



SELF-EFFICACY OF PRE-SERVICE TEACHERS: FACTORS THAT STRENGTHEN ITS COMPONENTS

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Abstract

The foundation for the successful work of pre-service teachers in the education of students lies in their professional and pedagogical knowledge and skills, reinforced by self-confidence in applying them when addressing more demanding situations in classrooms. This study aimed to examine the perceived efficacy of pre-service teachers. The research was conducted on a sample of 141 pre-service teachers from Pavol Jozef Šafárik University in Košice. Exploratory factor analysis was employed to validate the research instrument (the shortened, revalidated version of the Ohio State Teacher Efficacy Scale), indicating the existence of three factors (perceived efficacy in adapting teaching to students, managing the classroom, and providing students with learning challenges), as the original model tested by confirmatory factor analysis did not sufficiently fit the data obtained from respondents. The research assessed factors influencing the self-efficacy of pre-service teachers. These factors included gender, field of study, motivation for choosing teacher education, types of teaching practice completed, and courses/subjects related to inclusive education. Significant differences were observed in adapting teaching to students in terms of motivation for teaching, and in adapting teaching and providing students with learning challenges in terms of completed teaching practice. The results in the context of a specifically focused study suggest that, to strengthen these components of pre-service teachers' self-efficacy, it would be beneficial for university instructors to understand pre-service teachers' motivation to pursue a teaching career, support the development of their professional identity, and foster more reflective teaching practice through mentors in schools.

Keywords: *exploratory factor analysis, pre-service teachers' self-efficacy, pre-service teacher training, university education*

Introduction

Teaching is one of the adaptable professions. It adapts to change, and its relevance to society's needs is largely unquestionable. However, in order to maintain this status over time, it is essential to focus on developing transferable skills, student-centred teaching, and on updating professional and pedagogical knowledge and skills through continuous professional development. This has been explicitly illustrated in the study by Ming and Guan (2016), which has discussed three value paradigms in relation to improving teacher education: a focus on the student, the teacher's identity, and participation in building the teaching community. Flexibility and the competence to use practice in the creation of educational knowledge clearly come to the forefront. This has been further emphasised by the meta-analysis of Kausar and Ajmal (2024), which has examined pre-service teachers' expectations of current teacher programmes. They have arrived at a very similar conclusion, highlighting, among other things, the importance of critical thinking and problem-solving skills. The OECD (2021) comments on teacher preparation for managing their careers and emphasises that initial teacher education should be based on the integration of theory and practice, as otherwise it becomes challenging to keep pace with the ongoing demands from students. The question, therefore, is how to work with pre-service teachers so that they are provided with a solid foundation, enabling them to persist in practice and, through it, foster their professional growth.

In Slovakia, ideas from the new *State Education Programme for primary education* (Ministerstvo školstva, vedy, výskumu a športu Slovenskej republiky, 2023) are gradually being introduced into schools, and their implementation depends on preparing teachers for the updated content and teaching methods. This cannot occur without changes in their higher education training and the strengthening of professional development. According to the programme, schools are places where collaborative learning takes place, addressing both students' educational needs and the professional needs of teachers and other educational stakeholders.

In response to this situation, the Ministry of Education, Research, Development and Youth of the Slovak Republic (2025) developed the *Professional Standard for Beginning Teaching Staff*. From this, three key competencies can be identified that determine a teacher's success in practice: diagnostic, didactic, and reflective. Regarding the latter, it is noteworthy that a beginning teacher is capable of utilising various resources for professional development and possesses knowledge of self-assessment and self-efficacy (in terms of professional proficiency).

The preparation of pre-service teachers for real school practice depends on the development of their professional and pedagogical competencies, the effectiveness of which in the educational process is enhanced by their self-efficacy. This concept refers to how individuals perceive their own capacity to cope with situations that represent challenges. It has been argued by Gavora (2012b) that the manner in which a teacher (including a novice) evaluates their own qualities constitutes one of the most important self-regulatory elements in educational practice. Through this, the teacher activates competencies and acts accordingly. While being aware of one's potential does not necessarily guarantee success, it ensures persistence in pursuing goals (by reassessing educational activities and seeking resources to address problems, sometimes even routine ones with incoming students).

According to Mareš (2020), drawing on Bandura's description of self-efficacy (also referred to as professional capability), an individual who is aware of their efficacy demonstrates self-confidence and approaches demanding tasks as challenges rather than threats. Such an individual sets more ambitious goals and exhibits persistence in achieving them. Failures are attributed either to insufficient effort or to inadequate abilities. From the perspective of self-efficacy, however, both are viewed as improvable. It may therefore be assumed that pre-service teachers with higher teaching self-efficacy are more motivated and, at the same time, more willing to devote greater attention to the development of professional competencies. Active engagement in the educational process is likely to lead to improvements and a gradual expansion of their didactic skills. Conversely, a higher level of professional competencies has the potential to increase their self-efficacy (inspired by Bandura, 1997; Poulou, 2007; Tschannen-Moran & Woolfolk Hoy, 2001). This can be described as a reciprocal reinforcement effect.

As noted in the meta-analytic study by Chesnut and Barley (2015), teachers' beliefs in their self-efficacy, both prior to and during their practice, have an impact on their commitment to the teaching profession. A similar view has been presented in the study by Scarparolo and Subban (2021), which suggests that teachers' self-efficacy has the potential to influence classroom management, student motivation, and the attention given to the diverse needs of students. Täschner et al. (2024) argued that a high level of self-efficacy is a prerequisite for a healthy teaching career. Therefore, it is important to focus on examining interventions that could support it, both for pre-service teachers and for experienced teachers. This is supported by specific research findings.

The study by Valencia et al. (2021) has demonstrated that there is a statistically significant relationship between teacher self-efficacy in the preparatory phase and their pedagogical performance. In a similar vein, Saracaloğlu and Altin (2021) have reported a statistically significant positive correlation between the classroom management competencies of teacher candidates and their self-efficacy. The study by Sezen-Gultekin et al. (2021) has demonstrated

that pre-service teachers' self-efficacy is a statistically significant predictor of their competencies in using communication technologies. Asare and Amo (2023), using regression analysis, have concluded that the perceived efficacy of pre-service teachers in motivating (engaging) students positively influences their teaching effectiveness. The results of multiple regression analysis in the study by Brown et al. (2021) have indicated that there is a moderate but significant predictive relationship between perceived efficacy in early teaching stages and preparedness (in combination), which explains 13% of the variance in pre-service teachers' performance.

Kudryashova et al. (2016) have provided an overview of the teacher's roles in the modern educational environment, based on an analysis of the compatibility between Bloom's taxonomy of objectives and the 5E Instructional Model, which, according to the authors, best aligns with new educational goals. Progressing through its ascending levels, the teacher is expected to assume the roles of motivator, authority, controller, coach, moderator, facilitator, and leader. Assessing the professional capacity of teachers is therefore, alongside the evaluation of competency development, one of the key means for adequately fulfilling these roles. Therefore, it is also appropriate to focus on monitoring the self-efficacy of pre-service teachers.

Kihoro and Bunyi (2017), based on their own research conducted among preschool teachers, have even argued that the OSTES scale could be potentially useful in the recruitment of new teachers. In this educational context as well, it is essential that teachers demonstrate sufficient effort in engaging even weaker students. It is also important for this professional quality to be monitored both during the studies of future teachers, with regard to the individual stages of becoming a teacher (Gavora, 2009; Gavora, 2010). The model of pedagogical practice can be considered a factor impacting the enhancement of pre-service teachers' self-efficacy (Taufik et al., 2025), not only at a general level (Fairbrother, 2025; Nousheen et al., 2024). Factors that should not be underestimated include pre-service teachers' gender (likely associated with personality traits that support coping with teaching challenges; Muega-Geronimo & Carlos, 2023), completion of specific courses aimed at improving didactic competence, chosen field of study (Kervan & Morina, 2018), and motivation to pursue a teaching career (Kula, 2022). The study by Özokcu (2017) led to the conclusion that teachers' general self-efficacy is linked to their self-efficacy in implementing inclusive education. It appears that in these cases, it is a broader ability that influences various areas and activities, although it is primarily concrete or contextual, such as the energy required to handle different educational tasks or situations.

Research Aim and Research Questions

The aim of the research was to identify factors that may potentially influence the enhancement of pre-service teachers' self-efficacy. Their selection was justified in the studies mentioned above, which indicate that these are foundational aspects for sustaining a teaching career. They warrant attention during the preparation of future teachers, and their impact on changes in self-efficacy in relation to teaching effectiveness and classroom management should be regularly monitored. The following research questions were formulated:

RQ1: How do selected factors influence pre-service teachers' perceived efficacy in adapting teaching to students?

RQ2: How do selected factors influence pre-service teachers' perceived efficacy in classroom management?

RQ3: How do selected factors influence pre-service teachers' perceived efficacy in providing students with learning challenges?

Research Methodology

General Background

The study examined self-efficacy among pre-service teachers, with the main aim of comparing the perceived self-efficacy of pre-service teachers in the observational phase of teacher preparation with those who had already completed teaching practice (i.e., had independent teaching experiences). The research was grounded in Bandura's social-cognitive theory (Gavora, 2011), which defines self-efficacy as an individual's belief in their ability to organise and execute actions required to manage future situations. Bandura identifies vicarious and mastery experiences as key sources of self-efficacy. Pre-service teachers in the observational phase typically acquire mostly vicarious experiences by observing experienced teachers, whereas participants in teaching practice engage in direct mastery experiences. This distinction can be helpful for identifying changes in self-efficacy, understanding the influence of experience type on self-efficacy, and even assessing the preparedness of future teachers for educational practice.

A non-experimental quantitative descriptive research design was used, allowing for a comparison of perceived self-efficacy between the two groups of pre-service teachers (considering other factors as well; for example, field of study, choice of studying teaching, and so on). An adapted self-efficacy scale (Gavora, 2012a) provided a measure of how pre-service teachers perceive their teaching abilities, enabling the identification of trends emerging across different phases of teacher preparation.

The timing of the research was aligned with the structure of the teacher education program at Pavol Jozef Šafárik University in Košice. This was carried out during the academic year among master's pre-service teachers, specifically shortly before the completion of teaching practice and immediately after its conclusion. This approach allowed for a comparison of self-efficacy levels across two different types of practice – observational and independent teaching.

The study included pre-service teachers at different stages of teacher preparation, ensuring a broader and more diverse sample. By including participants from the observational phase as well, the research accounted for differences arising from academic coursework, teaching experience, and the gradual acquisition of teaching skills. This approach helped capture variability in self-efficacy components and the factors influencing their development.

Sample

Participants were selected for the study via convenience sampling. Data collection took place during the relevant periods in 2023–2024. The respondents were informed about the significance of research on self-efficacy for school practice, the researchers conducting the study (members of the Department of Pedagogy), the expectations (they would be assessing perceived self-efficacy), and how the data would be processed. They were also informed that participation was voluntary and anonymity was guaranteed. To motivate their involvement in the study, a “quid pro quo” was offered, providing them with a basic summary of the data analysis upon completion of the research. A total of 144 pre-service teachers took part in the research. Those who had not completed any teaching practice were removed, resulting in a final sample of 141 participants, with a mean age of 23.18 years ($SD = 1.33$). A description of the research sample is presented in Table 1. The originally planned research sample of approximately 200–250 respondents, which would have roughly reflected the representation of pre-service teachers at the master's level, was not achieved. The likely reason was conceptual uncertainties among pre-service teachers regarding what constitutes competence and self-efficacy (for self-efficacy, its commonly used synonym in Slovak contexts, namely professional capability/pedagogical

readiness, was provided. As a result, some pre-service teachers did not participate in the study or discontinued completing the questionnaire.

An approximate proportional representation can be observed in terms of field of study, with pre-service teachers from the humanities predominating (e.g., German–English, History–Slovak, Philosophy–Psychology), followed by pre-service teachers from the natural sciences (e.g., Biology–Chemistry, Mathematics–Physics, Geography–Informatics), and finally pre-service teachers from combined fields (e.g., Slovak and Mathematics, Biology–Psychology, History–Geography). The same applies to motivation for pursuing the teaching profession. Primary motivation indicates that becoming a teacher was the pre-service teacher’s priority from the very beginning of their studies. Secondary motivation refers to pre-service teachers who initially had different plans but ultimately decided to remain in teaching. Tertiary motivation can be understood as pre-service teachers who were initially unsure about their future career path and eventually chose the teaching profession. These circumstances can be seen as one of the reasons why not all pre-service teachers chose courses during their studies focused on acquiring knowledge of inclusive pedagogy and developing related skills. Some pre-service teachers only encounter the topic of integrating students into mainstream schools in the final year of their master’s programme.

Table 1
Participant Demographics

Research Sample Details	<i>N</i>	%
Gender		
Female	120	85.11
Male	21	14.89
Field of Study		
Humanities Subjects	60	42.55
Science Subjects	50	35.46
Subject Combinations	31	21.99
Year of Study (Master's Programme)		
1st year	104	73.67
2nd year	37	26.24
Choice of Teacher Education Studies (Motivation)		
Primary	59	41.84
Secondary	55	39.01
Tertiary	27	19.15
Types of Completed Teaching Practice		
Observation-based Practice, Continuous Practice	104	73.76
Extended Practice I, Extended Practice II	37	26.24
Participation in Inclusive Education Courses/Subjects (Common Core)		
No	58	41.13
Yes	83	58.87

Instruments and Procedures

The self-efficacy of pre-service teachers was measured using the OSTES (The Ohio Teacher Efficacy Scale), originally developed by Tschannen-Moran and Woolfolk Hoy (2001) and adapted to Slovak conditions by Gavora (2012a). The research instrument consisted of 15 items in the form of questions, to which respondents were asked to respond by selecting one of the options on a 9-point scale (ranging from 1 – not at all, to 9 – very much). In this adapted version, the instrument was structured around the dimensions of self-efficacy in using teaching strategies and self-efficacy in classroom management. Its use was based on the understanding that, since it involved a subjective assessment of pre-service teachers' abilities, expressing the degree of agreement commonly employed in Likert scales measuring self-efficacy may not fully reflect their actual potential to perform specific educational tasks. This perspective has also been discussed in the study by Majerčíková and Gavora (2013). In addition, the scale format was modified from nine to five points (none – little – somewhat – quite a lot – very much). This was done to prevent cognitive overload for respondents and to reduce inconsistencies in responses in small samples. This adjustment has also been applied in the study by Novocký et al. (2023), who have examined the self-efficacy of lower secondary school teachers (without significant changes in the validation of the scale). Prior to final distribution among pre-service teachers, the scale underwent an initial trial ($N = 10$) followed by a preliminary investigation ($N = 38$). Pre-service teachers suggested no substantive or stylistic modifications to the items. They were not included in the study.

In the validation process, confirmatory factor analysis (maximum likelihood estimator) was prioritised, since the existing model was already familiar. Alternative models were tested: a single-factor model and a two-factor model (the first with uncorrelated factors and the second with correlated factors). In all cases, the fit indices (incremental and absolute) did not reach the recommended thresholds for an acceptable model (Hair et al., 2010). The fit of the two-factor model improved when correlations between residuals of conceptually similar items were allowed, but this improvement occurred only when three specific item pairs were included (Comparative Fit Index, Tucker Lewis Index $> .90$; Goodness of Fit Index $< .90$; Root Mean Square Error of Approximation $> .60$; Standardised Root Mean Squared Residual $> .60$). Based on Soukup's experience (2022) with introducing residual covariances (or correlated errors), they should not be added to the model in large numbers or without justification solely to artificially increase the fit indices. This situation likely arose due to the specificity of the sample and its size.

Considering these findings, the data were subjected to exploratory factor analysis using the principal axis factoring method with promax oblique rotation. According to Soukup (2021), this method is a more suitable alternative for scale validation than principal component analysis, which is conceptually designed for different purposes. Inter-factor correlations were assumed (Tabachnick & Fidell, 2007). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (.846) and Bartlett's test of sphericity ($p < .001$) indicated that the procedure was suitable for evaluating the structure of the research instrument. The number of factors was initially restricted to two, in line with their original structure in Gavora's (2012a) study. The common variance explained after extraction was 41.60%. Subsequently, after examining the scree plot, a three-factor alternative (eigenvalue greater than 1) was considered, which yielded higher explained variance both in the initial phase (58.18%) and after extraction (47.60%). Gavora (2012c, p. 32) has emphasised that in the social sciences, an explained variance above 50% is considered an acceptable result; however, research instruments with explained variance below 50% may also be valid, provided they correspond to the theoretical model on which they are based.

Item loadings were required to exceed .40, with the condition that this loading value should not appear across multiple factors simultaneously. Based on this criterion, one item

with a factor loading below .40 (“What are you able to do when students ask you difficult questions?”) was removed.

The factor of perceived efficacy in adapting teaching to students included items reflecting what pre-service teachers are able to do to facilitate students’ learning while respecting their educational needs (with awareness of ensuring the smooth course of the educational process). This factor explained 33.89% of the common variance in the variables, based on the extracted sums of squared loadings.

The factor of perceived efficacy in classroom management comprised items describing what pre-service teachers are able to do to address student discipline during instruction (to ensure that the lesson proceeds in a standard manner). This factor explained 9.27% of the common variance in the variables, based on the extracted sums of squared loadings.

The factor of perceived efficacy in providing students with learning challenges comprised items reflecting what pre-service teachers are able to do in order to influence students’ higher cognitive processes through educational activities by introducing corresponding instructional procedures. This factor explained 4.44% of the common variance in the variables, based on the extracted sums of squared loadings.

Correlations of factor scores ranged between $r = .46$ and $r = .63$. Cronbach’s alpha exceeded .70 in all cases (.83, .78, .73). For the full research instrument, the coefficient reached .87, indicating very good internal consistency for both the individual dimensions and the instrument as a whole (Nunnally & Bernstein, 1994). An overview of the values is presented in Table 2.

Table 2
Structure of the Research Instrument: Self-Efficacy of Teacher Education

Items (Questions) Saturated by Factors	Factors			
	α	I.	II.	III.
(I) Efficacy in Adapting Teaching to Students	.83			
What are you able to do to help students better understand the subject matter?	.924	-.133	.009	
What are you able to do when students do not understand the subject matter at all?	.724	.146	-.144	
What are you able to do to formulate appropriate questions for students?	.678	-.076	.112	
What are you able to do to support the development of talented students?	.484	.049	.244	
What are you able to do to ensure that routine classroom activities run smoothly?	.432	.187	.098	
(II) Efficacy in Classroom Management	.78			
What are you able to do in dealing with insolent students?	.005	.883	-.225	
What are you able to do to handle disruptive students?	.083	.638	.094	
What are you able to do with highly problematic students?	-.220	.597	.221	
What are you able to do to eliminate individuals capable of disrupting the entire lesson?	.132	.565	-.101	
What are you able to do to prevent students from disturbing the class?	.043	.499	.158	
(III) Efficacy in Providing Students with Learning Challenges	.73			
What are you able to do to foster students’ creativity?	-.051	-.092	.778	
What are you able to do to introduce innovations into teaching?	.172	-.076	.577	
What are you able to do to teach students to think critically?	-.011	.232	.506	
What are you able to do to apply diverse methods for assessing students’ knowledge and skills?	.173	.098	.413	
Rotated Sums of Squared Loadings	3.90	3.33	3.41	

Data Analysis

Parametric tests (Student's *t*-test, ANOVA) and non-parametric tests were used in the statistical analysis of the data (Mann-Whitney *U* test, Kruskal-Wallis test with Dunn-Bonferroni post hoc pairwise comparisons), because the normality of variable distributions was confirmed only in certain subsamples, as indicated by the Kolmogorov–Smirnov and Shapiro–Wilk tests. In one case, Welch's test (an analogue of ANOVA for more than two independent groups) was applied due to the violation of homogeneity of variances. The chosen level of significance was .05. From descriptive statistics, the arithmetic mean (*M*) and median (*Me*) were used. Data analysis was performed with SPSS (version 27.0.1.0) and JASP (version 0.14.1).

Research Results

Factors Enhancing Pre-Service Teachers' Self-Efficacy

The quantitative data analysis was conducted with the aim of identifying key variables that potentially influence changes in the components of pre-service teachers' self-efficacy. The results are summarised in Table 3.

Table 3
Differences in the Dimensions of Pre-service Teachers' Self-Efficacy from the Perspective of Selected Variable

Measures			Outcomes					
Determinants			Efficacy in Adapting Teaching to Students		Efficacy in Classroom Management		Efficacy in Providing Students with Learning Challenges	
Gender	Mann-Whitney <i>U</i> test	<i>p</i>	Student's <i>t</i> -test	<i>p</i>	Mann-Whitney <i>U</i> test	<i>p</i>		
	1102.500	.357	-0.420	.675	1214.500	.790		
Field of Study	Kruskal-Wallis test	<i>p</i>	ANOVA (<i>F</i>)	<i>p</i>	Kruskal-Wallis test	<i>p</i>		
	.878	.645	1.749	.178	0.633	.729		
Choice of Teacher Education Studies (Motivation)	Kruskal-Wallis test	<i>p</i>	Welch's test	<i>p</i>	Kruskal-Wallis test	<i>p</i>		
	6.803	.033*	0.774	.465	.758	.684		
Types of Completed Teaching Practice (Combinations)	Mann-Whitney <i>U</i> test	<i>p</i>	Student's <i>t</i> -test	<i>p</i>	Mann-Whitney <i>U</i> test	<i>p</i>		
	1274.500	.002**	-0.852	.396	1387.000	.011*		
Completion of Courses on Inclusive Education	Mann-Whitney <i>U</i> test	<i>p</i>	Student's <i>t</i> -test	<i>p</i>	Mann-Whitney <i>U</i> test	<i>p</i>		
	2158.000	.292	-0.120	.905	1968.500	.063		

From Table 3, it follows that there is a statistically significant difference in the perceived efficacy of pre-service teachers in adapting teaching to students with respect to their motivation for studying teacher education (Kruskal-Wallis test = 6.803; $p = .033$). With regard to pairwise comparisons, this difference was identified between the group of pre-service teachers with predominantly primary motivation and the group of pre-service teachers with predominantly tertiary motivation (Dunn-Bonferroni post hoc test = 2.517; $p = .035$). Respondents with primary motivation scored higher in this dimension ($M = 4.30$; $Me = 4.40$) than respondents with tertiary motivation ($M = 4.00$; $Me = 4.00$) to study teacher education.

From Table 3, it follows that there is a statistically significant difference in the perceived efficacy of pre-service teachers in adapting teaching to students with respect to the type of completed teaching practice (Mann-Whitney U test = 1274.500; $p = .002$). Respondents who completed extended types of practice, where independent teaching outputs predominated, scored higher in this dimension ($M = 4.43$; $Me = 4.60$) than those who completed the first two types of practice, where observation of the activities of the supervising teacher and peers predominated ($M = 4.17$; $Me = 4.20$).

From Table 3, it follows that there is a statistically significant difference in the perceived efficacy of pre-service teachers in providing students with learning challenges with respect to the type of completed teaching practice (Mann-Whitney U test = 1387.000; $p = .011$). Respondents who completed extended types of practice, where independent teaching outputs predominated, scored higher in this dimension ($M = 4.28$; $Me = 4.25$) than those who completed the first two types of practice, where observation of the activities of the supervising teacher and peers predominated ($M = 4.02$; $Me = 4.00$).

Discussion

The effectiveness of the work of pre-service teachers in schools results from the level of their acquired knowledge in the relevant scientific discipline and in the field of educational sciences, pedagogical activities enabling them to understand classroom conditions and convey subject matter to students while reconstructing teaching, and from their perception of their own potential to cope with the associated difficulties. It is important not to underestimate the monitoring of the extent to which pre-service teachers trust themselves in their educational work, both as a means of providing feedback for faculties of education (to allow them to respond to the requirements of practice) and in terms of the pre-service teachers' self-diagnostic capacity when reflecting on their professional development.

The original version of the OSTES questionnaire, as developed by Tschannen-Moran and Woolfolk Hoy (2001), consisted of three factors. However, examinations of its structure using data from Slovak teachers suggest alternatives with one factor (24 items) (Gavora, 2011) and two factors (15–18 items depending on respondent characteristics) (Gavora, 2012a; Kohútová, 2018).

The two-factor model (Gavora, 2012a) did not correspond with the data obtained from pre-service teachers at Pavol Jozef Šafárik University (nor was this substantially improved by allowing residual covariances). Exploratory factor analysis was applied to the data, indicating the possibility of considering three factors (though not in the same constellation as in the study by Tschannen-Moran and Woolfolk Hoy, since a revalidated version by Gavora (2012a) was used, which did not include the factor of self-efficacy in motivating students). In this case, the factor of self-efficacy in classroom management was retained, but changes occurred in the factor of self-efficacy in using teaching strategies, where the covered items could be divided into two aspects: self-efficacy in adapting teaching to students and self-efficacy in providing students with learning challenges. This result suggests that the structure of the validated version of the OSTES instrument may depend on the particularities of the research sample (in this case,

pre-service teachers). Instead of orthogonal rotation (varimax), an oblique rotation (promax) was performed, under the assumption that the resulting factors would be correlated. Soukup (2021), addressing the question of whether orthogonal or oblique rotation is more appropriate, referred to Osborne's claim that oblique rotation is generally the preferable solution and can, with some caution, be considered more suitable. Previous authors revalidating the OSTES scale did not use exploratory factor analysis with oblique rotation (oblimin or promax). They may have inadvertently eliminated a larger number of items from the research instrument. An appropriate example is the study by Citterbergová and Novocký (2018), who, when validating their proposed instrument (a semantic differential with its own specificities), employed varimax rotation. However, analysis of the factor loading matrix suggests that it would have been more appropriate to use one of the oblique rotations. They addressed this issue by not setting a cut-off value for item saturation for factor acceptance, but instead by assigning each item to the factor with the highest loading. Although they arrived at a structure similar to what would have been perhaps obtained using oblique rotation, such a procedure cannot be recommended (as this often arises when adhering too rigidly to conventions whose suitability is questionable given the conceptually different types of scale-based instruments). It would therefore be appropriate to revalidate the original 24-item OSTES scale with preference for an oblique factor solution. Moreover, the validation results of the OSTES scale, as proposed by Gavora (2012a) in the study by Novocký et al. (2023), obtained via confirmatory factor analysis, support our conclusions (the oblique solution is likewise acceptable). Confrontations with alternative perspectives on the structure of the OSTES instrument also appear in other studies (irrespective of sample) (Bilali, 2015; Cocca & Cocca, 2022). The internal consistency of the three proposed dimensions, evaluated through Cronbach's alpha, confirmed the compatibility of the included items.

Following the validation of the OSTES questionnaire, a comparative analysis of the self-efficacy of groups of pre-service teachers according to selected independent variables was conducted. The aim was to identify those factors that potentially underlie the existence of statistically significant differences in how pre-service teachers perceive themselves in terms of the effort (or activity) they are capable of exerting to meet educational challenges in classrooms.

The choice of teacher education studies (motivation for pursuing this profession) emerged as a factor potentially influencing the self-efficacy of pre-service teachers in adapting teaching to students. Kim and Cho (2014), using hierarchical regression analysis, revealed that the perceived efficacy of pre-service teachers and intrinsic motivation were strong predictors of their anticipation of reality shock (while controlling for gender). Bilim (2014), in a quantitatively oriented study, demonstrated that the perceived teaching efficacy of pre-service teachers was statistically significantly positively related to their intrinsic motives (abilities, satisfaction of curiosity) and negatively related to motives of a fallback career. It can be assumed that pre-service teachers primarily motivated to pursue the teaching profession have stronger beliefs in their efficacy to organise the educational process, as they can demonstrate greater perseverance when faced with challenges and tend to perceive them as opportunities for growth in knowledge and skills. This, in turn, likely reflects back on their perceived ability to help students achieve better learning performance and outcomes. Additionally, verbal persuasion, as one of the sources of perceived efficacy, plays a role, relying on suggestion and encouragement (Bandura, as cited in Mareš, 2020; Reeve, as cited in Mareš, 2020). An intrinsically motivated pre-service teacher is also more open to reflecting on his or her teaching activities (related to the desire to perform well, rather than focusing only on the importance of the discipline or subject taught). It may be expected that a teacher with such motivation strives to create a more positive and supportive classroom atmosphere. According to the study by Bach and Hagenauer (2022), emotions (joy, anger, or anxiety) should not be underestimated either, as they showed various associations with the self-efficacy of pre-service teachers. For example, joy was positively associated with their self-efficacy across all three areas of the adapted OSTES scale, whereas anger was negatively

related to their self-efficacy in motivating students. Anxiety was negatively associated with self-efficacy in classroom management and in using teaching strategies.

The types of completed teaching practice were found to play a decisive role in influencing the self-efficacy of pre-service teachers in adapting teaching to students and in providing them with learning challenges. Gavora (2011), drawing on Bandura, argues that successful experience – in other words, teaching with which the teacher is satisfied – constitutes the strongest agent shaping perceived efficacy. When a teacher achieves satisfactory results with students, this strengthens their self-efficacy, as they expect to experience success again in the future (and project it accordingly). Moreover, even in cases of failure, a teacher's self-efficacy does not necessarily decline if such outcomes are interpreted as overcoming personal shortcomings (competition with oneself). In our view, this also relates to the concept of locus of control, which influences how individuals approach problem-solving. Those with a predominant internal locus of control believe their successes and failures are the result of their own actions and efforts, whereas those with a predominant external locus of control hold that their lives (and related events) are determined by external factors, such as chance, fate, or the decisions of others (Rotter, 1966).

The study by Gavora et al. (2024) demonstrated a relationship between teachers' length of professional experience and their evaluation of mastery and vicarious experiences. Teachers with longer experience evaluated their mastery experiences more highly, while for teachers with shorter experience, vicarious experiences predominated (as sources of self-efficacy). The study by Ma et al. (2022) aimed to contribute to long-term arguments concerning teacher self-efficacy by examining it over a two-year period in an Australian initial teacher education program. A total of 201 pre-service teachers were assessed at three points in time – after the first professional practicum, before the final placement, and after it – using a teacher self-efficacy scale. All three dimensions significantly increased during the final placement (although there was a marked decline in classroom management and student engagement between the initial stages).

The purpose of the study by Colson et al. (2017) was to compare the perceived efficacy of teacher candidates in a one-year teaching residency with that of candidates in a traditional one-semester practicum. The results showed that pre-service teachers completing the one-year residency expressed stronger beliefs in their ability to motivate students and manage classroom behaviour compared to their peers completing the standard practicum. Ultimately, to ensure that pre-service teachers acquire mastery experiences that feed back into their practice (modifying their application of educational skills in teaching), it is important not to underestimate the evaluation of pre-service teachers' internships in primary and secondary schools. This concerns not only increasing the number of independent teaching outputs at the expense of observations but also providing more consistent support from didactics specialists who are involved in selecting supervising teachers that help pre-service teachers experience successful teaching, and from mentors who create space for reflection on the instructional strategies and procedures employed.

The study by Thomas and Mucherah (2014) suggests that immersive and supportive environments foster the development of self-efficacy among pre-service teachers, even in the midst of sociocultural gaps between them and their students. This study employed a quasi-experimental design, comparing the self-efficacy of teachers who completed immersive education with those who followed a traditional campus-based teacher education program. The study by Samuelsson et al. (2021) contributed insights into how pre-service teachers form self-efficacy beliefs from three types of experiences (teaching virtual characters, teaching peers, and teaching students in schools). It was shown that three hours of simulation training in small groups with virtual characters tended to develop teachers' belief in their efficacy to teach mathematics as effectively as three weeks of real classroom training with students, and significantly more than teaching peers in a seminar setting.

Limitations

The first major limitation of the conducted research is that the findings cannot be fully generalised to all pre-service teachers at Pavol Jozef Šafárik University, as a convenience sampling method was used. The second limitation concerns the number of respondents included in the study, with a predominance of pre-service teachers who had successfully completed observational and continuous teaching practice (characterised by a higher number of observations of the supervising teacher's didactic activities). This may also explain the insufficient correspondence between the existing two-factor model of the OSTES instrument and the data, which subsequently led to the examination of its structure using exploratory factor analysis. A particular issue arose with the naming of the first factor (abstracting what the included items had in common and what they precisely represented). The third limitation lies in the data analysis itself, as it cannot be stated with certainty – especially regarding the self-efficacy of pre-service teachers in adapting teaching to students – which factor is more significant for its enhancement. For this reason, it is recommended that future research focus on the application of linear regression analysis, which requires a more robust sample and a combination of scales, for example, when defining pre-service teachers' motivation for pursuing the teaching profession.

Conclusions and Implications

The study examined self-efficacy among pre-service teachers at different stages of their training, comparing their perceived abilities during observation and independent teaching, using an adapted scale questionnaire. The research showed that teachers' self-efficacy enhances with practice, with motivation for studying teacher education playing a key role. The most notable changes were observed in adapting teaching to students and providing learning challenges. Pre-service teachers with more independent teaching experience evidently gained greater opportunities to test the effectiveness of teaching strategies and build confidence in their own abilities.

The results suggest that the development of pre-service teachers' self-efficacy can be systematically supported throughout their studies, particularly through motivation, reflection, and gradual practical experience. It is essential to blend subject knowledge with pedagogical training and carefully pair pre-service teachers with mentors to guarantee meaningful experiences and foster the growth of their professional identity.

Emphasis should be placed on compulsory didactic courses before teaching practice, more frequent use of modern classrooms and pedagogical laboratories, and the planning of the development of future teachers' competencies. Further research could examine the long-term impact of independent teaching practice on teachers' self-efficacy, its effect on students' learning (cognitive) development, and the relationship between pre-service teachers' motivation and the internalization of teaching skills.

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Declaration of Interest

The authors declare no competing interest.

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