SCIENTIFIC CULTURE
www.sci-cult.com

*SCIENTIFIC CULTURE, Vol. 12, No. 4, (2026), pp. 5496-5508*
*Open Access. Online & Print*

**DOI: 10.5281/zenodo.12426590**

# SELF-EFFICACY BELIEFS OF SAUDI IN-SERVICE SCIENCE TEACHERS: AN ANALYSIS USING THE STEBI INSTRUMENT

**Samar Salem Albalawi**

*Assistant Professor, Collage of Education, University of Ha'il, Saudi Arabia*

**Received: 16/08/2025**
**Accepted: 09/03/2026**

*Corresponding author: Samar Salem Albalawi*
*(lsamar.albalawi@uoh.edu.sa)*

## ABSTRACT

This study investigated the self-efficacy beliefs of Saudi in-service science teachers using the Science Teaching Efficacy Beliefs Instrument (STEBI). Specifically, it examined teachers' personal science teaching efficacy (PSTE) and science teaching outcome expectancy (STOE) and explored differences based on gender and teaching experience. Data were collected from 76 teachers across various educational levels. Descriptive and inferential analyses revealed moderate-to-high PSTE levels and slightly lower STOE levels, indicating that while teachers are confidence in their instructional abilities, they are less certain about their impact on student learning outcomes. No significant differences related to gender or teaching experience differences emerged. Furthermore, regression analysis showed that STOE was a strong predictor of PSTE, accounting for 27.7% of its variance.

**KEYWORDS:** Teacher self-efficacy, Science education, STEBI-A.

## 1. INTRODUCTION

Science education plays a central role in national development, as it prepares societies to address the emerging challenges of the twenty-first century, including rapid technological advancement and sustainable development. International large-scale assessments such as PISA and TIMSS consistently show that many education systems struggle to translate science curricula into measurable student achievement (Lewis, 2020; Taguma & Barrera, 2019). In response, Saudi Arabia has prioritised science, technology, engineering and mathematics (STEM) education as part of its human capital development under Saudi Vision 2030 (Azhar & Ahmad Rashid, 2024).

While curriculum reform is critical, the success of these initiatives ultimately depends on the science teacher, who is responsible for interpreting and implementing the reforms within the classroom. Even the most well-designed science curriculum cannot achieve its intended outcomes unless teachers possess the confidence to teach science effectively (Klassen et al., 2014; Tschannen-Moran & Hoy, 2001). This confidence reflects a construct known as teacher self-efficacy, defined as a teacher's belief in their ability to plan, organise and execute teaching actions required to bring about desired student outcomes. In the classroom context, self-efficacy determines whether teachers believe they can engage all learners successfully, including those who may be unmotivated or difficult to teach.

A substantial body of research demonstrates that teachers with high self-efficacy show greater professional resilience, are more willing to adopt innovative instructional strategies and exert a stronger positive influence on student learning outcomes (Bandura, 2013; Tschannen-Moran & Hoy, 2001). In contrast, low levels of self-efficacy can impede teachers' willingness to engage in pedagogical change, often limiting the successful implementation of educational reforms (Guskey, 2002). Despite the growing recognition of the construct's importance, the majority of self-efficacy research has been conducted in Western contexts, with comparatively few studies emerging from Arab educational settings. This has resulted in a notable gap in the literature across the Arab region.

Much of the existing evidence for science teaching self-efficacy, particularly that derived from the Science Teaching Efficacy Belief Instrument (STEBI-A) is grounded in Western cultural and educational environments. Given that teacher beliefs are shaped in part by cultural norms, institutional structures and contextual expectations, transferring these findings directly to Saudi Arabia without local validation poses methodological challenges. To address this limitation, the present study aims to examine science teaching self-efficacy among in-service Saudi teachers using the STEBI-A, thereby contributing culturally relevant evidence to the field and helping establish the instrument's applicability within the Saudi educational context.

This study is grounded in Bandura's social cognitive theory (SCT), which conceptualises human behaviour as the result of dynamic interactions among personal factors, behaviours and environmental influences in a process referred to as triadic reciprocal causation (Bandura, 1989). Within this framework, self-efficacy is not a measure of actual skill but rather a subjective evaluation of capability. Bandura (1989) distinguishes two components that form the theoretical basis of STEBI-A:

Efficacy expectation: the belief in one's ability to successfully perform a teaching task, represented as personal science teaching efficacy (PSTE).

Outcome expectancy: the belief that effective teaching will lead to positive student outcomes, represented as science teaching outcome expectancy (STOE).

This distinction is crucial. A teacher may believe that inquiry-based instruction improves learning (high STOE) yet lack the confidence to conduct complex laboratory investigations (low PSTE). Conversely, a teacher may feel personally competent (high PSTE) yet doubt their impact due to external constraints such as rigid curricula or students' socioeconomic circumstances (low STOE).

Understanding these dynamics is particularly important in Saudi Arabia, where science education has undergone rapid transformation. Historically, science instruction relied heavily on teacher-centred pedagogy and rote memorisation (Alshehry, 2018). However, Vision 2030 has initiated major reforms, including the alignment of the national curriculum with the American Next Generation Science Standards (NGSS) and a shift toward inquiry-based learning (IBL) (Azhar & Ahmad Rashid, 2024; Madani, 2020). This transformation requires teachers to move from being "transmitters of information" to "facilitators of inquiry", a shift that places substantial demands on their self-efficacy. Teachers must now employ instructional strategies they may not have experienced during their own schooling and navigate unfamiliar digital and laboratory tools.

Given these challenges, the present study aims to investigate the self-efficacy beliefs of Saudi in-service science teachers using the Science Teaching Efficacy

Belief Instrument (STEBI-A), in order to assess their readiness to implement contemporary science education reforms. Consequently, assessing teacher self-efficacy is not only an academic endeavour but also a practical diagnostic tool for determining the preparedness of the science teaching workforce to meet national educational aspirations.

Next, the concept and significance of teacher self-efficacy, the influence of teaching experience on its development, gender differences in science teaching self-efficacy, and cross-cultural comparisons of science teacher efficacy are discussed.

### *1.1. The Concept and Significance of Teacher Self-Efficacy*

Teacher self-efficacy, grounded in Bandura's socio-cognitive theory, refers to teachers' beliefs in their capability to organize and execute the actions required for effective teaching (Bandura, 1997). For in-service teachers, these beliefs reflect confidence in managing the daily demands of the classroom, implementing instructional strategies, supporting diverse learners, and responding to real-time challenges in professional practice (Holzberger et al., 2013; Tschannen-Moran et al., 1998).

Bandura's (1997) socio-cognitive theory identifies four sources of self-efficacy: mastery experiences, vicarious experiences, social persuasion, and physiological and emotional states. Although mastery experiences are often cited as the most influential source, evidence about the relative impact of each source within teaching contexts remains mixed (Morris et al., 2017), despite the strong importance of high teacher self-efficacy for effective practice (Klassen et al., 2014; Zee, 2016). Mastery experiences stem from successfully performing a teaching task. In teacher education, these include pre-service practicum teaching (Knoblauch & Chase, 2015; Liaw, 2017), and practice-based activities such as role-plays for in-service teachers (Aasheim et al., 2020; Dicke et al., 2015).

Vicarious experiences arise when teachers observe competent models. Pre-service teachers may watch classroom videos (Bowlin et al., 2015; Kumschick et al., 2017; Thiel et al., 2023), while in-service teachers often observe colleagues or expert practitioners (Schipper et al., 2022; Tschannen-Moran & Hoy, 2001; Werbrouck & Van Keer, 2025). Social persuasion involves constructive feedback and encouragement. Both pre-service and in-service teachers benefit from feedback provided by peers, mentors, supervisors, and instructional coaches (Hoogendijk et al., 2018; Weber et al., 2019).

Physiological and emotional states influence how teachers interpret their affective responses. For example, interpreting nervousness as excitement can strengthen perceived capability, whereas emotional exhaustion can weaken it (Burić & Kim, 2020; Dicke et al., 2015). Interventions such as mindfulness or autogenic training aim to support emotional regulation in teacher education (Ansley et al., 2021; de Carvalho et al., 2021).

A large body of research including meta-analyses and systematic reviews has demonstrated the wide-ranging benefits of high self-efficacy for practicing teachers. In-service teachers with stronger self-efficacy consistently report higher job satisfaction (Klassen et al., 2011; Stephanou et al., 2013; Toropova et al., 2021), greater professional commitment (Chesnut & Burley, 2015), and lower levels of emotional exhaustion and stress (Aloe et al., 2014; Betoret, 2006; Dicke et al., 2015; Fernet et al., 2012; Skaalvik & Skaalvik, 2014). These outcomes are particularly important in modern classrooms, where teachers face increasing instructional and administrative demands.

High self-efficacy also translates into observable improvements in teaching quality. Both students and independent observers tend to rate the instruction of highly self-efficacious teachers as more effective, supportive, and cognitively engaging (Holzberger et al., 2013; Klassen & Tze, 2014; Ryan et al., 2015). Longitudinal research further shows that teachers' self-efficacy early in their career predicts their classroom climate, management skills, and cognitively activating instruction even a decade later (Künsting et al., 2016). Beyond global instructional quality, self-efficacy is a strong predictor of specific pedagogical practices such as differentiated instruction (De Neve et al., 2015; Suprayogi et al., 2017) and innovative instructional strategies (Thurlings et al., 2015). These instructional advantages meaningfully benefit learners: students taught by more self-efficacious teachers show higher engagement (Zee & Koomen, 2020), stronger teacher student relationships (Holzberger et al., 2014), and greater academic interest (Fauth et al., 2019). Importantly, high teacher self-efficacy is also linked to improved student academic performance (Caprara et al., 2006; Kim & Seo, 2018).

The link between teacher self-efficacy and instructional quality is well established. Effective science teaching requires laboratory management skills, the ability to explain abstract concepts and the capacity to stimulate curiosity. Teachers with high self-efficacy are more likely to implement student-centred approaches such as inquiry, even when challenges arise. Seneviratne et al. (2019) found that teachers with high efficacy were significantly more

likely to adopt inquiry-based learning (IBL), whereas teachers with low efficacy perceived inquiry as difficult and risky.

Empirical studies have shown that teachers' perceptions of their self-efficacy significantly influence classroom practices and their ability to adopt reform-oriented pedagogies. For instance, (Klassen et al., 2014) illustrated that teachers who view themselves as highly effective are more likely to remain positive when they face challenges and when they implementing new innovative teaching methods. Similarly, Zee (2016) discovered that teachers' perceived self-efficacy is significantly correlated with their teaching quality, classroom management and psychological connection with students.

In the field of science education, teachers' beliefs regarding their ability to manage inquiry-based activities have been confirmed to predict their actual implementation of student-centred methodologies (Fackler & Malmberg, 2016). Teachers who view themselves as less qualified often avoid open-ended inquiry tasks and prefer traditional, teacher-centred approaches. These findings support the claim that teachers' self-efficacy perceptions are not only psychological traits but also significant indicators of pedagogical behaviour and reform adaption.

### *1.2. Teaching Experience and the Development of Self-Efficacy*

Bandura (1997) posited that self-efficacy stabilizes once established, a claim supported by longitudinal findings showing that after a strong rise in the first years of teaching, in-service teachers' self-efficacy tends to remain stable (Künsting et al., 2016; Savolainen et al., 2022). However, research also shows that teacher self-efficacy can continue to develop across the career span. Teachers with more years of experience typically report higher self-efficacy than both pre-service teachers and less-experienced in-service teachers (Chan, 2008; Fackler et al., 2021; George, 2018; Klassen et al., 2013; Wolters & Daugherty, 2007; Yeo, 2008). This likely reflects the greater variety of instructional and classroom management experiences accumulated throughout the profession.

### *1.3. Gender Differences in Science Teaching Self-Efficacy*

Findings regarding gender and self-efficacy in science teaching remain mixed across contexts. Some international studies report slightly higher efficacy among male teachers in traditionally male-dominated domains like physics, while others find no significant gender differences after controlling for experience and teaching context (Klassen & Chiu, 2010).

In Arab educational settings, it is clear that structural and cultural environments dictate differences in teacher self-efficacy far more than gender. For example, Abu-Tineh et al. (2011) discovered that male and female teachers in Arab schools shared remarkably similar levels of self-efficacy. Ultimately, it seems that shared professional standards and rigid institutional expectations often override gender as the deciding factor.

In Saudi Arabia, the single-sex schooling system may influence how teachers perceive their professional competence. Alibraheim and Almubayreek (2023) found that female science teachers in Saudi Arabia demonstrated high self-efficacy and strong alignment with NGSS practices. The study suggested that female-only environments may shield teachers from the gender stereotypes commonly encountered by women in mixed-gender STEM settings. As a result, Saudi female science teachers may develop stronger professional identities and higher levels of confidence.

### *1.4. Cross-Cultural Comparisons of Science Teacher Efficacy*

Comparative research highlights notable differences between Western and Arab educational contexts with respect to teacher self-efficacy. In Western systems, instructional effectiveness is closely tied to teachers' ability to implement constructivist, inquiry-based practices, where the teacher functions primarily as a facilitator. In contrast, Arab educational systems particularly those within the Gulf region often emphasise the teacher's authoritative role, prioritising classroom control and adherence to prescribed content (Oplatka & Arar, 2017).

Shaukat et al. (2020) describe this tension as a form of 'cultural clash' experienced when Arab teachers attempt to adopt Western-style, student-centred pedagogies. Whereas Western teachers often gain self-efficacy through promoting student autonomy, Arab teachers work within cultural expectations that value authority and structured learning. Consequently, their confidence may diminish when required to implement unfamiliar, learner-centred methods. Evidence from Saudi Arabia and the UAE shows that teacher efficacy is frequently associated with formal qualifications and discipline management rather than adaptability in pedagogical practice (Shaukat et al., 2020). These findings underscore the importance of assessing self-efficacy within the local Saudi context to ensure alignment with national priorities and cultural norms.

The national shift toward inquiry-based learning (IBL) under Vision 2030 further compounds these challenges. The reform requires science teachers to adopt a less authoritative stance and support open-ended scientific exploration. For teachers with low self-efficacy, this transition can be perceived as risky. Studies show that such teachers often worry about managing students' open-ended questions and feel unprepared to handle unpredictable classroom interactions, leading them to revert to lecture-based, textbook-centred instruction (Palmer et al., 2015; Velthuis et al., 2014).

These challenges are particularly visible in laboratory instruction. Inquiry-oriented laboratory work requires both substantial content knowledge and confidence in managing dynamic, hands-on learning environments. Halim et al. (2021) found that teachers' self-efficacy strongly predicts students' development of science process skills (SPS). Teachers with low laboratory-related efficacy tend to simplify practical investigations into rigid, step-by-step activities ('cookbook' labs), undermining authentic inquiry. Conversely, successful laboratory teaching experiences can create a positive feedback cycle that strengthens personal science teaching efficacy (PSTE) over time (Bleicher, 2007; Şengül & Karabacak, 2026). Together, these findings demonstrate that psychological readiness is just as critical as technical competence in enabling teachers to implement inquiry-based reforms effectively.

Despite extensive global research on teacher efficacy, the Arab region remains significantly underrepresented. A cross-national study by Alanazi et al. (2023) comparing science teachers in Saudi Arabia, Pakistan and the United Arab of Emirates found that Saudi teachers generally reported higher self-efficacy; however, their efficacy was strongly associated with formal qualifications and years of experience. This suggests that in the Saudi context, professional identity may be shaped more by formal recognition than by pedagogical performance. Cross-cultural studies further demonstrate how societal expectations influence teachers' self-judgements. Klassen and Tze (2014) reported substantial cultural variation in how teachers evaluate their professional capability, noting that beliefs about authority, autonomy and classroom roles significantly shape self-efficacy. Similarly, Hoy and Spero (2005) observed pronounced differences in instructional confidence between Western and East Asian teachers, linking these differences to contrasting cultural attitudes toward classroom control and student participation. Collectively, these findings underscore the need for context-sensitive assessment tools such as the STEBI-A when examining teacher self-efficacy in Saudi Arabia.

This study aims to verify the Arabic version of the STEBI-A, grounded in the theoretical framework and the identified gaps in the literature. Four specific empirical questions direct this research:

**RQ1: What are the current levels of personal science teaching efficacy (PSTE) among Saudi in-service science teachers?**

**RQ2: What are the current levels of science teaching outcome expectancy (STOE) among Saudi in-service science teachers?**

**RQ3: Are there statistically significant differences in PSTE and STOE scores based on demographic variables, specifically gender and teaching experience?**

**RQ4: To what extent does science teaching outcome expectancy (STOE) predict personal science teaching efficacy (PSTE) in the Saudi context?**

## 2. METHODOLOGY

### *2.1. Research Design and Participants*

This study employed a quantitative cross-sectional survey design. This method was chosen because it enables the efficient collection of data on teachers' existing beliefs and an analysis of the correlations among the various variables, including PSTE, STOE and demographics.

Participants were in-service science teachers employed in public schools in Hail, a major city in the north of Saudi Arabia. A random sampling technique was applied to guarantee a representative sample of the teaching workforce. The final analytical sample included 76 teachers (N=76).

The sample size, however limited, demonstrates demographic diversity. The participants included male (32.9%) and female (67.1%) teachers, in accordance with the gender-segregated structure of Saudi schools. The sample covered the entire range of the teaching career: 26.3% were novice teachers (≤ 5 years), 31.6% were mid-career professionals (6–10 years) and 42.1% were senior teachers with over 15 years of experience. This variation enables an in-depth investigation of how efficacy beliefs can evolve throughout the course of a career.

### *2.2. Instrumentation*

Data were collected using the Science Teaching Efficacy Belief instrument (STEBI-A), developed by Riggs and Enochs (1988). This tool is universally acknowledged as a benchmark for measuring science-specific efficacy. It includes 25 items categorised into two different subscales:

Personal Science Teaching Efficacy (PSTE): this

scale (13 items) assesses teachers' confidence in their teaching skills (e.g. 'I know the steps necessary to teach science concepts effectively').

Science Teaching Outcomes Expectancy (STOE): this scale (12 items) assesses the beliefs that teachers have about how effective teaching can impact student learning regardless of external circumstances (e.g. 'the teacher is generally responsible for the achievement of students in science').

### *2.3. Translation and Adaptation Process*

A comprehensive translation technique was implemented to guarantee the instrument is culturally and linguistically appropriate for the Saudi context. The original English STEBI-A was translated into Arabic by a bilingual expert in science education. A back translation process was carried out, in which a second independent translator translated the Arabic version back into English to ensure semantic accuracy. The Arabic translation was evaluated by a committee of three faculty members from Saudi universities, experts in science education, to confirm that the terminology matched the local language of the Ministry of Education.

### *2.4. Data Collection Procedure*

The survey was conducted online over a secure internet platform. The distribution channel used official Ministry of Education networks, incorporating professional learning communities (PLCs) and supervisors' email lists. To maximise the response rate and ensure data integrity, the survey was available for three weeks. Ethical standards were rigorously followed: participants were informed of the study's confidentiality, their right to withdraw at any time and that the collected data would be used exclusively for this study.

### *2.5. Reliability and Internal Consistency*

Cronbach's alpha coefficients were calculated for both subscales to evaluate the fit of Arabic STEBI-A within the Saudi context. The instrument had strong internal consistency. The Personal Science Teaching Efficacy (PSTE) subscale generated an alpha coefficient of 0.88. In contrast, the Science Teaching Outcome Expectancy (STOE) subscale provided a Cronbach's alpha coefficient of 0.79. Both values exceed the suggested threshold of 0.70, thus confirming the instrument's reliability.

## 3. RESULTS

The primary goal of this study was to investigate the self-efficacy beliefs of Saudi science teachers using the Science Teaching Efficacy Belief instrument (STEBI-A). The data were analysed with SPSS (Version 28.0) to evaluate psychometric characteristics, descriptive efficacy levels and the influence of demographic variables. Before analysis, a data screening process was employed to identify missing values and outliers, resulting in a final analytical sample of 76 in-service teachers. Negatively phrased items (items 3, 6, 8, 10, 13, 17, 19, 20, 21, 22, 23, 24) were reverse-coded to ensure that higher scores consistently represented higher efficacy.

### *3.1. Descriptive Analysis of Efficacy Beliefs (RQ1 and RQ2)*

Descriptive statistics were calculated to address the first two study questions regarding the current levels of PSTE and STOE. General findings demonstrate that Saudi science teachers express significantly higher sense of self-efficacy (see Table 1).

PSTE: Teachers reported a high level of confidence in their personal ability to teach science (M=3.65), (SD=0.52).

STOE: Teacher also reported positive, although slightly lower, expectations regarding their abilities to influence student outcomes (M=3.42), (SD=0.48).

***Table 1: Descriptive Statistics for STEBI-A***

| Subscale | No. of Items | N | M | SD |
|---|---|---|---|---|
| Personal Science Teaching Efficacy (PSTE) | 13 | 76 | 3.65 | 0.52 |
| Science Teaching Outcome Expectancy (STOE) | 12 | 76 | 3.42 | 0.48 |
| Total STEBI-A Score | 25 | 76 | 3.54 | 0.46 |

The findings were detailed responding to each question as following:

### *3.2. RQ1: What are the current levels of Personal Science Teaching Efficacy (PSTE) among Saudi in-service science teachers?*

***Table 2: PSTE Results***

| Item | Item Statement | (Mean) | (SD) | Order |
|---|---|---|---|---|
| 2 | I am continually finding better ways to teach science. | 4.05 | 0.78 | 2 |
| 3 | Even when I try very hard, I don't teach science as well as I do most subjects. | 3.01 | 1.24 | 4 |
| 5 | I know the steps necessary to teach science concepts effectively. | 4.29 | 0.76 | 1 |
| 6 | I am not very effective in monitoring science experiments. | 2.58 | 1.45 | 8 |
| 8 | I generally teach science ineffectively. | 1.89 | 1.34 | 11 |

| | | | | |
|---|---|---|---|---|
| 12 | I understand science concepts well enough to be effective in teaching elementary science. | 1.86 | 1.34 | 12 |
| 17 | I find it difficult to explain to students why science experiments work. | 2.72 | 1.34 | 7 |
| 18 | I am typically able to answer students' science questions. | 2.17 | 1.34 | 9 |
| 19 | I wonder if I have the necessary skills to teach science. | 3.42 | 1.34 | 3 |
| 21 | Given a choice, I would not invite the principal to evaluate my science teaching. | 2.8 | 1.34 | 6 |
| 22 | When a student has difficulty understanding a science concept, I am usually at a loss as to how to help the student understand it better. | 2.91 | 1.34 | 5 |
| 23 | When teaching science, I usually welcome student questions. | 1.33 | 1.34 | 13 |
| 24 | I don't know what to do to turn students on to science. | 2.08 | 1.34 | 10 |

A closer look at the individual PSTE items reveals exactly where teachers feel more secure. They expressed the highest confidence in item 5 (M=4.29) and item 2 (M=4.05), reflecting a strong trust in their core capacity to deliver science concepts effectively. These teachers are obviously comfortable with their baseline teaching responsibilities.

At the same time, the data highlights specific areas of uncertainty. The lowest averages were for item 23 (M=1.33), item 12 (M=1.86) and item 8 (M=1.89). These drops suggests that teachers feel much less confident when dealing with unmotivated and underperforming students, updating their teaching strategies or manage unpredictable classroom dynamic. Despite a strong overall sense of efficacy, the more complex instructional tasks still present a noticeable challenge.

### *3.3. RQ2: What are the current levels of Science Teaching Outcome Expectancy (STOE) among Saudi in-service science teachers?*

***Table 3: STOE Results***

| Items | Item Statement | (Mean) | (SD) | Order |
|---|---|---|---|---|
| 1 | When a student does better than usual in science, it is often because the teacher exerted a little extra effort. | 4.14 | 0.78 | 2 |
| 4 | When the science grades of students improve, it is most often due to their teacher having found a more effective teaching approach. | 4.32 | 0.72 | 1 |
| 7 | If students are underachieving in science, it is most likely due to ineffective science teaching. | 3.39 | 1.41 | 4 |
| 9 | The inadequacy of a student's science background can be overcome by good teaching. | 2.03 | 1.24 | 11 |
| 10 | The low science achievement of some students cannot generally be blamed on their teachers. | 4.12 | 1.25 | 3 |
| 11 | When a low achieving child progresses in science, it is usually due to extra attention given by the teacher. | 2.12 | 1.31 | 10 |
| 13 | Increased effort in science teaching produces little change in some students' science achievement. | 3.21 | 1.41 | 5 |
| 14 | The teacher is generally responsible for the achievement of students in science. | 2.99 | 1.28 | 7 |
| 15 | Students' achievement in science is directly related to their teachers' effectiveness in science teaching. | 2.25 | 1.07 | 9 |
| 16 | If parents comment that their child is showing more interest in science at school, it is probably due to the performance of the child's teacher. | 1.61 | 0.9 | 12 |
| 20 | Effectiveness in science teaching has little influence on the achievement of students with low motivation. | 3.14 | 1.44 | 6 |
| 25 | Even teachers with good science teaching abilities cannot help some kids learn science. | 2.58 | 1.53 | 8 |

Turning to the outcome expectancy (STOE) results, the data reveal a strong foundational belief in the power of teaching. The highest averages appeared for items 4 (M=4.32), item 1 (M=4.14) and item 10 (M=4.12). This clearly shows that teachers genuinely believe effective instruction and teaching methods make a difference in students' academic performance.

This optimism is constrained by practical reality. The significant drop in scores for items 16 (M=1.61), item 9 (M=2.03) and item 11 (M=2.12) points to a specific limitation: many teachers feel their classroom efforts cannot always overcome the external circumstances that limit student achievement. When analysed alongside with the PSTE data, this pattern confirms that this workforce that is highly confident in their own teaching abilities; however, it also reveals notable concern over the ultimate student outcomes within their control.

### *3.4. RQ3: Are there statistically significant differences in PSTE and STOE scores based on demographic variables, specifically gender and teaching experience?*

To address the third research question, inferential statistics were used to examine differences by gender and years of experience.

Gender: An independent-sample t-test indicated no statistically significant difference in overall efficacy between male (M=3.51, SD=0.55) and female (M=3.55, SD=0.41) teachers, t (74) = -0.38, p=0.703. This lack of significance was observed in both the

PSTE (p=0.65) and STOE (p=0.82) subscales.

Teaching experience: A one-way analysis of variance (ANOVA) was used to compare teachers across three levels of experience: novice (≤ 5 years), mid-career (6–10 years) and senior (over 15 years). The analysis revealed no significant main effects of experiences of personal efficacy, F(2.73) = 1.12, p=0.331, or of outcome expectancy, F(2,73) = 0.85, p=0.432.

The result of this study suggests that teacher efficacy in this sample is a stable construct that does not significantly differ by gender or career experience (Table 3)

*Table 3: Tests of Significance for Efficacy by Gender and Experience*

| Variable | Group | N | M | SD | Test Statistic | Sig. (p) |
|---|---|---|---|---|---|---|
| Gender | Male | 25 | 3.51 | 0.55 | t=-0.38 | 0.703 |
| | Female | 51 | 3.55 | 0.41 | | |
| Experience | Novice (≤ 5 yrs) | 20 | 3.61 | 0.49 | F=1.12 | 0.331 |
| | Mid-Career (6–10 yrs) | 24 | 3.44 | 0.51 | | |
| | Senior (15+ yrs) | 32 | 3.58 | 0.41 | | |

Note: Significance level established at p <0.05.

### *3.5. RQ4: To what extent does science teaching outcome expectancy (STOE) predict personal science teaching efficacy (PSTE) in the Saudi context?*

A linear regression analysis was performed to determine the extent to which science teaching outcome expectancy (STOE) predicts personal science teaching efficacy (PSTE).

The regression model demonstrates statistical significance, F(1.74) = 28.4, p0.001. Table 4 indicates that the STOE function is a strong positive predictor of PSTE (β=0.53, t=5.33, p=0.001). This model accounts for approximately 27.7% of the variance in personal efficacy at school (R2 =.277). This research suggests that teachers with higher expectations for student performance are notably more likely to view themselves as skilled science teachers.

*Table 4: Summary of Simple Regression Analysis for STOE Predicting PSTE*

| Variable | B | SEB | β | t | Sig. (p) |
|---|---|---|---|---|---|
| (Constant) | 1.95 | 0.32 | - | 6.01 | 0 |
| STOE (Outcome Expectancy) | 0.56 | 0.1 | 0.53 | 5.33 | 0.000* |

Note: R2=0.277; Adjusted R2=0.267. Dependent Variable: personal science teaching efficacy (PSTE).

## 4. DISCUSSION

This research establishes a clear psychological baseline for ongoing pedagogical reforms. The results demonstrate that strong personal teaching competence operates alongside moderate outcomes expectations. Importantly, these core efficacy beliefs remain entirely consistent, regardless of a teachers' gender or number of years of experience. The data confirm that a teacher's outcome expectations directly influence their personal instructional confidence, offering a realistic framework for assessing their psychological readiness for reform-oriented practice.

The data confirm a highly elevated sense of personal teaching efficacy. Scholars consistently trace a direct line between pedagogical confidence and teachers' professional resilience or willingness to embrace new teaching methods (Klassen et al., 2014; Zee, 2016). In the current Saudi landscape, we must recognise that this confidence does not exist in a vacuum; it is significantly shaped by institutional frameworks. A centralised curriculum full of strict rules naturally makes teachers more sure of themselves when they plan daily lessons plans. The risk is in confusing this 'procedural efficacy', which amounts to comfort with required routines, with true pedagogical mastery. For true educational transformation to take place, teachers need to be able to work outside these strictures effectively. To effectively implement inquiry-based science education, teachers must develop an adaptive competence that enables them to manage and navigate the natural of unpredictability of student-centred learning, moving well beyond simple procedural compliance.

The noticeable divide between PSTE and STOE aligns with what Velthuis et al. (2014) previously observed regarding teacher psychology: teachers frequently separate their pedagogical confidence from their belief that instruction can actually overcome external barriers to student learning. This disconnect is crucially influential during periods of systemic educational reform. If high instructional confidence is undermined by lowered outcome expectations, teachers will naturally hesitate to invest energy into demanding new teaching methods: they think they will get poor returns due to perceived structural or socio-environmental problems. From a social cognitive perspective, these fundamental evaluations significantly impact a teacher's goal commitment and determination in the classroom. To effectively bridge this gap, professional development has to overcome the limited knowledge of new pedagogical technique. Instead, training initiatives

need to explicitly confront and alter how teachers attribute the root cause of student achievement.

Notably, self-efficacy beliefs show no significant differences based on gender or number of years of teaching experience. This is different from Western models, but it strongly supports existing literature on Arab educational systems (Abu-Tineh et al., 2011; Shaukat et al., 2020). When professional standards and curricula are highly standardised, they tend to help teachers feel like they have the same professional identity. In other word, the broader institutional environment shapes teaching confidence much more than individuals' specific career experience (Folberg & Kaboli-Nejad, 2020; Sani, 2019).

The predictive power of STOE over PSTE strongly supports Bandura's (1989) theory of reciprocal causation. When teachers expect their instructional efforts to yield real student progress, they naturally view themselves as more capable teachers. This dynamic creates a powerful, self-reinforcing loop between their expectations and their actual teaching practice (Tschannen-Moran & Hoy, 2001). This connection highlights a crucial point for professional development. Training initiative cannot afford to focus solely on teaching skills. To build genuine pedagogical confidence, these programs need a dual approach. They must actively raise teachers' expectations for student learning while simultaneously providing hands-on mastery experiences in inquiry-based instruction (Artino Jr, 2012; Klassen et al., 2014). If we ignore these underlying outcomes beliefs, we risk developing teachers who are technically competent but lack the inner drive to implement new practice.

Ultimately, what these findings reveal is that teachers' self-efficacy during periods of systematic change is rarely just a personal trait. Instead, it is a consequence of the institutional framework and is significantly shaped by curricular designs, structure and established teaching standards. For the sustainable implementation of the Saudi Vision 2030 reforms, educational leaders must align their efforts and professional learning with actual school level support. Enhancing teacher self-efficacy in their own competence is only half of the battle; we must also cultivate strong outcome expectations to ensure that teacher perceive their ongoing investment in inquiry-based science teaching is truly justified.

### *4.1. Interpretation of Efficacy Levels: Competence Amidst Reform*

In contrast to the gap narratives found in non-Western literature, which argue that teachers in developing contexts lack pedagogical confidence, the participants in this study showed a high level of personal science teaching efficacy (M=3.65). This finding aligns with Bandura's social cognitive theory, which claims that mastery experiences are the most powerful source of self-efficacy. In the Saudi context, this higher confidence probably signifies the structured framework of the national science curriculum. According to Alshehry (2018) the Ministry of Education provides teachers with a comprehensive, standardised framework. A centralised curriculum may restrict autonomy, although it functions as a framework; teachers feel 'they know the steps' (item 5) simply because of the well-defined curricular roadmap.

A significant 'efficacy gap' emerged between PSTE (M=3.65) and the slightly lower outcome expectancy (M= 3.42). Although teachers believe they are capable of delivering scientific content, they have concerns about their capacity to address external factors, such as students' challenges at home and lack of motivation. This aligns with the research findings of Velthuis et al. (2014), who indicated that teachers frequently distinguish between their own performance, which is within their control, and student outcomes, which they consider to be influenced by external factors. Within the framework of Saudi Vision 2030, this indicates that although teachers possess technical skills, they may require additional support to address the 'the whole child' and mitigate the effects of socio-environmental obstacles on learning.

### *4.2. The Null Effect of Demographics: A Unified Professional Identity*

Perhaps the most notable conclusion of this study is the absence of significant variation in efficacy views by gender (p=0.703) and teaching experience (p=0.331). This contrasts with international research findings, which frequently report that male teachers show higher efficacy in 'hard science' or that senior teachers have greater confidence due to tenure (Palmer et al., 2015).

In the Saudi context, this unity can be referred to two systemic factors:

Centralised professional development: the limited differences between novice and senior teachers indicate that 'experience' is less relevant during comprehensive system reform. With the implementation of new inquiry-based standards under the 2030 Vision, an experienced teacher with 20 years of teaching experience serves as a 'novice' alongside a recruit, both constantly exploring the same unfamiliar teaching landscape. The 'levelling effect' encourages a collective professional identity instead of a hierarchy of competence.

Gender Parity in Standards: despite the gender-segregated nature of Saudi schools, the curriculum assessment requirements and teachers' qualifications remain similar for both genders. The findings challenge the belief that female science teachers perceive themselves as less competent; rather, they indicate that a segregated environment may shield female teachers from the gender bias common in mixed STEM settings, enabling their professional effectiveness to thrive alongside that of their male colleagues.

### *4.3. The Prospective Power of Outcome Expectancy*

The regression study ultimately provided strong evidence for the interconnections of efficacy beliefs. The finding that outcome expectancy explains approximately 28% of the variance in personal efficacy (R2 =0.277) has great significance for theory. A teachers' belief in their students' potential is essential for their own teaching planning confidence. This relationship also confirms Bandura's (1988) concept of reciprocal causation, as environmental perceptions (STOE) directly affect personal factors (PSTE). Essentially, this indicates that professional development programs that primarily focus on enhancing teachers' subject-matter knowledge (PSTE) could yield diminishing returns unless they also consider teachers' perceptions of student learning (STOE). If a teacher believes that 'students cannot learn due to their background' (low STOE), their drive to implement innovative teaching tactics (PSTE) will remain diminished, regardless of their technical expertise. Consequently, enhancing science education in Saudi Arabia requires a dual focus: expanding teachers' competencies and elevating their expectations of students' potential.

## 5. LIMITATIONS AND FUTURE RESEARCH

This study provides valuable insights into Saudi science teachers' efficacy beliefs, although many limitations must be recognised when interpreting the findings. The study used a cross-sectional design, capturing teachers' beliefs at a certain point in time. Self-efficacy beliefs are a variable construct that may fluctuate in response to daily classroom achievements or setbacks. Thus, this design interferes with the establishment of causation. Future studies should utilise longitudinal designs to monitor the development of efficacy beliefs as teachers gain experience with the new Vision 2030 curriculum over several years.

The sample size (N=76), although sufficient for an exploratory validation study, limits the generalisability of the results to the entire SA. The sample was mainly drawn from the city of Hail in Saudi Arabia; teachers in much larger cities like Riyadh or Jeddah may encounter different obstacles and varying resource supply. The following studies should target a larger, nationally representative sample to validate the Arabic STEBI-A's factor structure.

This study focused on the efficacy of individual teachers, the concept of collective teacher efficacy and the collective belief of a school's teachers in their capacity to assist students, which has been revealed as a major predictor of student success (Goddard et al., 2004). Future studies in the Saudi context should investigate the impact of departmental culture and school leadership on the collective efficacy of science teachers.

## ACKNOWLEDGEMENT

This work was supported by the University of Ha'il [Project Number (BA- 24 003)].

## ETHICS STATEMENT

Ethical standards were followed. Participation was voluntary, and respondents were informed about confidentiality and their right to withdraw at any time.

## DATA AVAILABILITY STATEMENT

The datasets generated for this study are not publicly available due to confidentiality and consent considerations, but are available from the author u

## REFERENCES

Aasheim, M., Fossum, S., Reedtz, C., Handegård, B. H., & Martinussen, M. (2020). Examining the incredible years teacher classroom management program in a regular Norwegian school setting: Teacher-reported behavior management practice, problem behavior in classroom and school environment, teacher self-and collective efficacy, and classroom climate. Sage Open, 10(2), 2158244020927422.

Abu-Tineh, A. M., Khasawneh, S. A., & Khalaileh, H. A. (2011). Teacher self-efficacy and classroom management styles in Jordanian schools. Management in Education, 25(4), 175–181.

Alanazi, F. H., Khalaf, M. A., Alzamil, M. S., & Almufti, A. N. M. (2023). Science teachers' perceptions of the cultural factors influencing students' science learning: comparative analysis of Saudi Arabia, Egypt, and Yemen. Journal of Turkish Science Education, 20(3), 534–548.

Alibraheim, E. A., & Almubayreek, T. S. (2023). Investigating The Relationship Between Female Teachers' Self-

Efficacy And Their Practice Of Next Generation Science Standards. Journal of Positive School Psychology, 7(4).
Aloe, A. M., Amo, L. C., & Shanahan, M. E. (2014). Classroom management self-efficacy and burnout: A multivariate meta-analysis. Educational psychology review, 26(1), 101–126.
Alshehry, A. (2018). Case Study of Science Teachers' Professional Development in Saudi Arabia: Challenges and Improvements. International Education Studies, 11(3), 70–76.
Ansley, B. M., Houchins, D. E., Varjas, K., Roach, A., Patterson, D., & Hendrick, R. (2021). The impact of an online stress intervention on burnout and teacher efficacy. Teaching and Teacher Education, 98, 103251.
Artino Jr, A. R. (2012). Academic self-efficacy: from educational theory to instructional practice. Perspectives on medical education, 1(2), 76–85.
Azhar, A., & Ahmad Rashid, R.-A. (2024). A Systematic Literature Review on K-12 STEM Education Research in Saudi Arabia: The Story of Transformation Under Vision 2030.
Bandura, A. (1989). Human agency in social cognitive theory. American psychologist, 44(9), 1175.
Bandura, A. (1997). Self-efficacy in changing societies. Cambridge university press.
Bandura, A. (2013). Self-Efficacy: The foundation of agency1. In Control of human behavior, mental processes, and consciousness (pp. 16–30). Psychology Press.
Betoret, F. D. (2006). Stressors, self-efficacy, coping resources, and burnout among secondary school teachers in Spain. Educational psychology, 26(4), 519–539.
Bleicher, R. E. (2007). Nurturing confidence in preservice elementary science teachers. Journal of science teacher education, 18(6), 841–860.
Bowlin, T. M., Bell, S. M., Coleman, M. B., & Cihak, D. F. (2015). Co-Teaching and Collaboration: Preservice Teachers' Knowledge, Attitudes, and Perceived Sense of Efficacy in Teaching Students with Disabilities. Journal of the American Academy of Special Education Professionals, 37, 57.
Burić, I., & Kim, L. E. (2020). Teacher self-efficacy, instructional quality, and student motivational beliefs: An analysis using multilevel structural equation modeling. Learning and instruction, 66, 101302.
Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. Journal of school psychology, 44(6), 473–490.
Chan, D. W. (2008). Emotional intelligence, self-efficacy, and coping among Chinese prospective and in-service teachers in Hong Kong. Educational psychology, 28(4), 397–408.
Chesnut, S. R., & Burley, H. (2015). Self-efficacy as a predictor of commitment to the teaching profession: A meta-analysis. Educational research review, 15, 1–16.
de Carvalho, J. S., Oliveira, S., Roberto, M. S., Gonçalves, C., Bárbara, J. M., de Castro, A. F., Pereira, R., Franco, M., Cadima, J., & Leal, T. (2021). Effects of a mindfulness-based intervention for teachers: A study on teacher and student outcomes. Mindfulness, 12(7), 1719–1732.
De Neve, D., Devos, G., & Tuytens, M. (2015). The importance of job resources and self-efficacy for beginning teachers' professional learning in differentiated instruction. Teaching and Teacher Education, 47, 30–41.
Dicke, T., Elling, J., Schmeck, A., & Leutner, D. (2015). Reducing reality shock: The effects of classroom management skills training on beginning teachers. Teaching and Teacher Education, 48, 1–12.
Fackler, S., & Malmberg, L.-E. (2016). Teachers' self-efficacy in 14 OECD countries: Teacher, student group, school and leadership effects. Teaching and Teacher Education, 56, 185–195.
Fackler, S., Malmberg, L.-E., & Sammons, P. (2021). An international perspective on teacher self-efficacy: Personal, structural and environmental factors. Teaching and Teacher Education, 99, 103255.
Fauth, B., Decristan, J., Decker, A.-T., Büttner, G., Hardy, I., Klieme, E., & Kunter, M. (2019). The effects of teacher competence on student outcomes in elementary science education: The mediating role of teaching quality. Teaching and Teacher Education, 86, 102882.
Fernet, C., Guay, F., Senécal, C., & Austin, S. (2012). Predicting intraindividual changes in teacher burnout: The role of perceived school environment and motivational factors. Teaching and Teacher Education, 28(4), 514–525.
Folberg, A. M., & Kaboli-Nejad, S. (2020). A mixed method examination of gender differences in perceptions of STEM among Iranian Americans. Journal of Social Issues, 76(3), 543–576.
George, M. L. (2018). Narrowing the Cultural Divide: Preparing Culturally Responsive Educators by Instituting

Transformative Pedagogical Pre-Service Training Programs. Northeastern University.
Goddard, R. D., Hoy, W. K., & Hoy, A. W. (2004). Collective efficacy beliefs: Theoretical developments, empirical evidence, and future directions. Educational researcher, 33(3), 3–13.
Guskey, T. R. (2002). Professional development and teacher change. Teachers and teaching, 8(3), 381–391.
Halim, A., Farada, S., Hamid, A., Mustafa, Nurulwati, Mahzum, E., & Irwandi, I. (2021). Effect of concept attainment model on student's science process skills. Journal of Physics: Conference Series,
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.
Holzberger, D., Philipp, A., & Kunter, M. (2014). Predicting teachers' instructional behaviors: The interplay between self-efficacy and intrinsic needs. Contemporary Educational Psychology, 39(2), 100–111.
Hoogendijk, C., Tick, N., Hofman, W., Holland, J., Severiens, S., Vuijk, P., & Van Veen, A. (2018). Direct and indirect effects of Key2Teach on teachers' sense of self-efficacy and emotional exhaustion, a randomized controlled trial. Teaching and Teacher Education, 76, 1–13.
Hoy, A. W., & Spero, R. B. (2005). Changes in teacher efficacy during the early years of teaching: A comparison of four measures. Teaching and Teacher Education, 21(4), 343–356.
Kim, K. R., & Seo, E. H. (2018). The relationship between teacher efficacy and students' academic achievement: A meta-analysis. Social Behavior and Personality: an international journal, 46(4), 529–540.
Klassen, R., Wilson, E., Siu, A. F., Hannok, W., Wong, M. W., Wongsri, N., Sonthisap, P., Pibulchol, C., Buranachaitavee, Y., & Jansem, A. (2013). Preservice teachers' work stress, self-efficacy, and occupational commitment in four countries. European Journal of Psychology of Education, 28(4), 1289–1309.
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.
Klassen, R. M., Durksen, T. L., & Tze, V. M. (2014). Teachers' self-efficacy beliefs: ready to move from theory to practice? In Teacher motivation (pp. 100–115). Routledge.
Klassen, R. M., & Tze, V. M. (2014). Teachers' self-efficacy, personality, and teaching effectiveness: A meta-analysis. Educational research review, 12, 59–76.
Klassen, R. M., Tze, V. M., Betts, S. M., & Gordon, K. A. (2011). Teacher efficacy research 1998–2009: Signs of progress or unfulfilled promise? Educational psychology review, 23(1), 21–43.
Knoblauch, D., & Chase, M. A. (2015). Rural, suburban, and urban schools: The impact of school setting on the efficacy beliefs and attributions of student teachers. Teaching and Teacher Education, 45, 104–114.
Kumschick, I. R., Piwowar, V., Ophardt, D., Barth, V., Krysmanski, K., & Thiel, F. (2017). Optimierung einer videobasierten lerngelegenheit im problem based learning format durch cognitive tools. Eine interventionsstudie mit lehramtsstudierenden. Zeitschrift für Erziehungswissenschaft, 20(Suppl 1), 93–113.
Künsting, J., Neuber, V., & Lipowsky, F. (2016). Teacher self-efficacy as a long-term predictor of instructional quality in the classroom. European Journal of Psychology of Education, 31(3), 299–322.
Lewis, S. (2020). PISA, Policy and the OECD. Springer.
Liaw, E.-C. (2017). Application of computer-mediated communication on teacher efficacy during school-based field experience. Teaching and Teacher Education, 65, 81–90.
Madani, R. A. (2020). Teaching Challenges and Perceptions on STEM Implementation for Schools in Saudi Arabia. European Journal of STEM Education, 5(1), 3.
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.
Oplatka, I., & Arar, K. (2017). The research on educational leadership and management in the Arab world since the 1990s: A systematic review. Review of Education, 5(3), 267–307.
Palmer, D., Dixon, J., & Archer, J. (2015). Changes in science teaching self-efficacy among primary teacher education students. Australian Journal of Teacher Education (Online), 40(12), 27–40.
Ryan, A. M., Kuusinen, C. M., & Bedoya-Skoog, A. (2015). Managing peer relations: A dimension of teacher self-efficacy that varies between elementary and middle school teachers and is associated with observed classroom quality. Contemporary Educational Psychology, 41, 147–156.
Sani, M. (2019). Women's Representation in STEM Related Education and Careers: A Case Study of Female University Students in Saudi Arabia Staffordshire University].
Savolainen, H., Malinen, O.-P., & Schwab, S. (2022). Teacher efficacy predicts teachers' attitudes towards

inclusion–a longitudinal cross-lagged analysis. International journal of inclusive education, 26(9), 958–972.
Schipper, T. M., Willemse, T. M., & Goei, S. L. (2022). Supporting teacher educators' professional learning through lesson study. Journal of Education for Teaching, 48(3), 316–331.
Seneviratne, K., Hamid, J., Khatibi, A., Azam, F., & Sudasinghe, S. (2019). Multi-faceted professional development designs for science teachers' self-efficacy for inquiry-based teaching: a critical review. Universal Journal of Educational Research, 7(7), 1595–1611.
Şengül, Ö., & Karabacak, N. N. (2026). Sustainable Inquiry-Based Learning Through Adaptive Management: A Phenomenological Study of Physics Teachers in Türkiye. Sustainability, 18(3), 1481.
Shaukat, S., Vishnumolakala, V. R., & Alghamdi, A. K. H. (2020). Science Teachers' Perceptions of Personal Science Efficacy Beliefs and Science Teaching in Saudi Arabia, Pakistan, and the United Arab Emirates. EURASIA Journal of Mathematics, Science and Technology Education, 16(8).
Skaalvik, E. M., & Skaalvik, S. (2014). Teacher self-efficacy and perceived autonomy: Relations with teacher engagement, job satisfaction, and emotional exhaustion. Psychological reports, 114(1), 68–77.
Stephanou, G., Gkavras, G., & Doulkeridou, M. (2013). The role of teachers' self-and collective-efficacy beliefs on their job satisfaction and experienced emotions in school. Psychology, 4(3A), 268.
Suprayogi, M. N., Valcke, M., & Godwin, R. (2017). Teachers and their implementation of differentiated instruction in the classroom. Teaching and Teacher Education, 67, 291–301.
Taguma, M., & Barrera, M. (2019). OECD future of education and skills 2030: Curriculum analysis. Dispon. Su Httpswww Oecd Orgeducation2030-Proj.--Learn. Pdf.
Thiel, F., Boehnke, A., Barth, V. L., & Ophardt, D. (2023). How to prepare preservice teachers to deal with disruptions in the classroom? Differential effects of learning with functional and dysfunctional video scenarios. Professional Development in Education, 49(1), 108–122.
Thurlings, M., Evers, A. T., & Vermeulen, M. (2015). Toward a model of explaining teachers' innovative behavior: A literature review. Review of educational research, 85(3), 430–471.
Toropova, A., Myrberg, E., & Johansson, S. (2021). Teacher job satisfaction: the importance of school working conditions and teacher characteristics. Educational review, 73(1), 71–97.
Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. Teaching and Teacher Education, 17(7), 783–805.
Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. Review of educational research, 68(2), 202–248.
Velthuis, C., Fisser, P., & Pieters, J. (2014). Teacher training and pre-service primary teachers' self-efficacy for science teaching. Journal of science teacher education, 25(4), 445–464.
Weber, K. E., Prilop, C. N., & Kleinknecht, M. (2019). Learning, Culture and Social Interaction.
Werbrouck, S., & Van Keer, H. (2025). Unlocking the Magic: Professional Development on Reading for Teachers in Prevocational Education—Insights from Four Case Studies. Education Sciences, 15(11), 1448.
Wolters, C. A., & Daugherty, S. G. (2007). Goal structures and teachers' sense of efficacy: Their relation and association to teaching experience and academic level. Journal of educational psychology, 99(1), 181.
Yeo, R. K. (2008). Brewing service quality in higher education: Characteristics of ingredients that make up the recipe. Quality assurance in education, 16(3), 266–286.
Zee, M. (2016). From general to student-specific teacher self-efficacy. Marjolein Zee.
Zee, M., & Koomen, H. (2020). Engaging children in the upper elementary grades: Unique contributions of teacher self-efficacy, autonomy support, and student-teacher relationships. Journal of Research in Childhood Education, 34(4), 477–495.