

# Perceived Research Competence Among Master's Students in Pre-Service Teacher Education Programmes

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∞ This paper investigates the perceived research competence of students at the beginning of their master's studies in pre-service teacher education programmes at various higher education institutions in Slovenia. Addressing the absence of suitable measurement tools, we developed and validated a Slovenian-language instrument specifically designed to assess research competence among pre-service teachers. Using this instrument, we were able to compare the perceptions of master's students with a prior bachelor's degree in education to those without such a degree. The results show that master's students perceive strong abilities in formulating research objectives, hypotheses and theoretical substantiation, but lack confidence in statistical procedures and using statistical analysis tools such as SPSS. They also feel unprepared to assess the validity and reliability of data collection instruments and to conduct action research. Furthermore, students without a bachelor's degree in education perceive better knowledge in research areas and exhibit higher confidence in most statistical and methodological aspects. On the other hand, students with a bachelor's degree in education demonstrate greater confidence in specialised areas such as statistical procedures and action research, and hold more positive attitudes towards the practical application of research in educational settings. Based on these findings, the paper suggests enhancing hands-on research experiences and fostering a supportive community to improve engagement, confidence and research competence among pre-service teachers.

**Keywords:** educational research, master's students, pre-service teachers, research-based teaching, research competence

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## Zaznana raziskovalna kompetenca magistrskih študentov, vpisanih v študijske programe, ki izobražujejo prihodnje učitelje

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☞ V prispevku preučujemo zaznano raziskovalno kompetenco magistrskih študentov, vpisanih v študijske programe različnih visokošolskih ustanov v Sloveniji, ki izobražujejo prihodnje učitelje. Zaradi pomanjkanja ustreznih instrumentov smo razvili in validirali nov instrument v slovenskem jeziku, namenjen merjenju raziskovalne kompetence prihodnjih učiteljev. Uporaba tega instrumenta nam je omogočila primerjavo zaznane raziskovalne kompetence magistrskih študentov, ki so na prvi stopnji končali pedagoški študijski program, in tistih, ki so končali nepedagoški študijski program. Rezultati kažejo, da se magistrski študentje ocenjujejo kot dobro usposobljeni za oblikovanje raziskovalnih ciljev, hipotez in za teoretično utemeljitev pridobljenih rezultatov, nižje pa ocenjujejo svojo usposobljenost poznavanja in izvajanja statističnih postopkov ter uporabe orodij, namenjenih statistični obdelavi podatkov, kot je SPSS. Prav tako se ocenjujejo manj usposobljeni za vrednotenje veljavnosti in zanesljivosti merskih instrumentov ter za izvajanje akcijskega raziskovanja. Analiza razlik med študenti pa razkriva, da tisti, ki so na prvi stopnji končali nepedagoški študijski program, višje ocenjujejo svoje poznavanje raziskovalnega področja ter izkazujejo višjo samozavest pri večini statističnih in metodoloških vidikov. Študentje, ki so na prvi stopnji končali pedagoški študijski program, bolj poznajo statistične postopke, značilne za pedagoško področje, višje ocenjujejo svoje znanje o akcijskem raziskovanju in izražajo pozitivnejši odnos do praktične uporabe raziskovanja v izobraževalnem okolju. Na osnovi teh ugotovitev se predlagata spodbujanje raziskovanja pedagoške prakse in oblikovanje raziskovalne skupnosti, ki bi lahko prispevala k višji ravni vključenosti, samozavesti in raziskovalne kompetence prihodnjih učiteljev.

**Ključne besede:** raziskovanje v izobraževanju, magistrski študentje, prihodnji učitelji, raziskovalno usmerjeno poučevanje, raziskovalna kompetenca

## Introduction

In recent years, there has been increasing recognition of the importance of research-based approaches and practices in enhancing the quality of pre-service teacher education programmes (Matjašič et al., 2023; Matjašič & Vogrinc, 2024; Saqipi & Vogrinc, 2020; Štemberger, 2020). Research-based approaches in pre-service teacher education are grounded in the belief that educators should be skilled in research methodologies. These approaches recognise the importance of bridging the gap between theory and practice by integrating research findings and evidence-based strategies into the teaching and learning process (Jensen & Dikilitas, 2023; Munthe & Rogne, 2015). By promoting research-based teaching among pre-service teachers, pre-service teacher education programmes foster autonomous learning among students (Gussen et al., 2023; Jensen & Dikilitas, 2023; Štemberger, 2020). Moreover, research-based teaching can enhance creativity, alternative thinking, analysis, interpretation, synthesis and research ethics (Jensen & Dikilitas, 2023), as well as encouraging pre-service teachers to engage in inquiry and reflective practice (Bayrak Özmutlu, 2022; Zeivots et al., 2024). By immersing pre-service teachers in research activities, such as conducting literature reviews, designing research projects and analysing data, these approaches foster a culture of curiosity and exploration, as pre-service teachers learn to ask meaningful research questions, gather and analyse data, and draw evidence-based conclusions. This not only strengthens their research competence but also cultivates a mindset of lifelong learning and continuous improvement, which equips them with the ability to adapt their teaching strategies to meet the diverse needs of their students and to navigate the ever-evolving educational landscape (Bayrak Özmutlu, 2022; Stan et al., 2023).

A growing body of studies (Gussen et al., 2023; Matjašič & Vogrinc, 2024; Stan et al., 2023) have highlighted the importance of research-based teaching in developing the research competence of pre-service teachers. These studies suggest that equipping pre-service teachers with research competence not only enhances their methodological knowledge but also significantly enriches their teaching practice.

Research competence is a multifaceted and complex construct encompassing a broad range of knowledge, skills, attitudes and behaviours that are crucial for effective research practice. This includes, but is not limited to, critical thinking, self-directed learning and the organisational skills necessary to plan and conduct research activities (Matjašič & Vogrinc, 2024). Developing research competence among pre-service teachers is essential for fostering their

professional autonomy, promoting evidence-based practice and enhancing the overall quality of teacher education (Matjašič & Vogrinc, 2024; Štemberger, 2020; Toquero, 2021).

Studies, including those of Bayrak Özmütlu (2022) and Gussen et al. (2023), have begun to delve into the various dimensions of research competence. A primary area of focus is the cognitive aspect, which involves acquiring knowledge about different research methodologies, statistical techniques and ethical considerations. This is the foundation upon which other skills are built, equipping pre-service teachers with the tools they need to conduct rigorous and meaningful research. Yet, research competence is not merely a cognitive endeavour; it is a practical one as well. The skills acquired in understanding research methodologies must be applied in real-world settings. For pre-service teachers, this could mean engaging in classroom-based research that investigates effective teaching strategies, student engagement or educational outcomes. Through such practical applications, pre-service teachers not only validate their theoretical knowledge but also contribute to the existing body of educational research, thereby closing the gap between theory and practice. Another dimension that is gaining attention is the emotional or attitudinal aspect of research competence (Issah & Braimah, 2020; Matjašič et al., 2023; Sizemore & Lewandowski, 2009). The attitudes and beliefs that pre-service teachers hold about research can profoundly impact their engagement with it. Those who view research as a valuable tool for professional development are more likely to invest time and effort in building their research competence. This emotional investment is crucial because research is often a long-term endeavour, requiring perseverance, resilience and a commitment to lifelong learning.

### **Research-based teaching and research competence**

The idea of fostering a deeper connection between teaching and research is not new. Numerous studies exploring this relationship have argued that there is a need to integrate research into teaching. Shore et al. (1990), for example, proposed the idea of using research as a framework for teaching. Similarly, Barnett (1997) advocated for teaching to adopt more research-based approaches, while Jenkins and Healy (2009) emphasised that strengthening the ties between teaching and research is a goal for which universities should strive.

In the context of universities, the integration of research-based teaching is particularly relevant for pre-service teachers, as it plays a crucial role in their professional development and preparation for their future careers (Gussen et al., 2023; Jensen & Dikilitas, 2023; Magnaye, 2022). Research-based teaching

provides valuable insights into various aspects of teaching and learning, including teaching methods, classroom management techniques and education policies. Through participation in research studies, pre-service teachers can develop critical thinking skills, engage in data analysis and gain a deeper understanding of educational theories and concepts (Van Katwijk et al., 2023). This hands-on experience empowers pre-service teachers to enhance their research competence and become reflective practitioners who continuously evaluate and improve their teaching methods based on research evidence.

The development of research competence often begins with a foundational understanding of research methodologies, both quantitative and qualitative (Gussen et al., 2023; Saunders & Jamieson, 2020). Pre-service teachers learn about various research designs, sampling techniques and data collection methods, giving them the tools to conduct their own studies. This knowledge is not just theoretical; it is practical and immediately applicable. The significance of research competence also lies in its impact on critical thinking. By engaging with research, pre-service teachers become discerning consumers of information (Gussen et al., 2023). They learn to question the validity and reliability of studies, to critically consider the implications of research findings, and to apply a rigorous, evidence-based approach to their teaching practices. This form of critical engagement with the literature and with their own teaching methods sets the stage for a career-long commitment to evidence-based practice. Additionally, research competence has a broader societal impact. Teachers with strong research competence are more likely to contribute to education policies and practices, even at the national level. Their ability to understand and conduct research makes them valuable stakeholders in education reform efforts, ensuring that policies are grounded in empirical evidence rather than anecdotal experiences (Agud & Ion, 2019; Van Katwijk et al., 2023). In essence, fostering research competence in pre-service teachers is not just an academic exercise but a fundamental investment in the future of education.

While the importance of research competence in pre-service teacher education programmes is widely acknowledged, there is a need for such programmes to reshape the development of research competence. As it stands, pre-service teachers predominantly play the role of consumers of research, often passively absorbing knowledge without actively engaging in the creation or dissemination of new findings (Ciraso-Calí et al., 2022; Matjašič et al., 2023). This consumption-oriented approach may affect their professional development. In order to ensure that pre-service teachers are not just consumers of existing knowledge but also active contributors to the field, it is imperative that pre-service teacher education programmes provide them with opportunities not only to understand

but to conduct research. By doing so, we can better equip them with the skills and confidence required to make meaningful contributions to educational advancements and to evolve as well-rounded professionals in their subsequent careers (Ciraso-Calí et al., 2022; Štemberger, 2020). Furthermore, the absence of a comparison of the research competence of students with a prior bachelor's degree in education with those without such a degree represents a significant gap in the literature, with several implications. Firstly, understanding how these distinct academic backgrounds influence students' perceptions of their research abilities is crucial for tailoring pre-service teacher education programmes at the master's level, in order to better meet the needs of students from varied educational trajectories. Secondly, by uncovering potential differences in research competence between these groups, educators can develop targeted interventions to address any disparities and ensure equitable access to research opportunities and resources. Thirdly, as research competence plays a pivotal role in pre-service teachers ability to implement evidence-based practices in the classroom, bridging this gap in understanding is essential for enhancing teaching quality and ultimately improving student learning outcomes. Addressing this research gap is therefore imperative for advancing the field of pre-service teacher education and promoting effective teaching practices in diverse educational contexts. Moreover, the literature (Matjašič & Vogrinc, 2024) reveals certain inconsistencies in both the conceptualisation and assessment of research competence. While there is some degree of agreement that research competence involves knowledge, skills and attitudes, the methods for assessing and measuring these components are far from standardised. This issue is especially evident when we consider the differentiation between perceived and actual research competence, two facets of the broader construct that each come with their own set of challenges for measurement. When it comes to actual research competence, one might assume that empirical methods for assessment would be well established; however, the reality is more complicated. Researchers (e.g., Albareda-Tiana et al., 2018) often develop their own instruments or frameworks for evaluation, sometimes tailored to the specific objectives of their studies and sometimes even without any testing or validation of the instrument. While this allows for a degree of flexibility, it also creates a body of literature that is challenging to compare or synthesise. The lack of standardised measures for actual research competence hampers our ability to draw generalised conclusions. The situation becomes even more complex when we turn our attention to perceived research competence. Here, the absence of consensus is strongly evident. Some researchers develop their own scales or questionnaires, tailored to the unique aspects of their studies but not necessarily applicable beyond that specific context. Others choose existing instruments, but

the selection often appears arbitrary, guided more by convenience or familiarity than by empirical validity (Matjašič & Vogrinc, 2024). This approach to measuring perceived research competence leaves us with a fragmented understanding, making it difficult to build a coherent narrative or develop actionable insights for pre-service teacher education programmes. Finally, the lack of instruments for measuring research competence creates a shaky foundation upon which to build education policies or reform pre-service teacher education programmes. It also hinders the ability to track progress over time or to compare the effectiveness of different interventions aimed at enhancing research competence.

In order to bridge this gap, it is essential to conduct research that aims for a more empirically validated approach to measuring both perceived and actual research competence of students. When this approach has been developed, the next important step is to use it to investigate the extent to which education programmes are oriented towards research-based teaching. Such an endeavour would serve multiple purposes. First and foremost, it would contribute to academic rigor by providing a unified framework that could be employed by future studies, thereby facilitating comparisons across different research projects. An empirically validated measure would enable scholars to build upon each other's work more effectively, thus accelerating the development of a comprehensive understanding of research competence in pre-service teachers.

### **Aim and research questions**

Given the complexities and challenges associated with measuring both perceived and actual research competence, a comprehensive study addressing both facets would be a monumental task. In the present study, we have therefore made the strategic decision to narrow the scope of our current research to address the less-explored but equally important facet of perceived research competence among pre-service teachers. We assessed students' perceived research competence at the beginning of their master's studies to ensure that it still reflected what they had gained during their bachelor's programmes, before any influence of the master's level. We believe that understanding the level of perceived research competence at this stage is essential for identifying strengths and weaknesses in the current educational approaches, which can inform improvements and adjustments to curricula.

The primary aim of the present study was to investigate the perceived research competence of master's students enrolled in pre-service teacher education programmes at various higher education institutions in Slovenia, comparing students with a prior bachelor's degree in education to those without such

a degree. To achieve this aim, we first developed and validated a Slovenian-language instrument designed to measure perceived research competence among pre-service teachers.

Based on this, the study addressed the following research questions:

- RQ1: What is the level of perceived research competence (i.e., research skills, knowledge and attitudes) among students currently enrolled in pre-service teacher master's programmes?
- RQ2: What differences exist in the perceived research competence (i.e., perceived research skills, knowledge and attitudes) between students with a prior bachelor's degree in education and those without a prior bachelor's degree in education?

## **Method**

### **Participants**

The participants in the study included master's students at the various higher education institutions in Slovenia that offer pre-service teacher education programmes at the master's level, including those within the University of Ljubljana (Faculty of Education, Faculty of Arts, Faculty of Theology, Faculty of Chemistry and Chemical Technology, Faculty of Mathematics and Physics, Faculty of Sport, Biotechnical Faculty, Academy of Music), the University of Maribor (Faculty of Education, Faculty of Arts, Faculty of Natural Sciences and Mathematics), and the University of Primorska (Faculty of Education, Faculty of Humanities, Faculty of Health Sciences) in the 2023/2024 academic year. These students had completed their bachelor's degrees in relevant pedagogical fields, providing a foundational level of research competence. Pedagogical study programmes are formally distinguished from non-pedagogical programmes through accreditation criteria. Specifically, accredited pedagogical programmes are required to include at least 60 ECTS credits of pedagogical content. This mandatory pedagogical component encompasses essential areas such as pedagogical-psychological knowledge (including psychology, pedagogy, didactics and andragogy), subject-specific didactics related to the student's primary discipline, and a minimum of 15 ECTS credits dedicated to pedagogical practice. On the other hand, non-pedagogical programmes focus primarily on subject-specific knowledge and skills in specific disciplines, and include courses related to research methodologies important to their fields. The students completed an online survey questionnaire at the start of their master's programme and

research course. The timing was important for our analysis, as it allowed us to measure the initial state of the students' perceptions, ensuring that the master's studies and their courses had not yet impacted their answers.

In conducting the study, it is noteworthy that despite multiple invitations, some institutions opted not to respond or participate, or simply opened the survey but decided not to answer the questions. Thus, the population under study consisted of various numbers of participants who completed the questionnaire (see Table 1).

**Table 1**  
*Participants*

University	Institution	<i>N</i>
University of Ljubljana	Faculty of Education	107
	Faculty of Arts	84
	Faculty of Chemistry and Chemical Technology	5
	Academy of Music	4
	Faculty of Theology	4
	Biotechnical Faculty	3
University of Maribor	Faculty of Education	13
University of Primorska	Faculty of Education	12

This varied number of participants across universities and faculties is due to the fact that universities and institutions have varying numbers of educational programmes and differing numbers of students enrolled in these programmes, which impacted the participation rates. Across all three universities as listed on the Ministry of Higher Education, Science and Innovation website (Ministry of Higher Education, Science and Innovation, 2024), there is a total of 53 pre-service teacher education programmes at the master's level. The University of Ljubljana has the highest number of such master's programmes (34), followed by the University of Maribor (15) and the University of Primorska (4).

### **Instrument**

Building upon the foundational work of Matjašič et al. (2023), who developed and tested an instrument to measure the perceived research competence of pre-service teachers, we comprehensively refined and adapted the instrument to suit the specific needs and context of the present study.

The modified instrument underwent a subsequent phase of testing to validate its reliability and effectiveness in capturing perceived research competence among the pre-service teachers in the present study. The instrument was subjected to a face validity evaluation by a group of experts in the field, who provided feedback on the items and the instrument as a whole. Following successful completion of the face validity process, a pilot test was conducted with a small group of participants, whose responses were collected and analysed. Based on the data analysis, the final version of the instrument was designed, consisting of 45 items measured on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), and organised into three key components of perceived research competence, as presented in Table 2.

### Research Design

The study employed a quantitative research approach in which online survey questionnaires were administered to all three participating universities (see Table 1). The online survey questionnaire was created using the 1KA online survey tool, an application that enables online surveys (<https://www.ika.si>), and distributed to students at the beginning of the semester by lecturers working at the institution. All of the students were informed about the purpose, the confidentiality of their responses, and the voluntary nature of their participation.

The study was approved by the Ethics Commission of the Faculty of Education, University of Ljubljana (approval no. 14/2023).

### Analysis

The student responses were examined using R software (version 4.3.1), along with the lavaan (version 0.6-11), psych (version 2.3.6) and effsize (version 0.8.1) packages, in order to gain insights across three primary components (see Table 2). In doing so, the reliability of the questionnaire was first assessed using the Cronbach alpha coefficient (Table 2), ensuring the consistency of the measurements. A Confirmatory Factor Analysis (CFA) was then conducted to validate the factor structure of the instrument, which was designed to measure the perceived research competence of pre-service teachers. Upon inspection of the data, Mardia's test for multivariate normality and the Anderson-Darling test for univariate normality revealed significant deviations from multivariate normality ( $p < .001$ ), which indicated that the maximum likelihood (ML) estimator was unsuitable for our data, as the assumption of multivariate normality was violated. To address the issues of non-normality and the ordinal nature of

our Likert-scale data, we employed the CFA with weighted least squares mean and the variance adjusted (WLSMV) estimator (Muthén & Muthén, 2017). The WLSMV estimator is specifically designed for ordinal data and does not assume multivariate normality (as opposed to ML), making it a suitable choice for our analysis. The CFA using the WLSMV estimator yielded acceptable fit indices: a CFI of .935, a TLI of .932, an RMSEA of .070 and an SRMR of .095. These values meet the commonly accepted thresholds for a good-fitting model (Hu & Bentler, 1999). Moreover, all standardised factor loadings were significant ( $p < .001$ ) and all were greater than or equal to .5 (see Tables 3, 4 and 5), indicating that the items serve as valid indicators of their respective latent constructs (i.e., research knowledge, research skills and research attitude).

With the questionnaire validated and the factor structure confirmed, we proceeded to address our research questions. For research question 1 (RQ1), descriptive statistics (mean and standard deviation) were used to assess the overall level of perceived research competence among all of the participants. Due to the non-normal distribution of the data, as confirmed by the Kolmogorov-Smirnov test ( $p < .05$ ) and Q-Q plots, mean ranks were used for descriptive statistics along with the Mann-Whitney  $U$  test to address research question 2 (RQ2). In addition, Vargha-Delaney  $A$  was calculated as an effect size measure (Vargha & Delaney, 2000). The Vargha-Delaney  $A$  statistic is a non-parametric effect size measure used to compare two groups. It ranges from 0 to 1 and represents the probability that a randomly selected score from one group will be greater than a randomly selected score from another group. A value greater than .50 indicates that the first group tends to have higher scores than the second group, and a value less than 0.50 indicates that the second group tends to have higher scores than the first group (Vargha & Delaney, 2000).

**Table 2**  
*Questionnaire Items*

Component	Number of items	Items	Cronbach's alpha
Research knowledge	15	See Table 3	.86
Research skills	15	See Table 4	.88
Research attitude	15	See Table 5	.81

## Results

In this section, we explore the insights gained from our analysis, focusing on the evaluation of perceived research competence among master's

students enrolled in pre-service teacher education programmes. We also examine the differences between the two groups (i.e., the students with a prior bachelor's degree in education and those without such a degree). The findings are systematically presented in three tables.

### Research knowledge

Table 3 provides an overview of how the pre-service teachers perceive their research knowledge.

**Table 3**

*Standardised factor loadings, descriptive statistics, Mann–Whitney U tests and effect sizes for items measuring perceived research knowledge*

Item	Factor Loading	Total	Bachelor's degree in education	No bachelor's degree in education	Vargha-DeLaney A
		<i>M (SD)</i>	Mean ranks		Value
I know how to theoretically substantiate the research problem of my study.	.64	3.7 (0.8)	101.57	138.85	.37*
I know how to formulate research objectives.	.60	3.8 (0.8)	100.79	139.89	.36*
I know how to formulate research questions.	.55	3.8 (0.7)	106.34	132.46	.41*
I know how to formulate hypotheses.	.50	3.8 (0.8)	109.80	126.58	.45*
I know how to choose the most appropriate research methodology for my work.	.57	3.2 (0.9)	97.36	144.49	.33*
I am familiar with different sampling methods or selection of individuals suitable for my research.	.55	3.3 (0.9)	112.75	122.66	.48
I am familiar with the characteristics of different data collection instruments (e.g., questionnaire, knowledge test, interview question list).	.60	3.6 (0.9)	110.73	122.91	.47
I am familiar with different methods of verifying the quality of data collection instruments (e.g., validity and reliability of the instrument).	.56	3.0 (0.9)	113.29	119.55	.50
I am familiar with different statistical procedures used in educational research (e.g., mean values, measures of dispersion, correlation coefficients).	.50	2.9 (1.0)	126.08	102.80	.61*

Item	Factor Loading	Total	Bachelor's degree in education	No bachelor's degree in education	Vargha-Delaney A
		<i>M (SD)</i>	Mean ranks		Value
I am familiar with the fundamental ethical principles of educational research.	.56	3.1 (1.1)	119.62	111.26	.55
I am familiar with the characteristics of quantitative research approaches.	.61	3.1 (1.0)	120.89	109.60	.56
I am familiar with the characteristics of qualitative research approaches.	.60	3.0 (1.0)	122.19	107.89	.57
I am familiar with the characteristics of action research.	.50	2.6 (1.1)	138.34	86.74	.71*
I am familiar with the characteristics of quantitative data analysis.	.73	2.9 (1.0)	114.47	118.00	.51
I am familiar with the characteristics of qualitative data analysis.	.72	2.9 (1.0)	112.47	120.63	.49
<i>N</i>		234	134	100	

\*  $p < .05$  (Mann-Whitney *U* test).

Table 3 shows that the pre-service teachers perceive themselves as having moderate to high skills in certain areas of research knowledge, but there are notable gaps in others. For example, the pre-service teachers generally feel confident in their ability to formulate research objectives, formulate hypotheses and formulate research questions, each with a mean score of  $M = 3.8$ . They also express confidence in their ability to theoretically substantiate the research problem of their study ( $M = 3.7$ ). However, there are significant areas where they feel less confident, including understanding different statistical procedures used in educational research ( $M = 2.9$ ), familiarity with the validity and reliability of data collection instruments ( $M = 3.00$ ) and understanding action research ( $M = 2.6$ ). Additionally, the pre-service teachers show relatively low confidence in their familiarity with both quantitative research approaches ( $M = 3.1$ ) and qualitative research approaches ( $M = 3.0$ ).

Comparing the two groups, we can observe that the students without a bachelor's degree in education generally perceive themselves as more knowledgeable in most research-related areas. Specifically, they report higher confidence in theoretically substantiating the research problem of their study (Mean rank: 138.85 vs. 101.57), formulating research objectives (Mean rank: 139.89 vs. 100.79), formulating research questions (Mean rank: 132.46 vs. 106.34), formulating hypotheses (Mean rank: 126.58 vs. 109.80) and choosing the most appropriate research methodology for their work (Mean rank: 144.49 vs. 97.36). These differences are supported by statistically significant Mann-Whitney *U*

and Vargha Delaney  $A$ , indicating large effects ( $A = .33$  to  $.37$ ) for several items and medium effects ( $A = .41$  to  $.45$ ) for others. On the other hand, the students with a bachelor's degree in education exhibit higher confidence in more advanced research topics, reporting greater familiarity with various statistical procedures used in educational research (Mean rank: 126.08 vs. 102.80) and the characteristics of action research (Mean rank: 138.34 vs. 86.74). These areas show statistically significant differences with medium to large effect sizes.

For other research knowledge areas, such as familiarity with different sampling methods, data collection instruments and methods of verifying the quality of data collection instruments, there are no statistically significant differences between the two groups. Additionally, the level of familiarity with the fundamental ethical principles of educational research and the characteristics of both quantitative and qualitative research approaches shows minimal differences without reaching statistical significance.

### Research skills

Next, we show descriptive and inferential statistics for the students' perceived research skills (Table 4).

**Table 4**

*Standardised factor loadings, descriptive statistics, Mann–Whitney  $U$  tests and effect sizes for items measuring perceived research skills*

Item	Factor Loading	Total	Bachelor's degree in education	No bachelor's degree in education	Vargha-Delaney $A$
		$M$ ( $SD$ )	Mean ranks	Mean ranks	Value
I know how to find the literature necessary for the theoretical background of my research	.58	4.2 (0.8)	99.78	136.30	.38*
I know how to cite the literature I have read.	.50	4.3 (0.8)	100.05	135.95	.38*
I know how to summarise the essence of the literature I have read.	.57	4.2 (0.7)	101.48	132.76	.40*
I know how to design a research plan.	.76	3.5 (0.9)	104.38	128.94	.43*
I know how to explain the purpose of my research.	.69	4.0 (0.8)	99.19	134.44	.39*
I know how to create various instruments for data collection (e.g., questionnaire, knowledge test, interview question list).	.65	3.6 (0.8)	106.60	124.80	.45*

Item	Factor Loading	Total	Bachelor's degree in education	No bachelor's degree in education	Vargha-DeLaney A
		<i>M (SD)</i>	Mean ranks	Mean ranks	Value
I know how to check the quality of the designed data collection instrument (its validity and reliability).	.70	3.0 (0.9)	105.87	124.51	.45*
I know how to use software for statistical data analysis (e.g., SPSS).	.50	1.9 (0.9)	112.32	117.34	.50
I know how to write a report on an empirical research study.	.68	3.1 (0.9)	100.45	132.81	.40*
I know how to write a summary of an empirical research report (e.g., for a seminar paper).	.74	3.6 (0.9)	99.26	134.36	.39*
I know how to describe the data collection process.	.68	3.8 (0.8)	98.13	133.22	.40*
I know how to formulate conclusions of the research based on the collected data.	.74	3.8 (0.8)	92.39	139.23	.36*
I know how to write a statistical interpretation of the statistical procedures used.	.63	3.00 (1.0)	101.82	131.03	.41*
I know how to present the results and findings of my research to a broader audience (e.g., to my classmates, at a conference).	.64	3.9 (0.8)	99.65	133.85	.39*
I know how to develop a plan (an action plan) for implementing changes in educational practice based on the findings of empirical research.	.50	2.7 (1.0)	119.09	108.52	.56
<i>N</i>		230	131	99	

\*  $p < .05$  (Mann-Whitney  $U$  test).

Looking at perceived research skills (Table 4), we can observe that the pre-service teachers perceive themselves as having moderate to high skills in various aspects of research skills. For example, they generally feel confident in their ability to find the necessary literature ( $M = 4.2$ ), cite the literature they have read ( $M = 4.3$ ) and summarise the essence of the literature ( $M = 4.2$ ). These skills are foundational for conducting thorough and credible research. However, there are notable areas where the pre-service teachers feel less confident. These include using software for statistical data analysis ( $M = 1.9$ ) and developing an action plan for implementing changes in educational practice based on research findings ( $M = 2.7$ ).

When comparing the two groups, we observe that the students without a bachelor's degree in education perceive themselves as more skilled in almost all research-related areas. For instance, they show higher confidence in finding the necessary literature (Mean rank: 136.30 vs. 99.78), citing the literature (Mean

rank: 135.95 vs. 100.05) and summarising the literature (Mean rank: 132.76 vs. 101.48). This trend continues in other areas, such as explaining the purpose of their research (Mean rank: 134.44 vs. 99.19), writing a research report on an empirical research study (Mean rank: 132.81 vs. 100.45) and knowledge about the quality of designed data collection instruments (validity and reliability) (Mean rank: 124.51 vs. 105.87). Looking at Vargha-Delaney  $A$  values (medium effect size) and Mann-Whitney  $U$ , we can observe statistically significant differences between the groups for several components. Specifically, for items such as finding the necessary literature, citing the literature, summarising the literature, designing a research plan, explaining the purpose of research, creating various instruments for data collection, checking the quality of these instruments, writing a research report, writing a summary of a research report, describing the data collection process, formulating conclusions based on collected data, and presenting research results to a broader audience.

The only area where the students with a prior bachelor's degree in education express slightly higher confidence is knowledge of how to develop an action plan for implementing changes in educational practice based on the findings of empirical research (Mean rank: 119.09 vs. 108.52;  $A = .56$ ), although Mann-Whitney  $U$  is not statistically significant.

### Research attitude

The descriptive statistics for the students' perceived research attitude are presented in Table 5.

**Table 5**

*Standardised factor loadings, descriptive statistics, Mann-Whitney  $U$  tests and effect sizes for items measuring perceived research attitude*

Item	Factor Loading	Total	Bachelor's degree in education	No bachelor's degree in education	Vargha-Delaney $A$
		$M$ ( $SD$ )	Mean ranks	Mean ranks	Value
I enjoy reading research reports.	.67	2.8 (1.0)	105.50	127.70	.43*
Knowledge of research in the field of education helps me succeed in my studies.	.70	3.3 (1.0)	113.43	117.10	.50
Understanding research in the field of education helps me grasp the theoretical concepts discussed in various courses.	.70	3.4 (0.9)	114.92	115.11	.51

Item	Factor Loading	Total	Bachelor's degree in education	No bachelor's degree in education	Vargha-DeLaney A
		<i>M (SD)</i>	Mean ranks		Value
I am interested in research in the field of education.	.58	3.3 (1.0)	116.35	113.19	.52
It is important to me that my teachers and assistants conduct research.	.63	3.4 (1.0)	114.97	115.04	.51
I find it important for a teacher to use examples from their own research in lectures.	.55	3.7 (1.0)	116.10	113.54	.52
For effective teaching at university, it is important that teachers and assistants engage in research.	.61	4.0 (0.9)	111.69	117.05	.50
Teachers' research in schools helps solve everyday practice problems.	.56	4.0 (0.8)	116.33	109.74	.53
When I work in a school, I will engage in research activities.	.61	3.3 (0.9)	119.34	106.96	.56
Conducting research is a good way to improve a teacher's teaching.	.67	3.9 (0.9)	117.00	110.05	.54
Conducting research is a good way to enhance the prestige of the teaching profession.	.63	3.7 (1.0)	111.41	117.41	.49
Educational practice should primarily be researched by specially trained researchers.	.51	3.3 (1.1)	104.64	126.32	.44*
I feel part of the faculty's research community.	.50	2.5 (1.0)	114.76	113.00	.52
Research causes me stress.	.50	3.1 (1.1)	112.89	115.46	.51
Research is boring.	.51	2.3 (1.0)	112.06	116.56	.50
<i>N</i>		229	131	98	

\*  $p < .05$  (Mann-Whitney  $U$  test).

Looking at perceived research attitude (Table 5), we can observe that the pre-service teachers generally have moderate attitudes towards various aspects of research in education. For example, they slightly agree that knowledge of research in education helps them succeed in their studies ( $M = 3.3$ ) and that understanding research helps them grasp the theoretical concepts discussed in courses ( $M = 3.4$ ). They also find it somewhat important that their teachers and assistants conduct research ( $M = 3.4$ ) and use examples from their own research in lectures ( $M = 3.7$ ). However, there are notable areas where the pre-service teachers do not show strong agreement. For instance, they exhibit neutral to slightly negative attitudes towards enjoying reading research reports ( $M = 2.8$ ) and feeling part of the faculty's research community ( $M = 2.5$ ). However, they do not think that research is boring ( $M = 2.3$ ).

Looking at the group comparisons, we again observe that those without a bachelor's degree in education generally report higher enjoyment in reading

research reports, as indicated by a statistically significant difference and medium effect size (Mean ranks: 127.70 vs. 105.50;  $A = .43^*$ ,  $p < 0.05$ ). Additionally, this group exhibits greater agreement that educational practice should primarily be researched by specially trained researchers (Mean ranks: 126.32 vs. 104.64;  $A = .44^*$ ,  $p < 0.05$ ), also indicating a medium effect size. On the other hand, the students with a prior bachelor's degree in education demonstrate slightly more positive attitudes towards the practical application of research within educational settings, although these differences are not statistically significant. For instance, they show a marginally higher interest in research in the field of education (Mean ranks: 116.35 vs. 113.19;  $A = .52$ ) and a stronger belief that teachers' research in schools helps solve everyday practice problems (Mean ranks: 116.33 vs. 109.74;  $A = .53$ ). Furthermore, they are more convinced that they will engage in research activities when they start working in schools (Mean ranks: 119.34 vs. 106.96;  $A = .56$ ), although these differences are not statistically significant.

Despite these differences, both groups agree on the importance of research in education. For instance, they agree that for effective teaching at university, it is important for teachers and assistants to engage in research ( $M = 4.0$ ), and they recognise that teachers' research can help solve everyday practice problems ( $M = 4.0$ ).

## Discussion

The present study offers an in-depth exploration of the perceived research competence of master's students enrolled in pre-service teacher education programmes at various higher education institutions in Slovenia.

In educational research, the relevance and appropriateness of the instruments employed plays a very important role in ensuring the validity and reliability of the findings. Theoretical frameworks, such as construct validity theory, emphasise that the instruments used in research must not only measure what they purport to measure but must also be sensitive to the context in which they are applied (Vessonen et al., 2023). Instruments that are not tailored to specific cultural, linguistic or educational contexts can inadvertently introduce biases, leading to misinterpretations or even erroneous conclusions (Geisinger, 1994).

The process of analysing perceived research competence therefore requires a preliminary step: the accurate capture of this competence. During the literature review, we found that there is no instrument to capture perceived research competence in the Slovenian language. Although there was one study that accommodated a questionnaire for both Slovenian and Kosovan contexts for students with a prior bachelor's degree in education (Matjašič et. al., 2023),

we found no instrument specifically tailored and validated for the Slovenian educational context. This gap presented an opportunity for our study to make a unique contribution. Our endeavour to create and validate an instrument tailored to the Slovenian context stands as a notable strength of our research. Firstly, by developing an instrument in the Slovenian language, we have ensured that language nuances, cultural specificities and educational contexts are aptly captured; and secondly, our approach to addressing this gap not only fulfils the immediate research needs but also adds to the broader academic repository. It exemplifies the adaptability of research methodologies, emphasising the importance of contextually relevant tools in educational research.

Regarding perceived research competence and starting with research knowledge, our findings indicate that pre-service teachers generally perceive themselves as moderately to highly knowledgeable in certain foundational areas of research. They feel confident in their ability to formulate research objectives, hypotheses and questions, and to substantiate research problems theoretically. These competences are crucial for initiating and planning research projects effectively. However, the confidence drops significantly when it comes to understanding statistical procedures, the validity and reliability of data collection instruments, and action research. This indicates a gap in the practical and technical aspects of research knowledge, the latter being essential for data analysis and interpretation. These findings are in line with those of Matjašič et al. 2023, who found that there are notable areas where pre-service teachers enrolled in master's programmes show a deficiency in perceived research knowledge, including knowledge of statistical data analysis software and the characteristics of action research. In order to improve the research knowledge of pre-service teachers, we therefore recommend integrating comprehensive training on statistical data analysis software (e.g., SPSS) into the curriculum, introducing specific courses on action research, and providing practical opportunities to participate in real-world research projects. Furthermore, the existing literature (Matjašič et al., 2023; Van Katwijk et al., 2023) emphasises the importance of experiential learning in teacher education. Experiential learning involves active participation and reflection, enabling pre-service teachers to develop critical thinking and problem-solving skills.

Comparing the two groups in the present research, interesting differences were found regarding perceived research knowledge. The students without a bachelor's degree in education generally perceive themselves as more knowledgeable in most research-related areas, particularly in formulating research objectives, substantiating research problems, and formulating research questions and hypotheses. This could be attributed to the broader academic

exposure and diverse methodological training they may have received in their undergraduate programmes. On the other hand, the students with a prior bachelor's degree in education expressed slightly higher confidence in understanding quantitative and qualitative research approaches, action research and understanding different statistical procedures used in educational research. This may reflect the more focused and practical orientation of their training in educational research methodologies.

Moving to the perceived research skills, our study revealed a mixed picture of confidence across different areas. On the one hand, there are several areas where pre-service teachers feel moderately to highly skilled. For instance, they express strong confidence in their ability to find the necessary literature, cite the literature accurately and summarise the essence of the literature they have reviewed. These skills are foundational and crucial for conducting thorough and credible research, as they facilitate the initial stages of research planning and theoretical framing. On the other hand, there are significant areas needing improvement, particularly the technical and practical aspects of research. Pre-service teachers report low confidence in using software for statistical data analysis and developing an action plan for implementing changes in educational practice based on research findings. These gaps highlight the need for more focused training in these critical areas to ensure that pre-service teachers are well equipped to handle all aspects of the research process. These findings are consistent with those of Ipanaqué-Zapata et al. (2023), who reported that students had difficulty defining study problems and objectives, and applying statistical techniques for data processing. This commonality points to a potential gap in the curriculum that transcends disciplinary boundaries, suggesting that students could benefit from enhanced training in quantitative analysis tools and translating research insights into practice. Furthermore, the struggle with the skills required to use statistical software and applied research implementation suggests a broader educational opportunity. Creating courses that emphasise these areas could help students better understand how research can drive improvements, especially in educational contexts.

Comparing the two groups in the present study, it was found that students without a bachelor's degree in education generally perceive themselves as more skilled in most research-related areas. For instance, they show higher confidence in finding the necessary literature, citing the literature and summarising the literature. This trend continues in other areas, such as explaining the purpose of their research and writing a research report. In our opinion, one reason explaining why students without a bachelor's degree in education perceive themselves as more skilled in research-related areas could be that their

education programmes provided broader academic exposure, thus enhancing their adaptability and confidence in various research scenarios. Interestingly, the students with a bachelor's degree in education did not report higher confidence in any specific research skills, except in developing action plans for implementing changes in educational practice, although this difference in mean rank was not statistically significant. This could mean that their prior education may have focused more on pedagogical knowledge than on general research competence.

Looking at perceived research attitude, the results indicate that while pre-service teachers acknowledge the importance of research, their overall attitudes towards it are moderate. The slight agreement that research knowledge aids their academic success and helps in understanding theoretical concepts indicates that pre-service teachers appreciate the theoretical benefits of research. However, their neutral to slightly negative attitudes towards reading research reports and the lack of a strong sense of belonging to the faculty's research community highlight a disconnect between recognising the value of research and actively engaging with it. Interestingly, it was found that pre-service teachers do not find research boring, which could indicate that their ambivalence towards research is not due to a lack of interest but to other factors. One significant factor may be that pre-service teachers are not sufficiently taught about the practical aspects and relevance of research, leading to a lack of awareness and understanding of how research can be engaging and applicable to their future careers (i.e., they do not feel part of the faculty's research community). If pre-service teachers are not exposed to the process and benefits of conducting research, they may perceive it as irrelevant or disconnected from their educational practice. This gap in their education could lead to the observed moderate attitudes. Moreover, previous research shows that teacher education can influence pre-service teachers' perceptions and attitudes towards research (Aspfors & Eklund 2017; Munthe & Rogne, 2015).

The comparison between the two groups of students revealed that those without a bachelor's degree in education generally have a more positive attitude towards research. Again, this could be due to broader academic exposure and more diverse methodological training in non-educational programmes, which may better equip these students with the skills and confidence needed for research activities. On the other hand, there are several areas where students with a prior bachelor's degree in education demonstrated a more positive attitude towards the role of research in direct educational practice. They are somewhat more interested in research in the field of education and believe that teachers' research in schools helps solve everyday practice problems. Additionally,

they are more convinced that they will engage in research activities when they start working in schools. These differences suggest that while students without a bachelor's degree in education may have a broader appreciation of research in general, students with a bachelor's degree in education see more direct applicability and value in research for improving educational practices. The results obtained indicate that institutions may need to place more emphasis on integrating practical research experiences and demonstrating the direct benefits of research engagement in order to foster more positive attitudes. One way to do this is to integrate action research in the curriculum, which has been found to be an ideal way to address and embrace all of the diverse perceptions, orientations, interests and motivations about research in pre-service teacher education (Gümüşok et al., 2024).

Finally, in order to better understand the differences in perceived research competence between the two groups in the present research, we also examined the curricula of pre-service teacher education programmes and other education programmes at the bachelor's level. Through curricula descriptions, we found that other education programmes include more courses with an emphasis on statistical methods and research methodologies, which likely contributes to the students' higher confidence in these areas. For example, the descriptions include several courses related to research methodology such as Introduction to Statistics, Descriptive Statistics, Introduction to Academic Writing and Presentation Techniques, Research Methodology, and Methodology of Researching Family Issues. Through a review of general descriptions and course syllabi, it was found that these courses cover both qualitative and quantitative methods as well as statistical analysis. Additionally, courses like Comparative Andragogy indicate a focus on interdisciplinary research and comparative studies, which may further explain the higher confidence in perceived research competence among students without a bachelor's degree in education. Thus, it seems that the difference between the students in our study can be attributed to the distinct emphasis in their respective study programmes, with other education programmes focusing more on statistical methods and pre-service teacher education programmes focusing on a broader range of research methodologies relevant to educational research.

## **Conclusion**

The key role of research in shaping educational outcomes and teaching pedagogies is undeniable. The present study, which focused on the perceived research competence of pre-service teachers enrolled in master's programmes,

sheds light on the intricate dynamics at play within education programmes. By introducing a new and validated instrument tailored for the Slovenian context, the research not only addresses a gap in the assessment of perceived research competence but also provides valuable insights into the effectiveness of research-based teaching practices.

The practical implications of the study emphasise the importance of incorporating comprehensive statistical training and hands-on research experiences within pre-service teacher education programmes. In addition, fostering a supportive research community through structured mentorship programmes and collaborative research opportunities is crucial. For instance, implementing mentorship initiatives where experienced researchers guide pre-service teachers through their first research projects can provide personalised support and enhance research skills. Collaborative research opportunities, such as interdisciplinary projects that involve multiple departments or institutions, can expose pre-service teachers to diverse methodologies and foster a collaborative spirit. Moreover, research-focused workshops, such as statistical analysis workshops, action research training and research methodology seminars, can provide targeted skill development and deepen pre-service teachers' understanding of research processes. These initiatives not only address the identified competence gaps but also create an environment where pre-service teachers can continuously engage with research. By adopting these strategies, educational institutions can ensure the development of confident and competent educators capable of integrating research into their teaching practices effectively.

It is clear from the data presented that research competence is a complex concept that requires multidisciplinary knowledge, and that different approaches must be used to develop it. Mere methodological and statistical knowledge is not enough. Students must also have good content knowledge in the area in which they are to conduct research. Based on the data collected, we can assume that the students who have not received pedagogical training during their bachelor's studies have acquired a good level of expertise in their own field of study, which enables them to define research problems and formulate meaningful research questions, hypotheses and research objectives. Their teachers and teaching assistants have obviously familiarised them well with their own research work, partly through the incorporation of examples from their research in their lectures. If students learn about research in one area, they will find it much easier to understand the characteristics of research in another area. In our study, this means that students without a bachelor's degree in education will be able to use their research competence for understanding research in education as well.

Finally, the present study is not without limitations. The reliance on self-reported measures for assessing perceived research competence might introduce a degree of subjectivity into the findings. Additionally, the cultural and educational specificity of the newly developed instrument, while a strength in the Slovenian context, may limit its applicability in other settings without further adaptation and validation. Future research should consider longitudinal designs to track changes in perceived research competence and attitudes over time, particularly as pre-service teachers transition to their professional roles. Exploring the impact of specific research-based interventions within pre-service teacher education programmes on actual research competence would also be valuable. Furthermore, expanding the scope of the study to include a broader range of educational contexts and cultures could enhance the generalisability of the findings and provide deeper insights into the global challenges and opportunities in integrating research into teacher education.

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