Those with prior engagement reported significantly more positive attitudes, higher self-assessed competences, and markedly greater willingness to engage in research activities (Zeichner, 2003). The effect sizes increased from attitudes to competences and were strongest for willingness. This gradient is theoretically significant. It suggests that research engagement is not only associated with abstract endorsement of inquiry but is most strongly associated with behavioural readiness and perceived agency. In other words, engagement appears closely linked to the development of an inquiry-oriented professional stance (Cochran-Smith & Lytle, 2009; Sachs, 2001). The strong association between research engagement and competence-related as well as attitudinal differences also helps explain why many studies in the literature report positive outcomes, despite relying on small-scale or self-selected samples (Pesti & Bodonyi, 2026a).

4.1.5 Perceived professional impact: divergent domains

The analysis of perceived professional impact adds an important layer of nuance. Students with research experience reported a very strong impact on their research-related competences, yet a substantially lower and more variable impact on teaching competences.

Correlation analyses revealed a differentiated relational structure. Self-perceived research competence was moderately associated with perceived impact on research-related competences but showed no relationship with perceived impact on teaching competences. Conversely, positive attitudes toward research were strongly associated with perceived teaching impact. This pattern suggests that research-related gains are primarily linked to methodological self-perceptions, whereas perceptions of pedagogical benefits depend more strongly on students' inquiry-oriented stance. Responding student teachers appear to conceptualise research competence and teaching competence as partially distinct domains rather than as automatically integrated. The transfer from research engagement to perceived teaching development is therefore not self-evident. It appears to require interpretive framing rather than merely skill acquisition.

These findings point to a fundamental tension in the role of research engagement within teacher education. While engagement is consistently associated with the development of research-related competences, its translation into pedagogical development is neither automatic nor uniform. The results suggest that competence development in research and teaching may follow partially distinct pathways, at least at the level of students' perceptions, and that the connection between them requires interpretive and contextual mediation. In this sense, research engagement does not directly produce improved teaching competence (Korthagen, 2017; Darling-Hammond, 2017); rather, it creates conditions under which such development may occur.

This differentiated pattern also helps explain the conceptual gap identified in an earlier systematic literature review (Pesti & Bodonyi, 2026a), in which competence development was more explicitly documented than identity-related processes. The present findings suggest that while research engagement readily translates into research-related competences, its connection to broader professional development (particularly in the pedagogical domain) depends on how research is interpreted and integrated into practice. In this sense, the study provides empirical support for the assumption that research engagement operates through mediated and context-dependent processes rather than through direct effects on teaching competence

4.1.6 Integrative interpretation

Across research questions, a layered model emerges. Student teachers' research engagement functions simultaneously as a competence-building activity and as a meaning-making experience. It strengthens methodological confidence and, even more strongly, willingness to assume an active inquiry-oriented professional stance. However, its perceived contribution to teaching competence depends on students' attitudinal orientation. This integrative interpretation directly addresses the fragmentation identified earlier (Pesti & Bodonyi, 2026a), where competence, identity, and practice-related outcomes were often examined in isolation rather than as interconnected dimensions of professional development.

The results reveal that engagement, competence, and identity-relevant professional orientation are interconnected in a potentially mutually reinforcing manner. Yet the connection between research-related competences and pedagogical development is neither automatic nor uniform,

but contingent on how research engagement is interpreted, integrated, and connected to practice.

Research engagement, therefore, appears as a potentially transformative element within teacher education, but one whose professionalising impact depends on structural integration and interpretive mediation. Accordingly, the present findings should be interpreted as evidence of identity-relevant orientations and professional self-concepts rather than as a direct measure of identity formation over time.

4.2 Implications for policy, practice and future research

At the policy level, the results provide empirical support for the relevance of research-based teacher education (e.g. Darling-Hammond, 2017). The strong association between research experience and willingness to engage in inquiry suggests that structured research opportunities shape professional orientation in meaningful ways. However, policy initiatives must move beyond formal inclusion of research components. If research engagement remains limited to elite or voluntary pathways, its professionalising potential may reinforce differentiation. Inclusive and systematically embedded research experiences are more likely to foster a broad-based inquiry orientation. Furthermore, aligning research engagement with school partnerships and practicum structures may strengthen the perceived coherence between research and teaching. Policy frameworks that recognise inquiry as an integral aspect of teacher professionalism can create structural conditions that further align it.

For teacher education practice, these findings suggest that research engagement should not remain confined to academically selective tracks (Korthagen, 2017; Zeichner, 2003). If research is to serve as a professionalising mechanism for all future teachers, structured opportunities must be integrated more broadly across the curriculum.

Equally important is the explicit linking of research activity to pedagogical practice. Since perceived teaching impact depends more strongly on attitudes than on competence alone, programmes may need to actively frame research as a tool for classroom reflection and instructional improvement. Embedding inquiry within practicum contexts and explicitly connecting research findings to pedagogical decision-making could strengthen this bridge.

Several avenues for further investigation emerge from the present findings. Longitudinal research would help clarify developmental trajectories and disentangle selection effects from engagement effects. Mixed-method designs could explore how student teachers interpret and integrate research experiences into their professional self-concept and inquiry-oriented professional stance. Moreover, comparative studies across institutional contexts could illuminate how structural arrangements influence the perceived impact of research engagement. Additionally, the role of digital research-related competences in shaping inquiry-oriented professional identity warrants further exploration in increasingly data-driven educational environments.

4.3 Limitations

Considering the methodological limitations, it must be emphasised that the study relies on self-reported data from student teachers, which reflect participants' perceptions rather than objective measures of competence. In particular, the assessment of professional impact is based on subjective evaluations and therefore captures perceived rather than observed developmental outcomes.

The cross-sectional design does not allow for causal or developmental conclusions. In addition, the use of a convenience sample introduces potential self-selection bias, as students with a stronger interest in research may be more likely to participate. This may contribute to the generally positive attitudes toward research and the relatively high levels of self-assessed research competence observed in the sample, but it also limits the generalizability of the findings beyond the specific institutional context.

At the same time, these limitations are inherent to the exploratory design and are taken into account in the interpretation of the results. Rather than aiming at statistical generalisation, the study provides analytically grounded insights into patterns of research engagement and their perceived professional relevance. The sample, while not representative, offers a sufficiently diverse empirical basis for exploratory analysis and complements the predominantly small-scale qualitative evidence in the literature.

The limitations also point toward directions for future research, including longitudinal designs, mixed-method approaches, and comparative studies across institutional and national contexts.

Conclusions

The results of this study suggest that research engagement within the examined initial teacher education programme is both promising and incomplete. It is strongly associated with the development of research-related competences and with identity-relevant dimensions of professional development, particularly willingness to adopt an inquiry-oriented professional stance. At the same time, its translation into perceived pedagogical development is neither automatic nor consistent, but depends on how research engagement is framed, interpreted, and connected to teaching practice.

The teacher-as-researcher paradigm therefore emerges not as a simple curricular addition, but as a complex developmental process requiring intentional design, institutional support, and interpretive integration. Research engagement appears to contribute most directly to methodological competence and inquiry-oriented professional orientation, while its connection to pedagogical development remains mediated and context-dependent.

These findings suggest that research engagement should be understood not as a single outcome-producing intervention, but as a differentiated developmental process in which competence-related and identity-relevant dimensions unfold unevenly and require integrative interpretation.

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Résumé: This study examines student teachers' research engagement in Hungarian initial teacher education and its relationship to attitudes, self-assessed competences, and perceived professional development. The research addresses gaps in the literature related to the limited quantitative evidence on research engagement and the underrepresentation of Central and Eastern European contexts. The empirical study employed a cross-sectional questionnaire design involving 122 student teachers enrolled in an undivided teacher education programme. The questionnaire explored forms of research engagement, attitudes toward research, research-related competences, and perceived professional impact. The findings indicate generally positive attitudes toward research and moderate to high levels of perceived research competence. Students with prior research experience reported significantly stronger attitudes, higher competence perceptions, and greater willingness to engage in inquiry-oriented activities. Research engagement was perceived as contributing more strongly to research-related

competences than to teaching competences. The study highlights the importance of integrating research engagement more closely with pedagogical practice in teacher education.

Résumé (Slovakian): Táto štúdia skúma zapojenie študentov učiteľstva do výskumu v maďarskom počiatočnom vzdelávaní učiteľov. Empirický výskum bol realizovaný prostredníctvom dotazníka na vzorke 122 študentov učiteľstva. Výsledky poukazujú na všeobecne pozitívne postoje k výskumu a strednú až vyššiu úroveň vnímaných výskumných kompetencií. Študenti s predchádzajúcou výskumnou skúsenosťou vykazovali pozitívnejšie postoje, vyššie hodnotenie kompetencií a väčšiu ochotu zapájať sa do bádateľsky orientovaných aktivít. Výskumná angažovanosť bola vnímaná ako významnejší prínos pre rozvoj výskumných než pedagogických kompetencií.

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