



Sources of Social Cognitive Theory and Educational Knowledge for Student Teachers' Self-efficacy

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Abstract

The goal is to analyze not only the significance of the sources contained in the social cognitive theory, but also the importance of factors outside the theory in the construction of the teacher's self-efficacy. Less attention has been given to the assimilation of educational knowledge. The data was collected from student teachers participating in class teacher training programs in Finland (N = 192). The data was analyzed using the Jamovi program and structural equation modeling. According to the results, the key factors are specifically the student teacher's own experiences and the positive feelings that support them. Regarding the knowledge factors, only the intentional use of educational knowledge also builds the subjects' self-efficacy beliefs. The spontaneous use of educational knowledge and other knowledge-related components of training teachers did not emerge as strongly. The identified key factors are in a logical and comprehensible relationship with Finnish teacher training programs, which emphasizes the application of educational knowledge and the teacher's own experiences. In the future, when it comes to the scientific teaching practice included in teacher training courses - in addition to the planned use of educational knowledge - more attention should also be given to the spontaneous and situational use of educational knowledge.

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Introduction

The teacher's motivational beliefs about teaching are important for how high-quality teaching is actualized and how it supports students' learning-focused work. These beliefs and motivational aspects that a teacher attaches to teaching are called the teacher's self-efficacy or teacher efficacy. Empirical studies in the field are interested in what factors are relevant in the construction of that belief, i.e., self-efficacy. The background of these studies can be traced to Bandura's (1997) social cognitive theory and its four sources of teacher self-efficacy: mastery experience, vicarious experiences, social or verbal persuasion, and physiological and affective states. Morris et al. (2017) describe that "teachers' self-efficacy beliefs (i.e., teaching self-efficacy) are beliefs teachers hold about their capabilities to carry out their professional task" (p. 796). The kind of content that a teacher uses for reflection and evaluation plays a significant role in self-efficacy, as information is interpreted based on those four sources. Sources do not affect self-efficacy directly; instead, dynamic interaction occurs between personal, behavioral, and environmental strands. As Morris et al. (2017) have concluded about a key idea of social cognitive theory: "... the effect of an experience on one's sense of efficacy depends on how a particular event is cognitively processed" (p. 798). Based on the model of the development of teaching self-efficacy proposed by Morris et al. (2017), sources are influential in a teacher's thinking and beliefs, subsequently constructing the teacher's self-efficacy.

Teachers with a high sense of efficacy typically use more effective teaching strategies, are less prone to burnouts, and are more dedicated to the teaching profession (see, e.g., Woolfolk Hoy & Davis, 2005; Zee & Koomen, 2016). Empirical research indicates that teacher efficacy is an essential factor in their instructional quality, as well as supporting their students (Holzberger et al., 2013), teacher engagement (Durksen et al., 2017; Granziera & Perera, 2019), job satisfaction (Klassen & Chiu, 2010), and their well-being (Zee & Koomen, 2016).

Logically, the focus subsequently shifts to what is behind teachers' self-efficacy, i.e., sources. According to the social cognitive theory coined by Bandura (1986, 1997), efficacy judgments are made when individuals reflect and integrate psychological sources of information, such as mastery experiences, verbal persuasions, vicarious experiences, and physiological and emotional arousals. Moreover, the teacher's attitude or "openness" to educational theory and research has been included as a new component in research on the sources of efficacy due to its tentative connection to the teacher's self-efficacy (see, Hascher & Hagenauer 2016; İlhan et al., 2015).

Teacher Efficacy and Its Sources in Teacher Education

Several studies of teachers' beliefs in teacher education or in their working life (Skaalvik & Skaalvik, 2007; Ng et al., 2010; Swackhamer et al., 2009) have addressed the social cognitive theory. According to Woolfolk Hoy and Burke Spero (2005), remarkable changes in student-teachers' self-efficacy occur at the initial stage of their studies, and self-efficacy also increases towards the end of their training (Gordon & Debus, 2002; Lin et al., 2002; Woolfolk Hoy & Burke Spero, 2005). Researchers emphasize that student-teachers' self-efficacy is highly susceptible to being "shaped" early in their studies, after which the teacher's self-efficacy is not totally static. Even later, teacher efficacy beliefs are prone to being changed through interventions and professional-development programs (Lumpe et al., 2012; Palmer, 2011). All in all, it is about the experiences, models, and

feedback that student teachers receive in their training and later in their working life. Much of the research on teachers' self-efficacy has focused on how the sources of social cognitive theory build teachers' self-efficacy. In the following section, we will examine these studies.

Clark and Newberry (2019) investigated the self-efficacy of student teachers in teacher education and its sources. The sources included: mastery experiences, vicarious experiences, verbal persuasion from teacher educators, and verbal persuasion from cooperating teachers. All sources were important predictors of the teacher's self-efficacy, but the explanation was only 18%. The result suggests that there must be other significant factors. O'Neill and Stephenson (2012) studied pre-service teachers' self-efficacy, its sources, and several other relevant factors. Their results indicated that personality traits and teachers' physiological and affective states predicted the level of teacher efficacy. Furthermore, opportunities to practice one's behavior-management skills correlated positively with teacher efficacy. In a study conducted by Ma et al. (2021), they took interest in changes in teachers' self-efficacy and its sources from the completion of their final professional experience placement into the first year of school teaching. Pre-service teachers (N = 71) completed the Scale for Teacher Self-Efficacy twice, of which seven teachers were comprehensively interviewed as a follow-up after their first teaching term. Teacher efficacy beliefs for classroom teaching increased significantly, whereas their efficacy beliefs for external classroom activities were of concern. Results show that mastery experiences based on mentorship, students, the types of teaching contracts, and the school administration were the most essential sources, followed by teachers' physiological and affective states. Verbal persuasions and vicarious experiences were detected infrequently.

Pfitzner-Eden (2016) noticed that pre-service teachers' changes in teacher efficacy were directly influenced by the mastery experiences during the teaching practicum. On the other hand, mastery experiences were greatly informed by the other three sources. Uzuntiryaki (2008) investigated the sources of the development of self-efficacy beliefs in Turkish pre-service teachers. In this qualitative study, mastery experiences were the main source of self-efficacy beliefs. Emotions and vicarious experiences were also active sources. In most studies, the teacher's own mastery experiences are the most important source. It varies which other sources are also relevant.

Teacher Knowledge and Teacher Efficacy

Teacher knowledge training is an important part of teacher training. Within it, the presentation of educational research from different areas of education also forms an essential part of academic teacher training. Courses related to teaching and learning, such as 'didactics' and educational psychology, are considered to be the most essential areas of education in teacher education; regarding education as a science, its research methods and all its areas are usually included in the contents of teacher education. The problem, however, is the lack of the so-called link between *theoretical* training and teaching *practice*. Student teachers' beliefs about the usefulness of theory when evaluating and reflecting on their practical experiences are considered an essential prerequisite for high-quality learning and teaching in teaching practice (Donche & van Petegem, 2009). However, this is an ideal that is often not reached on a practical level in teaching practice. As seen in the previous research, teacher candidates often reflect their resistance to use educational theories as a tool to teach their teaching practices (Allen & Wright, 2014).

Hascher and Hagenauer (2016) analyzed the interrelationship between student teachers' openness to educational theory, teacher efficacy, emotions, and classroom activity during the field experience. Researchers hypothesized that teachers who were more open to educational theories would be more likely to reflect a higher teacher efficacy, launching positive emotions that would, in turn, raise their autonomy support for student learning in their teaching. The participants in the study consisted of 117 student teachers from an Austrian university who were preparing for positions in secondary education schools. The study successfully showed the connection between student teachers' openness to theory, self-efficacy, and emotions, although no direct connection could be discovered regarding autonomy support. Researchers have concluded that educational theories offered in teacher education operate as a resource for teaching in the practicum. As indicated by the research findings, student teachers view both the teaching practice and the theoretical training in teacher education as significant factors for their professional development (Allen & Wright, 2014; König, 2013).

There have been challenges with putting the educational research into practice in classroom teaching. Additionally, it would be important to study what the relationship between teachers' attitudes and their self-efficacy is like, as this has hardly been studied. However, researchers İlhan et al. (2015, p. 184) state that "*... it is important to point out how self-efficacy beliefs of pre-service teachers may change along with their attitudes towards educational research, and it is also necessary for teachers to benefit from educational research in order to develop their self-efficacy*". Their study was conducted according to the survey research design. Their study data consisted of 517 pre-service science teachers at five different universities in Turkey. They observed a positive and significant relationship between the attitudes of pre-service science teachers towards educational research and their science teaching efficacy beliefs.

Some studies stress the weight of content knowledge or pedagogical content knowledge as a builder of self-efficacy, or that combined with self-efficacy, it gives the teacher a free hand to design pedagogically meaningful and diverse teaching solutions (see, e.g., Glackin & Hohenstein, 2018). For example, Menon and Sadler (2016) investigated changes in student teachers' science self-efficacy and science content knowledge, and their mutual links in a specialized science content course. The findings indicate that the development of self-efficacy beliefs and the development of student teachers' conceptual understanding are interrelated. In another study, Palmer et al. (2015) reported that an increased understanding of science concepts was an essential factor for developing self-efficacy. Again, in a study by Leonard et al. (2011), it has been noted that teachers with a high level of efficacy beliefs have a better understanding of their students' prior knowledge and background than other teachers.

Summary of Previous Research and Conclusions regarding the Research Questions of Our Study

1. The teacher's self-efficacy has been found to be a key factor in achieving the goals of education and teaching. A teacher with a high level of self-efficacy beliefs creates - together with the students - such a teaching interaction that increases the quality of the learner's work, the quality of the teaching, and thereby good learning results. Regarding the topic, this creates important demand to further investigate the background and reasons, and the types of experiences in the environment and the teacher's processing that increase the probability of increasing

her/his self-efficacy.

2. The sources of the teacher's self-efficacy have been studied within the context of working life and teacher training (including teaching practice). This study focuses on the context of teacher education. Based on the previous research, in this context, all the sources included in the social cognitive theory have been studied: mastery experiences, emotions, persuasion, and vicarious experiences. All these sources receive varying degrees of support from empirical studies conducted within the context of teacher education, although in a couple of studies, only mastery experiences and emotions come to the fore. On the other hand, there are some rare studies where all four sources are supported. However, mastery experiences are generally the strongest and clearest predictor of a teacher's self-efficacy.

3. The importance of a teacher's knowledge aspect regarding teacher efficacy has been less often studied, although a recent review article focusing on the sources of teachers' self-efficacy (Morris et al. 2017) clearly highlights this component as a necessary target for future research. The aspect of knowing is most likely central, specifically within the research context of teacher education. Even less often than the teacher's subject knowledge or related pedagogical content knowledge, the subject of research activities has been the link between the teacher's educational research knowledge and the formation of the teacher's self-efficacy. However, it can be concluded that it is a key factor in what kind of teaching solutions the teacher ends up with, both spontaneously and situationally, and over a longer period of time in the form of teaching plans.

4. Based on the social cognitive theory of the teacher's self-efficacy (Bandura, 1986, 1997) and the "classical" sources it contains and the knowledge aspect of the teacher envisioned by newer research, including the teacher's knowledge of educational research and theory, an effort was made to construct a research model in which the above-mentioned factors play the role of a predictor and the output factors are the teacher's self-efficacy, including its three different areas (teaching strategies, management, and learner commitment).

In accordance with the research model, the following research questions should be asked:

1. Which social cognitive theory factors effectively predict a teacher's self-efficacy?
2. Which knowledge factors of the teacher, including the teacher's knowledge of educational research and theory, effectively predict the construction of the teacher's self-efficacy?

Method

This study was conducted within the specific context of a quantitative research methods course, which serves as a fundamental component of the teacher education program. The primary objective of this course is to equip students with essential knowledge and skills in statistical techniques, including t-tests, which are crucial for conducting research in the field of education. Participants (N=192) were entitled to withdraw from the study (Table 1). The majority of them were women, and most had less than two years of work experience in teaching positions. Research permits were obtained from the head of the department and from each participant via signature, i.e., the student teachers completed our consent forms. Simultaneously, they were assured that the data

from this study and the participants' identities would be kept strictly confidential.

Table 1. Background Variables of the Student Teachers

Gender	Male	Female	Other / prefer not to answer	Total
	56	135	1	192
Work experience	None	Under 2 years	Over 2 years	Total
	61	87	44	192

Because filling out the form was part of teaching, it helped to compile research data that was as representative as possible. All of the students who participated in the survey filled out the form voluntarily and anonymously, so their non-identification ensured that they were able to answer the survey honestly and they did not have that pressure to please the researchers in the answers. It is an advantage to complete the form in the context of university education. Currently, in studies using electronic data collection tools, the representativeness of a group of respondents may often suffer, i.e. only certain types of respondents are overemphasized in the subjects, although the purpose in itself is to study the entire set of respondents, in this study all kinds of teacher students. This point is important from the point of view of the generalization goal related to data.

Recognizing the significance of self-efficacy in influencing students' learning outcomes and motivation, our investigation focused on exploring the experiences of self-efficacy among undergraduate class teacher students enrolled in this course. To gather data, an electronic questionnaire was administered to the participating students. The questionnaire consisted of a total of 68 questions, of which five questions were designed to gather background information about the students, such as work experience, year, gender, age, and student number. The remaining 63 questions aimed to assess various dimensions of self-efficacy and were responded to using a 7-point Likert scale, ranging from 'strongly disagree' to 'strongly agree.'

These questions were carefully designed to capture students' perceptions of self-efficacy across multiple dimensions based on previous research (Tschannen-Moran & Woolfolk Hoy, 2001; Oosterheert et al., 2002; Hoi et al., 2017). Specifically, the questionnaire encompassed seven areas of sources of self-efficacy, which can be described as follows: *Mastery Experiences* (ME) were defined as the acquiring of a sense of success by teaching experiences in routine and difficult teaching contexts through sustained effort. *Social Persuasion* (SP) refers to comments received from others in the same social group, including evaluative feedback. *Physiological Arousal* (PA) refers to positive or negative emotional reactions when a person is performing a task. For example, positive emotional reactions include excitement and happiness, and correspondingly, negative emotional reactions include fear and sorrow (Hoi, Zhou & Teo, 2017). *Vicarious Experiences* (VE) involve the acquisition of a sense of adequacy through observing others in the same social group, or comparing oneself with them.

The *Actively Relating Theory to Practice* variable (ATU, Active Theory Use) was measured using Oosterheert et al.'s (2002) research instrument, which includes six items. The *Reactively Relating Theory to Practice* variable (RTU, Reactive Theory Use) was measured using five items from the same instrument. Researchers constructed the *Knowledge-Related Competences* variable (KC, Knowledge Capabilities) based on a review of relevant

literature on subject-matter knowledge and pedagogical content knowledge, with particular reference to Morris et al.'s (2017) review article. This variable includes seven items (e.g., *I succeed in promoting students' learning when I feel I master the subject matter or skill I am teaching*). Additionally, it included three areas of perceived self-efficacy, namely self-efficacy in instructional strategies (SE1), classroom management (SE2), and student engagement (SE3) (Tschannen-Moran & Woolfolk Hoy, 2001). Each question aimed to assess students' confidence in their abilities to perform specific tasks or meet challenges within these domains.

Data Analysis

In this study, a two-step approach of the structural equation modeling (SEM) was employed. The first step involved conducting a confirmatory factor analysis (CFA) to evaluate the measurement properties of the latent constructs. The second step entailed performing a structural model analysis to test the hypothesized relationships among the variables. The confirmatory factor analysis (CFA) was utilized to analyze and consolidate the data pertaining to students' experiences of self-efficacy. This technique allowed for the assessment of the measurement properties of the latent constructs and the alignment of the data with a theoretical model, where all sources of self-efficacy contribute to the formation of perceived self-efficacy.

To evaluate the fit of the model, several fit indices were employed, including the Comparative Fit Index (CFI), Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), and Tucker-Lewis Index (TLI). In line with established guidelines (Hu & Bentler, 1998; Cangur & Ercan, 2015), the following cutoff values were applied: $CFI \geq 0.95$, $SRMR \leq 0.10$, $RMSEA \leq 0.07$, and $TLI \geq 0.95$. For ease of analysis, sum variables were created by combining related variables based on the factor solution, and the original variables were appropriately scaled accordingly. The reliability of the sum variables was assessed using Cronbach's alpha coefficient, which provided an estimate of internal consistency.

This study utilized path analysis as a maximum-likelihood estimation method, a technique within the structural equation modeling (SEM), to examine the relationships among sources of self-efficacy and veritable self-efficacy variables. The path analysis allows for a comprehensive understanding of the underlying mechanisms influencing students' self-efficacy by assessing both direct and indirect effects among variables. The first step in the path analysis involved defining a theoretical model that represented the hypothesized relationships among the self-efficacy variables (see Figure 1).

In this study, we employed Jamovi, a statistical software package, to test the theoretical model depicted in Figure 1. The development of the theoretical model was informed by a thorough review of existing literature and theoretical considerations. It incorporated key self-efficacy variables, namely Mastery Experiences (ME), Social Persuasion (SP), Physiological Arousal (PA), Vicarious Experiences (VE), Active Theory Use (ATU), Reactive Theory Use (RTU), and Knowledge Capabilities (KC). Additionally, it included perceived self-efficacy variables related to instructional strategies (SE1), classroom management (SE2), and student engagement (SE3). These variables were derived from established frameworks and previous research in the field (Tschannen-Moran & Woolfolk Hoy, 2001; Oosterheert et al., 2002; Hoi et al., 2017).

Once the model was specified, data collection was conducted using an electronic questionnaire that examined students' self-efficacy experiences. Subsequently, the parameters of the path analysis model were estimated. The goodness-of-fit of the model was assessed using various fit indices, including the goodness-of-fit index (GFI), chi-square, Tucker-Lewis index (TLI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). These fit indices provided valuable information about how well the model aligned with the observed data.

After estimating the model, we proceeded to interpret the results by examining the significance and magnitude of the path coefficients. Significant coefficients indicated the presence of a statistically significant relationship between variables, while the magnitude of the coefficients provided valuable insights into the strength and direction of these relationships. Additionally, we analyzed the total, direct, and indirect effects to obtain a comprehensive understanding of the underlying mechanisms contributing to students' self-efficacy within the sample.

Results

Based on the confirmatory factor analysis, it was confirmed that the data supports the examination of the theoretical model ($\chi^2(543) = 584$, $p = 0.109$, CFI = 0.989, TLI = 0.986, SRMR = 0.052, RMSEA = 0.019 (90% confidence interval [0, 0.032])). Table 1 describes the descriptive statistics, means and standard deviations of all sum variables that were estimated. In addition, Table 2 reports the Cronbach alpha values describing the reliability of the sum variables.

Table 2. Means, Standard Deviations and Reliabilities of Sum Variables

Variable	Mean	SD	Cronbach
1.ME	4.22	0.97	0.88
2.SP	4.39	1.39	0.90
3.PA	4.90	1.18	0.90
4.VE	5.52	0.83	0.74
5.ATU	3.38	0.64	0.66
6.RTU	3.53	0.73	0.78
7.KC	5.63	0.82	0.74
8.SE1	4.79	0.71	0.72
9.SE2	4.68	0.96	0.87
10.SE3	4.73	0.76	0.76

The path analysis was conducted using Jamovi. The following conceptual model of self-efficacy was tested: Students' sources of self-efficacy would influence their perceived self-efficacy. This was done by setting all seven variables of sources of self-efficacy as exogenous variables and by setting all three variables of perceived self-efficacy (SE1-SE3) as endogenous variables. The hypothesized relationship and causal paths are depicted in Figure 1.

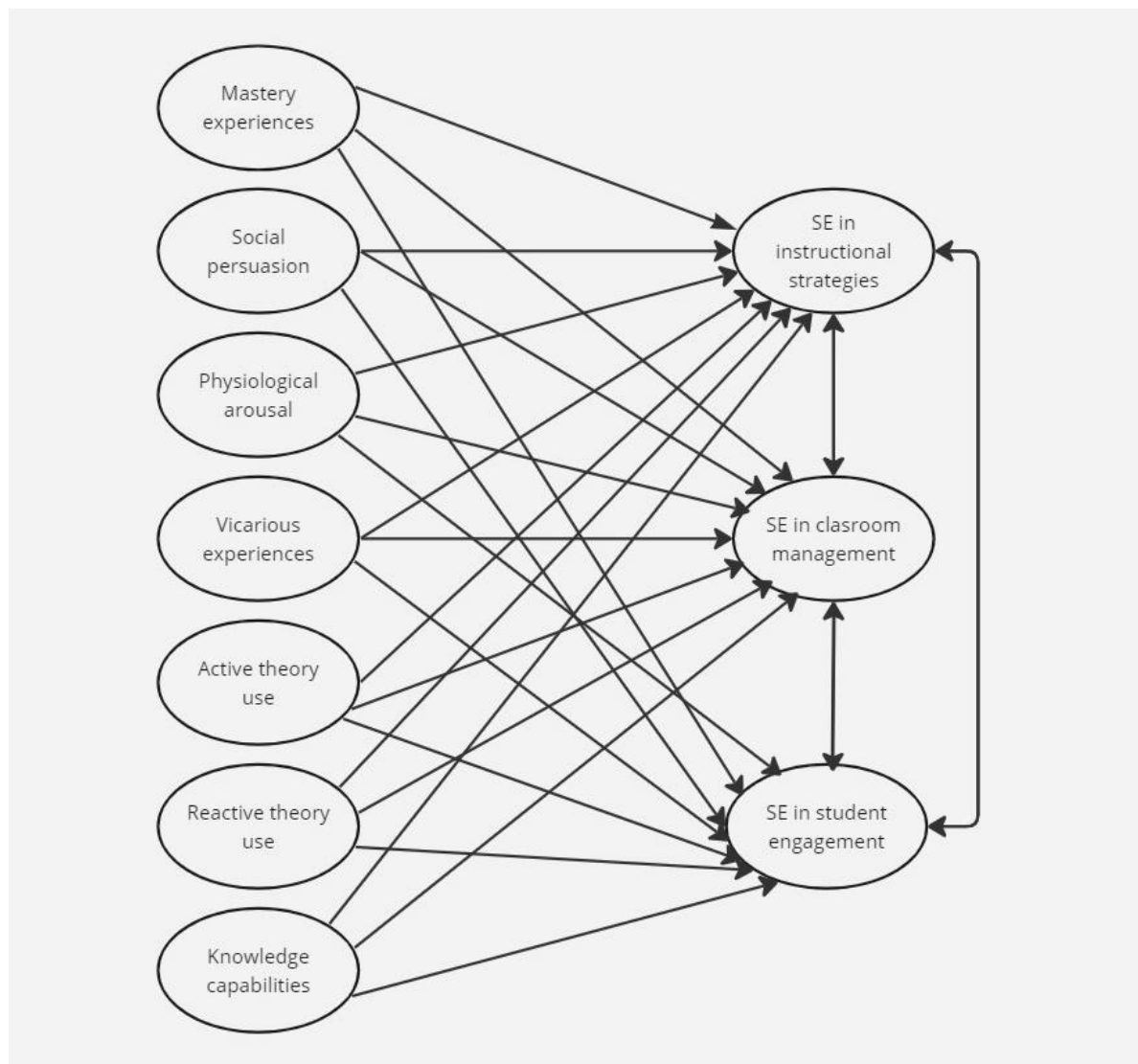
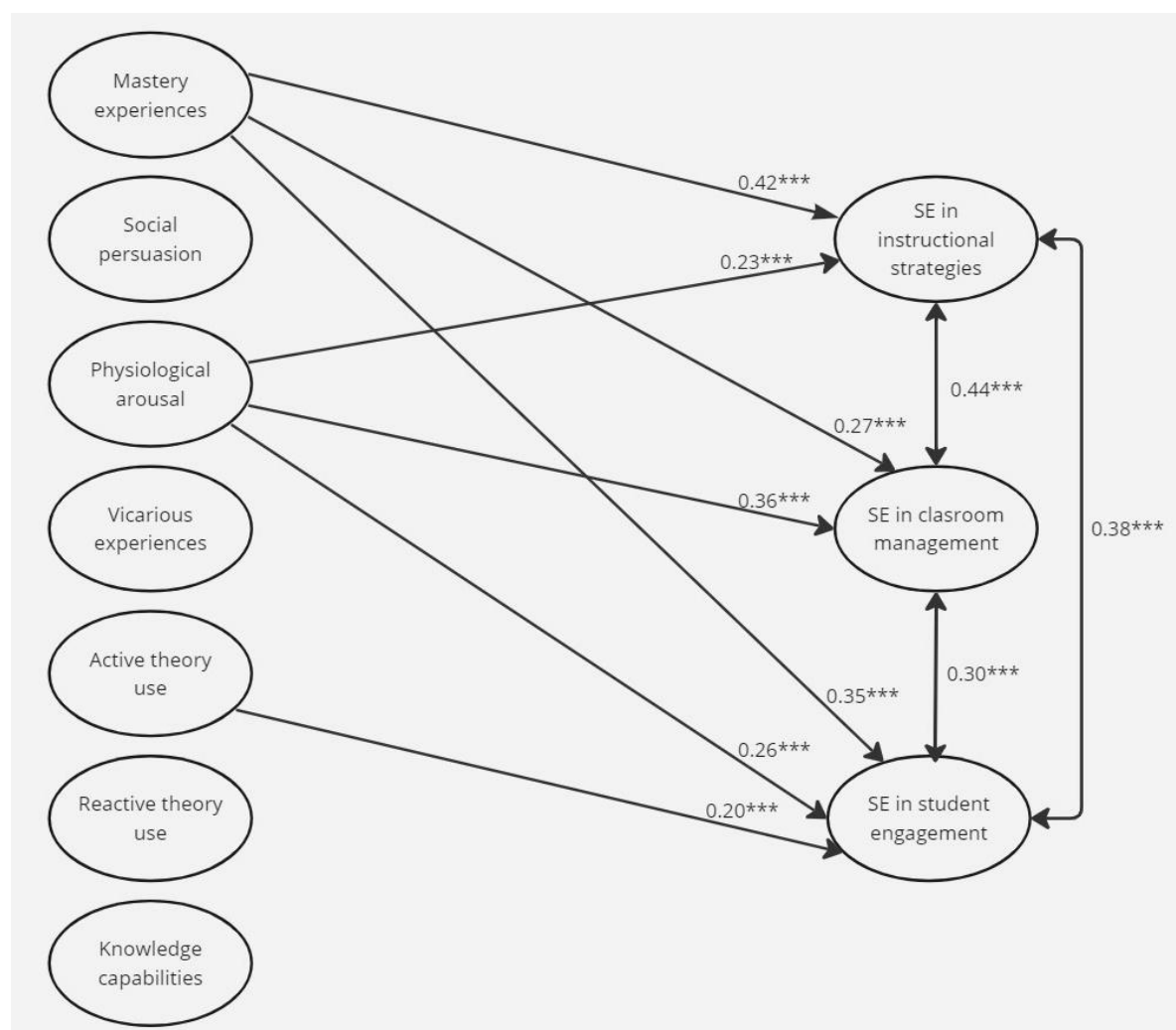


Figure 1. Hypothesized Relationship and Causal Paths Among self-efficacy Variables

The path analysis was used to test which sources of self-efficacy built perceived self-efficacy in this sample. The fit indices of the best-found structural model were acceptable: $\chi^2(7) = 7.55$, $p = 0.374$, GFI = 0.98, CFI = 0.998, TLI = 0.994, SRMR = 0.026, RMSEA = 0.020 (90% confidence interval [0, 0.093]). The results of the path analysis revealed significant relationships between the variables in the proposed model. The standardized estimates (path coefficients) and unstandardized estimates (regression coefficients) are presented in Table 2. All reported estimates are based on a significance level of $p < 0.05$. The model is presented visually in Figure 2.

Firstly, in examining the standardized estimates, we found three positive and statistically significant paths from Mastery Experiences (ME) to all three SE variables, indicating a strong positive relationship between these variables. Similarly, Physiological Arousal (PA) demonstrated a significant positive effect on all three SE variables. Additionally, we found a positive and statistically significant path from Active Theory Use (ATU) to SE in student engagement, indicating a positive relationship between these variables. We found the strongest statistically significant positive relationship between SE in instructional strategies and SE in classroom management ($\beta = 0.45$, $p < 0.001$). Standardized estimates between the statistically significant paths varied from

0.20 to 0.44 ($p < 0.001$).



*** $p < 0.001$

Figure 2. The Best-found Structural Model and Causal Path Among Self-efficacy Variables

Table 3. Structural Parameter Estimates and p Values

Dep	Pred	Estimate	SE	B	z	p
SE in instructional strategies	Mastery Experiences	0.311	0.052	0.418	5.962	< 0.001
SE in instructional strategies	Physiological Arousal	0.140	0.040	0.231	3.478	< 0.001
SE in classroom management	Mastery Experiences	0.268	0.073	0.271	3.681	< 0.001
SE in classroom management	Physiological Arousal	0.293	0.058	0.362	5.063	< 0.001
SE in student engagement	Mastery Experiences	0.279	0.059	0.345	4.748	< 0.001
SE in student engagement	Physiological Arousal	0.169	0.046	0.255	3.647	< 0.001
SE in student engagement	Active Theory Use	0.239	0.068	0.196	3.503	< 0.001

Moving to the unstandardized estimates, the regression coefficient from Mastery Experiences to SE in instructional strategies is 0.311 ($p < 0.001$), indicating that a one-unit increase in Mastery Experiences is

associated with a 0.311-unit increase in SE in instructional strategies. Furthermore, the regression coefficient from Physiological Arousal to SE in instructional strategies is 0.140 ($p < 0.001$), suggesting that a one-unit increase in Physiological Arousal is associated with a 0.140-unit increase in SE in instructional strategies. These findings highlight the important roles of Mastery Experiences and Physiological Arousal in influencing SE in instructional strategies. Specifically, Mastery Experiences and Physiological Arousal have substantial positive impacts on SE in instructional strategies, as well as SE in classroom management. A one-unit increase in Mastery Experiences is associated with a 0.268-unit increase, and a one unit-increase in Physiological Arousal is associated with a 0.293 unit increase in SE in classroom management. Additionally, Mastery Experiences and Physiological Arousal have substantial positive impacts on SE in student engagement, while Active Theory Use contributes to its increase. Regression coefficients vary, as the smallest coefficient is 0.169 (Physiological Arousal, $p < 0.001$) and the largest coefficient is 0.279 (Mastery Experiences, $p < 0.001$). The regression coefficient from Active Theory Use to SE in student engagement was 0.239 ($p < 0.001$).

Figure 2 and Table 3 show that variables Mastery Experiences and Physiological Arousal from the sources of self-efficacy are connected to all three areas of self-efficacy. It is notable that Physiological Arousal refers to positive or negative emotional reactions. In addition, it can be seen that the variable Active Theory Use is connected only to self-efficacy in student engagement. From the results, it can be stated that on this sample, the Mastery Experiences of the class-teacher students predict the strongest self-efficacy in instructional strategies and student engagement. On the other hand, Physiological Arousal predicts the strongest self-efficacy in classroom management.

Discussion

According to the empirical results of the study, the most important sources for a teacher's self-efficacy are mastery experiences, positive emotions, and the educational theories and studies adopted by the teacher, giving hints on how to get the learner to commit to goal-oriented work in teaching. Similar to the prior research (e.g., Narayanan et al., 2023; Pfitzner-Eden, 2016; Thomas & Mucherah, 2016; Wang et al., 2017;), we noticed the essential role of mastery experiences in the teacher's reflections on self-efficacy. Emotions also play a central role, as they are the affective side of things. On the other hand, both sources work specifically in the teacher's own and independent thinking. The teacher thus reflects his/her own experiences and feelings on what kind of experiences she/he had and how those experiences felt. In particular, the results of the study conducted by Ma et al. (2021) match the results of our own study. It brings out the stronger position of Mastery Experiences and emotions than other sources in the social cognitive theory. Also, Hagenauer et al. (2015) have noticed a positive connection between teacher efficacy and enjoyment during instruction.

An interactive relationship exists between one's mastery experiences (or failure experiences) and emotions. Emotion is a somewhat problematic factor in a causal sense. In other words, it can be considered in a causal role, but on the other hand, it is also a result of, for example, "successful" teaching and its further development. Ma et al. (2021, p. 4) have also drawn attention to this:

"Doubts have been raised, however, on whether physiological and affective states could be an

independent source of TSE, because of its reliance on other sources (van Rooij et al., 2019). In other words, it is still unclear whether the level of TSE causes the corresponding physiological and affective states or vice versa. A qualitative study revealed that physiological and affective states tended to be reported simultaneously when interviewees reflected on the other three sources (Phan & Locke, 2015)."

Bapst et al. (2022) study emphasizes the connection of the emotional, social, and organizational features of teaching to the teacher's self-efficacy. The data was collected in a teacher training institution and secondary schools in Switzerland. More specifically, the data focusing on teachers' self-efficacy and the learning environment in the classroom perceived by the teachers and their students were collected. According to the results, the social learning environment is connected to the teacher-students' perception of the teacher's self-efficacy. The two dimensions of the learning environment that student teachers seem to consider the most when evaluating their efficacy beliefs regarding the behavior management within their class are: the teacher's proximity - known as the emotional side of teaching - and the rules and organization.

According to the theory, the factors mentioned above, i.e., mastery experiences and emotions, predict quite versatile aspects of the teacher's self-efficacy. Of course, it is not a case of causal verification, as it would require an experimental and/or longitudinal research design instead of a correlative design. Based on the analysis of the research data, the third significant predictor seems to be the utilization of educational theory and research results in the planning and implementation of teaching, not so much in its spontaneous utilization and unexpected teaching situations. The meaning of the intentional use of educational theory and research focuses on the aspects of the teacher's self-efficacy, mainly in the extent to which the student teacher tries to promote the learner's commitment during the teaching process. This emphasis may have several explanatory factors, although they remain speculative and uncertain. One possible factor is that Finnish educational discourse and teacher education have strongly emphasized a pupil-centered orientation for quite some time. This also tells us that in Finnish research-based teacher training programs, we want to cultivate an active and modern teaching-learning concept; in other words, a concept where the student's own actions and motivation, as well as actions aimed at this in teaching, have a central place in the teacher's thinking.

Of course, teaching and evaluation methods and the management of teaching situations are also key environmental factors and strategies in teaching. They enable the teacher to ultimately try to maximize the achievement of the teaching goals, specifically through the learner's own work and mental activation. This is then expected to be reflected in different, yet important learning outcomes in terms of the curriculum and the educational goals of the school.

Beyond Bandura's four canonical sources, numerous studies have highlighted the importance of subject-matter knowledge and pedagogical content knowledge in contributing to teacher self-efficacy. Glackin and Hohenstein (2018) demonstrated, through qualitative analysis, that strong subject knowledge enables teachers to design more flexible and pedagogically meaningful instruction, thereby reinforcing mastery experiences. Bjerke and Solomon's (2020) study of Norwegian pre-service mathematics teachers over nearly two years showed that understanding why mathematical procedures work was central to experiencing mastery and developing sustained

self-efficacy. Palmer (2006, 2011) reported that cognitive mastery of subject content, combined with in situ feedback, strongly contributed to self-efficacy development. Importantly, these studies suggest that subject knowledge does not function as an independent source of self-efficacy but rather shapes how teaching experiences are appraised, aligning with Morris et al.'s (2017) reconceptualization of efficacy sources as interacting information streams. However, this factor did not emerge as a significant independent predictor of self-efficacy in the present study, even though it is essential for teaching and is emphasized in the review article as a priority for future research. One possible explanation is that students may find it more difficult to evaluate their own subject-matter knowledge, which is relatively abstract, than to assess the motivational source components derived from social cognitive theory.

Knowledge of educational science and theory constitutes a distinct domain in the development of teacher professionalism and teacher education. Empirical evidence on its significance for teachers' self-efficacy remains limited. However, studies by Hascher and Hagenauer (2016) and İlhan (2015) indicate that it may function as a positive factor during teaching practice and in teacher education more broadly. Overall, this dimension — encompassing knowledge of and attitudes toward research — requires further empirical investigation. In an ideal implementation of teacher education, this dimension would be expected to exert a much stronger influence on student teachers' thinking than was found in the present study.

Previous research has consistently identified a persistent challenge: educational theory and research often fail to translate effectively into teaching practice. For example, Jakhelln et al. (2021) explored how newly qualified teachers in Finland and Norway perceive research-based practices acquired during initial teacher education. Drawing on semi-structured interviews conducted after participants had completed their master's degrees but before entering the profession, the authors found that research-based knowledge from teacher education was only weakly connected to teachers' everyday professional work. This suggests that the situation falls short of the normative ideal; at best, the empirical data illustrate how things are rather than how they should be. Although research-based teacher education remains a central ideal, whether it has been fully realized remains open to question.

These empirical research results of the study must be also interpreted, especially within the context and culture of Finnish teacher education. The student's own experiences in teaching practice and his/her relevant emotions both hold importance. Both aspects turn into the student's subjective experiences, and they have an essential meaning in terms of credibility. For example, receiving feedback and making observations about other teachers are naturally influential factors, i.e., sources as well, but they are not trusted in the same way as one's own experiences.

Student teachers want to gain new influences in their thinking, and they are adopted in teacher education from its various study courses and educational research literature. But even they always submit to the teacher-student's own experiments, experiences, and reflections: their own experiences and related emotions are thus ultimately very decisive. The results of the study especially emphasize the planned use of educational theory and research results, not so much its implicit, flexible, and situational application. Perhaps more attention could be given to this situation-specific perspective (which is also essential when it comes to the application of the utilized theory)

in teacher training in general (utilization of research results), and especially in teaching practice linked to it.

In the lessons and related feedback discussions, the teacher-student, his/her mentor and other teacher-students in the teaching practice could open up and look critically together, discussing why the student teacher acts the way he/she does. This is related to situational and "here and now" thinking and the application of educational theory and knowledge by teacher-students. Bringing this point of view forward, "practicing" it and emphasizing it as a part of research-based teacher training in no way reduces the basis of teaching on emotional and intuitive tuning. In other words, teaching is not only a rational and planned activity: the teacher's instincts, intuition and emotional feelings are central sources and interactive elements in the whole of teaching and its "orchestration." Of course, the stage of the teacher's development must be taken into account. In the early stages of a teacher's career (pre-service teachers, novice teachers), thinking and reflection in a teaching situation is naturally more cognitively challenging for a student teacher than for an experienced, so-called expert teacher, whose cognitive structures regarding teaching have already taken shape through numerous events and reflections.

Limitations related to Self-report Data and Directions for Future Research

It is important to note that this study has some limitations, including the specific context of the participants and the sample size. These limitations should be taken into consideration when interpreting the results and generalizing the findings. The findings of this study may be limited in terms of external validity, as they may primarily reflect the experiences and characteristics of students enrolled in this particular course. Another limitation pertains to the use of a path analysis. While the path analysis is a valuable statistical technique for exploring relationships among variables, it is subject to certain limitations. One limitation is the assumption of linearity, which implies that the relationships between variables are linear and do not account for non-linear associations. Additionally, the path analysis relies on the availability of high-quality and reliable data. Any issues related to measurement errors or biases in the collected data can affect the accuracy of the results. Furthermore, the path analysis assumes that the included variables sufficiently explain the observed relationships. Omitted variables or unmeasured factors that influence the relationships among the variables of interest can impact the validity of the path analysis model. To mitigate these limitations, future research could consider employing larger sample sizes to enhance the generalizability of the findings. It is important to acknowledge that conducting the study within a specific course context allows for a focused examination of self-efficacy beliefs in a relevant educational context. However, researchers and readers should be mindful of the potential limitations regarding the generalizability of the findings beyond this specific context.

A key limitation of the present study is its reliance on self-report data, which raises well-documented concerns related to common method bias and social desirability bias. As Glackin and Hohenstein (2018) note, self-report instruments — particularly Likert-scale questionnaires — assume that participants provide accurate and truthful accounts of their beliefs, an assumption that is often problematic. Respondents may consciously or unconsciously present themselves in a favorable light, leading to inflated self-efficacy ratings, a phenomenon described in the literature as social desirability bias and, in professional development contexts, as "pretend teacher efficacy." In addition, relying on a single data source and method increases the risk of common method bias, potentially

strengthening observed relationships between variables due to shared measurement rather than substantive theoretical connections. Glackin and Hohenstein (2018) further argue that self-report measures tend to oversimplify the inherently complex and context-dependent nature of teacher self-efficacy, producing broadly “high” efficacy profiles that mask important qualitative differences between teachers’ articulated beliefs and their enacted practices.

To address these limitations, studies by Glackin and Hohenstein (2018) recommend that future research move beyond an exclusive reliance on self-report data by systematically integrating qualitative methods into self-efficacy research designs. In particular, they emphasize the value of methodological triangulation, combining self-report questionnaires with lesson observations, interviews, and other practice-based data sources. Their proposed qualitative analytical framework — structured around multiple dimensions of self-efficacy (subject knowledge, flexibility and disposition, teacher–learner focus, and behavior management) — illustrates how qualitative data can reveal discrepancies between reported and embodied self-efficacy, thereby enhancing construct validity. These insights suggest that future studies should adopt mixed-methods or longitudinal designs that allow researchers to examine how self-efficacy beliefs evolve over time and across contexts and how they are reflected in actual teaching practices. Such approaches would not replace self-report measures but rather contextualize and complement them, leading to a more nuanced, credible, and comprehensive understanding of teacher self-efficacy than self-report data alone can provide.

Conclusions

This study focused on examining the relationships between teachers’ self-efficacy and its source factors. In future research on teacher self-efficacy, the model should be extended to what self-efficacy produces and what good it results in for education and teaching. At the same time, however, one should study the sources of self-efficacy and their interactive and complex relationships with the teacher's self-efficacy. Structural models should be implemented that aim to outline even broader entities related to the teacher's well-being and coping and, on the one hand, how the entire working community in the school could support this. This has more to do with how teachers and students enjoy themselves, become motivated and work goal-oriented at school. Expanding the model also essentially concerns the inclusion of the student component in the research. It is the student's activity, motivation, emotions, and various learning outcomes. Together, the teacher and the student/students form a complex and dynamic interactive entity, which should be examined at the level of research designs, e.g., through structural equation models - and later, also through longitudinal studies. The advantage of structural equation models is that even a large set of components can be viewed as an interactive whole. However, the process-like essence of education, teaching, and learning should not be forgotten either. Combining quantitative research and especially structural modeling, with the help of research designs that trace the dynamic course of the process, opens up new and valid ways of understanding the essence of teaching and learning. In terms of research methodology, this can also be enriched through in-depth cases requiring a qualitative analysis (teacher, student), which would have been extracted from the same data. Together, these form a research methodological framework based on the mixed methods approach.

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References

- Allen, J. M., & Wright, S. E. (2014). Integrating theory and practice in the pre-service teacher education practicum. *Teachers and Teaching*, 20(2), 136-151. <https://doi.org/10.1080/13540602.2013.848568>
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.
- Bapst, M. S., Genoud, P. A., & Hascoët, M. (2022). Taking a step towards understanding interactions between teacher efficacy in behavior management and the social learning environment. A two-level multilevel analysis. *European Journal of Psychology of Education*, 38, 1129-1144. <https://doi.org/10.1007/s10212-022-00647-4>
- Bjerke, A. H., & Solomon, Y. (2020). Developing self-efficacy in teaching mathematics: Pre-service teachers' perceptions of the role of subject knowledge. *Scandinavian Journal of Educational Research*, 64(5), 692-705. <https://doi.org/10.1080/00313831.2019.1595720>
- Clark, S., & Newberry, M. (2019). Are we building preservice teacher self-efficacy? A large-scale study examining teacher education experiences. *Asia-Pacific Journal of Teacher Education*, 47(1), 32-47. <https://doi.org/10.1080/1359866X.2018.1497772>
- Donche, V., & van Petegem, P. (2009). The development of learning patterns of student teachers: across-sectional

- and longitudinal study. *Higher Education*, 57(4), 463-475. <https://doi.org/10.1007/s10734-008-9156-y>
- Durksen, T. L., Klassen, R. M., & Daniels, L. M. (2017). Motivation and collaboration: The keys to a developmental framework for teachers' professional learning. *Teaching and Teacher Education*, 67, 53-66. <https://doi.org/10.1016/j.tate.2017.05.011>.
- Glackin, M., & Hohenstein, J. (2018). Teachers' self-efficacy: Progressing qualitative analysis. *International Journal of Research and Method in Education*, 41(3), 271-290. <https://doi.org/10.1080/1743727X.2017.1295940>
- Gordon, C., & Debus, R. (2002). Developing deep learning approaches and personal teaching efficacy within a preservice teacher education context. *British Journal of Educational Psychology*, 72(4), 483-511. <https://doi.org/10.1348/00070990260377488>
- Granziera, H., & Perera, H. N. (2019). Relations among teachers' self-efficacy beliefs, engagement, and work satisfaction: A social cognitive view. *Contemporary Educational Psychology*, 58(4), 75-84. <https://doi.org/10.1016/j.cedpsych.2019.02.003>
- Hagenauer, G., Hascher, T., & Volet, S. E. (2015). Teacher emotions in the classroom: Associations with students' engagement, classroom discipline and the interpersonal teacher-student relationship. *European Journal of Psychology of Education*, 30(4), 385-403. <https://doi.org/10.1007/s10212-015-0250-0>
- Hascher, T., & Hagenauer, G. (2016). Openness to theory and its importance for pre-service teachers' self-efficacy, emotions, and classroom behaviour in the teaching practicum. *International Journal of Educational Research*, 77, 15-25. <https://doi.org/10.1016/j.ijer.2016.02.003>
- Hoi, C., Zhou, M., & Teo, T. (2017). Measuring efficacy sources: Development and validation of the sources of teacher efficacy questionnaire (STEQ) for Chinese teachers. *Psychology in the Schools*, 54(7), 756-769. <https://doi.org/10.1002/pits.22025>
- Holzberger, D., Philipp, A., & Kunter, M. (2013). How teachers' self-efficacy is related to instructional quality: A longitudinal analysis. *Journal of Educational Psychology*, 105(3), 774-786. <https://doi.org/10.1037/a0032198>
- İlhan, N., Yılmaz, Z. A., & Dede, H. (2015). Attitudes of pre-service science teachers towards educational research and their science teaching efficacy beliefs in Turkey. *Journal of Baltic Science Education*, 14(2), 183-193. <https://doi.org/10.33225/jbse/15.14.183>
- Jakhelln, R., Eklund, G., Aspfors, J., Bjørndal, K., & Stølen, G. (2021). Newly qualified teachers' understandings of research-based teacher education practices: Two cases from Finland and Norway. *Scandinavian Journal of Educational Research*, 65(1), 123-139. <https://doi.org/10.1080/00313831.2019.1659402>
- Klassen, R. M., & Chiu, M. M. (2010). Effects on teachers' self-efficacy and job satisfaction: Teacher gender, years of experience, and job stress. *Journal of Educational Psychology*, 102(3), 741-756. <https://doi.org/10.1037/a0019237>
- König, J. (2013). First comes the theory, then the practice? On the acquisition of general pedagogical knowledge during initial teacher education. *International Journal of Science and Mathematics Education*, 11, 999-1028. <https://doi.org/10.1007/s10763-013-9420-1>
- Leonard, J., Barnes-Johnson, J., Dantley, S. J., & Kimber, C. T. (2011). Teaching science inquiry in urban contexts: The role of elementary preservice teachers' beliefs. *The Urban Review*, 43(1), 124-150. <https://doi.org/10.1007/s11256-010-0173-7>

- Lin, H., Gorrell, J., & Taylor, J. (2002). Influence of culture and education on U.S. and Taiwan pre-service teachers' efficacy beliefs. *The Journal of Educational Research*, 96(1), 37-46. <https://doi.org/10.1080/00220670209598789>
- Lumpe, A., Czerniak, C., Haney, J., & Beltyukova, S. (2012). Beliefs about teaching science: The relationship between elementary teachers' participation in professional development and student achievement. *International Journal of Science Education*, 34(2), 153-166. <https://doi.org/10.1080/09500693.2010.551222>
- Ma, K., Chutiyami, M., & Nicoll, S. (2021). Transitioning into the first year of teaching: Changes and sources of teacher self-efficacy. *The Australian Educational Researcher*, 49(2), 1-18. <https://doi.org/10.1007/s13384-021-00481-5>
- Menon, D., & Sadler, T. D. (2016). Preservice elementary teachers' science self-efficacy beliefs and science content knowledge. *Journal of Science Teacher Education*, 27(6), 649-673. <https://doi.org/10.1007/s10972-016-9479-y>
- Morris, D. B., Usher, E. L., & Chen, J. A. (2017). Reconceptualizing the sources of teaching self-efficacy: A critical review of emerging literature. *Educational Psychology Review*, 29(4), 795-833. <https://doi.org/10.1007/s10648-016-9378-y>
- Narayanan, M., Ordynans, J. G., Wang, A., McCluskey, M. S., Elivert, N., Shields, A. L., & Ferrell, A. C. (2023). Putting the self in self-efficacy: Personal factors in the development of early teacher self-efficacy. *Education and Urban Society*, 55(2), 175-200. <https://doi.org/10.1177/00131245211062528>
- Ng, W., Nicholas, H., & Williams, A. (2010). School experience influences on pre-service teachers' evolving beliefs about effective teaching. *Teaching and Teacher Education*, 26(2), 278-289. <https://doi.org/10.1016/j.tate.2009.03.010>
- O'Neill, S., & Stephenson, J. (2012). Exploring Australian pre-service teachers sense of efficacy, its sources, and some possible influences. *Teaching and Teacher Education*, 28(4), 535-545. <https://doi.org/10.1016/j.tate.2012.01.008>
- Oosterheert, I. E., Vermunt, J. D., & Denessen, E. (2002). Assessing orientations to learning to teach. *British Journal of Educational Psychology*, 72(1), 41-64. <https://doi.org/10.1348/000709902158766>
- Palmer, D. (2006). Sources of self-efficacy in a science methods course for primary teacher education students. *Research in Science Education*, 36(4), 337-353. <https://doi.org/10.1007/s11165-005-9007-0>
- Palmer, D. (2011). Sources of efficacy information in an inservice program for elementary teachers. *Science Education*, 95(4), 577-600. <https://doi.org/10.1002/scs.20434>
- Palmer, D., Dixon, J., & Archer, J. (2015). Changes in science teaching self-efficacy among primary teacher education students. *Australian Journal of Teacher Education*, 40(12), 27-40. <https://doi.org/10.14221/ajte.2015v40n12.3>
- Pfitzner-Eden, F. (2016). Why do I feel more confident? Bandura's sources predict preservice teachers' latent changes in teacher self-efficacy. *Frontiers in Psychology*, 7, 1-16. <https://doi.org/10.3389/fpsyg.2016.01486>
- Phan, N. T. T., & Locke, T. (2015). Sources of self-efficacy of Vietnamese EFL teachers: A qualitative study. *Teaching and Teacher Education*, 52, 73-82. <https://doi.org/10.1016/j.tate.2015.09.006>
- Skaalvik, E. M., & Skaalvik, S. (2007). Dimensions of teacher self-efficacy and relations with strain factors,

- perceived collective teacher efficacy, and teacher burnout. *Journal of Educational Psychology*, 99, 611-625. <https://doi.org/10.1037/0022-0663.99.3.611>
- Swackhamer, L., Koellner, K., Basile, C., & Kimbrough, D. (2009). Increasing the self-efficacy of inservice teachers through content knowledge. *Teacher Education Quarterly*, 36(2), 63-78.
- Thomas, K. E., & Mucherah, W. M. (2016). The contextual difference: Developing preservice teacher efficacy through immersive learning experiences. *Education and Urban Society*, 48(4), 364-383. <https://doi.org/10.1177/0013124514533795>
- Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive concept. *Teaching and Teacher Education*, 17, 783-805. [https://doi.org/10.1016/S0742-051X\(01\)00036-1](https://doi.org/10.1016/S0742-051X(01)00036-1)
- Uzuntiryaki, E. (2008). Exploring the sources of turkish pre-service chemistry teachers' chemistry self-efficacy beliefs. *Australian Journal of Teacher Education*, 33(6), 12-28. <https://doi.org/10.14221/ajte.2008v33n6.2>
- van Rooij, E. C. M., Fokkens-Bruinsma, M., & Goedhart, M. (2019). Preparing science undergraduates for a teaching career: Sources of their teacher self-efficacy. *Teacher Educator*, 54, 270-294. <https://doi.org/10.1080/08878730.2019.1606374>
- Wang, L. Y., Tan, L.-S., Li, J.-Y., Tan, I. & Lim, X.-F- (2017). A qualitative inquiry on sources of teacher efficacy in teaching low-achieving students. *Journal of Educational Research*, 110(2), 140-150. <https://doi.org/10.1080/00220671.2015.1052953>
- Woolfolk Hoy, A. & Burke Spero, R. (2005). Changes in teacher efficacy during the early years of teaching: A comparison of four measures. *Teaching and Teacher Education*, 21, 343-356. <https://doi.org/10.1016/j.tate.2005.01.007>
- Woolfolk Hoy, A., & Davis, H. A. (2005). Teachers' sense of efficacy and its influence on the achievement of adolescents. In T. Urdan & F. Pajares (Eds.), *Adolescence and education: Volume V: Self-efficacy beliefs during adolescence* (pp. 117-137). Greenwich, CT: Information Age.
- Zee, M., & Koomen, H. M. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research*, 86(4), 981-1015. <https://doi.org/10.3102/0034654315626801>.