

Creativity in Action: Building Preservice Teachers' Creative Self-Efficacy Through Lesson Design and Implementation

Luecha Ladachart, University of Phayao, Thailand
Ladapa Ladachart, Chiang Mai University, Thailand

The Asian Conference on Education 2025
Official Conference Proceedings

Abstract

Creativity is a key characteristic for individuals navigating the modern world. As such, teachers are expected to foster creativity in students—directly, by explicitly setting creativity as a learning outcome, and indirectly, by modeling creative behavior in the classroom. In both cases, teachers require creative self-efficacy, or a belief in their own creative ability. Therefore, teacher education programs must cultivate creative self-efficacy in preservice teachers. However, longitudinal research tracking preservice teachers' creative self-efficacy over time remains limited. This study addresses this gap by examining the development of creative self-efficacy in 23 preservice teachers (3 male, 20 female) enrolled in a teacher education program in Thailand. Participants were assessed at the beginning and end of two courses—Course A and Course B—taken in the second and fourth years of the program, respectively. Course A was theory-oriented and focused on instructional methods and lesson planning. More practically, Course B emphasized the design and rehearsal of instruction. A Likert-type questionnaire served as the research instrument. Although the Shapiro-Wilk test indicated that the data were normally distributed ($p > .05$), Mauchly's test revealed a violation of the assumption of sphericity ($p < .05$). Consequently, the Friedman test with Conover's post-hoc comparisons was used instead of repeated-measures ANOVA to analyze the data. The results showed a significant increase in participants' creative self-efficacy during Course B, highlighting the importance of creativity in lesson implementation rather than in lesson design alone. Sources of creative self-efficacy are discussed from a theoretical perspective, and practical implications are proposed.

Keywords: creative self-efficacy, preservice teacher, teacher education, teaching rehearsal

iafor

The International Academic Forum
www.iafor.org

Introduction

Since creativity is crucial for addressing complex problems (Treffinger, 1993), it has been considered one of the essential competences of the 21st century (Newton & Newton, 2014). Consequently, creativity has been established as an educational goal (Fasko, 2001). In pursuing this goal, teachers play a critical role through nurturing students' creativity (Mellou, 1996). To do so, they may adopt various approaches, such as teaching for creativity, creating a classroom environment that supports creativity, and serving as role models of creative individuals (Soh, 2017). Regardless of the approach, teachers need to possess creative self-efficacy (Li et al., 2017)—in other words, they must believe in their own creativity (Nemerzitski & Heinla, 2020). Therefore, to achieve the goal of fostering creativity among young generations, it is imperative that teacher education programs develop teachers' creative self-efficacy so that they can, in turn, facilitate their students' creativity (Paek & Summers, 2019).

Several efforts have been made to develop teachers' creative self-efficacy. For instance, aligning with the notion of “teaching as a design science” (Laurillard, 2012), Henriksen et al. (2020) engaged teachers in designing elements relevant to their work (e.g., curriculum, instruction, and materials). They observed that such activities can help teachers begin “to see themselves as creative individuals” (p. 223). Similarly, Liu et al. (2024) used a design thinking process through which preservice teachers designed instruction, courseware, and micro-lessons. The authors found that this process enhanced preservice teachers' creative self-efficacy. These studies resonate with research—though conducted with K–12 students—indicating that design-based learning provides a context in which individuals use creativity and strengthen creative self-efficacy (Ladachart et al., 2022, 2024). Hence, it is worth examining the potential of design-based learning in the context of teacher education.

Irrespective of whether or not they involve design-based learning, attempts to develop preservice teachers' creative self-efficacy in teacher education programs have tended to focus on individual courses (Eyup, 2023; Liu et al., 2024). Little is known about whether or how preservice teachers develop their creative self-efficacy throughout a teacher education program. To address this gap, research that longitudinally tracks preservice teachers' creative self-efficacy is needed. Situated in the Thai context, the present study focuses on two courses of a teacher education program in which preservice teachers used their creativity in designing lessons. However, the two courses differed regarding whether preservice teachers had opportunities to implement their lessons—that is, whether their creativity was put into action. Altogether, this study offers insights into which elements of the courses are effective in fostering preservice teachers' creative self-efficacy and provides recommendations for advancing teacher education programs.

Literature Review

According to Puente-Diaz (2016), creative self-efficacy is a construct based on the social cognitive theory proposed by Bandura (1982), who defined self-efficacy as “judgements of how well one can execute courses of action required to deal with prospective situations” (p. 122). This notion is based on the premise that the more individuals believe they can succeed at a task, the more likely they are to complete it (Bandura, 1978). Later, Tierney and Farmer (2002) applied the concept of self-efficacy to the context of creative work by defining creative self-efficacy as “the belief one has the ability to produce creative outcomes” (p. 1138). Following Bandura (1978), creative self-efficacy is based on the premise that the more people believe in their creativity, the more likely they are to work creatively. However, because

creativity is relevant across many types of work, other terms, such as “creative confidence” (Kelley & Kelley, 2013), may be used with meanings similar to creative self-efficacy.

Creative self-efficacy is also applied in education (Unal & Tasar, 2021). In this context, teachers are no longer expected to implement pre-developed lessons, but instead design their own lessons that are adaptable to students' learning needs (Jordan, 2016). In doing so, they must harness not only “what is known about teaching to attain the goal of student learning, [but also] the implementation of its designs to keep improving learning” (Laurillard, 2012, p. 1). This process necessitates creativity, as Noddings (2013) notes:

Teachers do not need to find a method or theory that they will follow slavishly. Rather, they need to analyze a multiplicity of ideas and put their creative power to work in answering questions such as: Where could I use this? For what purpose? With whom? In what context? (p. 210)

From this perspective, teachers are therefore regarded as designers (Henriksen et al., 2020) who use and exercise creativity in their work, for example, to develop curriculum, instruction, and assessments.

Research has demonstrated several benefits of teachers' creative self-efficacy. For example, Cayirdag (2017) found that it is strongly related to teaching behaviors that foster creativity. Similarly, Huang et al. (2019) observed a significant association between creative self-efficacy and positive attitudes toward teaching for creativity. Moreover, Li et al. (2017) revealed that creative self-efficacy mediates the relationship between teachers' proactive personality and their innovative working behaviors. Given these benefits, researchers have recommended developing teachers' creative self-efficacy (Paek & Summers, 2019). In this regard, Creely et al. (2021) suggest providing teachers with opportunities to take risks in creative endeavors. Drawing on Bandura (1978), Mathisen and Bronnack (2009) have emphasized mastery in using creativity, vicarious experiences through observing others using creativity, and persuasion from others to use creativity as primary sources of creative self-efficacy.

The importance of creative self-efficacy has also been recognized among preservice teachers in teacher education programs. Yuce et al. (2023), for example, found that creative self-efficacy is a mediating factor linking metacognitive knowledge with openness to diversity and challenge. Thus, as with teachers working in schools, preservice teachers should be prepared to develop creative self-efficacy (Eyup, 2023). One promising approach is to provide preservice teachers with experience in designing lessons (Liu et al., 2024). This approach aligns well with the notions of “teaching as a design science” (Laurillard, 2012) and “teachers as designers” (Henriksen et al., 2020). However, the extant literature remains limited in identifying which elements in such design-based experiences foster preservice teachers' creative self-efficacy. Recognizing this gap, and considering that tracking preservice teachers' creative self-efficacy across courses involving lesson design could provide valuable insights, the following research question was formulated:

- How do preservice teachers develop creative self-efficacy during teacher education programs, and to what extent do courses involving lesson design contribute to this development?

Methodology

Given its purpose of tracking preservice teachers' creative self-efficacy over time, this study employed a longitudinal methodology (White & Arzi, 2005). According to Arzi's (1988) definition, longitudinal studies are those "in which information on the same subjects was collected at least twice, over a time span of at least one calendar year extending beyond the boundaries of a single school year" (p. 23). In this study, preservice teachers' creative self-efficacy was assessed four times across one and a half years within a teacher education program. Throughout this extended period and within an uncontrolled setting, several factors could have influenced preservice teachers' creative self-efficacy, making casual conclusions about whether the intervention led to the expected-for outcomes unlikely (Tytler, 2009). Hence, this paper aims instead to offer descriptive insights into the development of this aspect. The study's context, participants, and procedures are described in the following sections.

Context

This study was conducted within a four-year teacher education program at a university in northern Thailand. It was a dual-degree program in which preservice teachers simultaneously pursued two bachelor's degrees—one in an academic major and one in education. The academic majors included various disciplines in the sciences (e.g., mathematics, physics, chemistry, and biology) and the liberal arts (e.g., Thai language, English language, music, and dancing art). However, as detailed below, this study focused only on preservice teachers majoring in physics and biology, based on convenience sampling. The program is organized into three semesters each year, except for the final year, which has two semesters. Preservice teachers majoring in physics and biology are required to complete 162 and 165 credits, respectively. These credits are categorized into three groups: general education (39 credits), disciplinary education (87–90 credits), and teacher education (36 credits).

General education includes courses considered necessary for all undergraduates, including preservice teachers in all majors. These courses are organized by the university's Division of Educational Services, concentrated in the first two years of the program, and relate to various dimensions of life, such as language, citizenship, health, personality, aesthetics, technology, and multiculturalism. Disciplinary education comprises courses focused on academic disciplines according to preservice teachers' majors. For those majoring in the sciences, these courses are organized by the university's Faculty of Science. While they focus on developing preservice teachers' scientific knowledge, skills, and attitudes within their majors, they also cover related fields such as mathematics. These courses are evenly distributed in the first two years and double in number in the third year. The first semester of the fourth year is devoted to a seminar and an independent study in the major.

Teacher education includes courses designed to meet the criteria for teaching licensure. These courses are organized by the university's School of Education, have similar content regardless of preservice teachers' majors, and are distributed evenly across the first three years of the program. During the first year, preservice teachers take three courses: an introduction to the teaching profession; educational psychology; and the social, economic, and technological influences on education. In the second year, they take a course on educational technology in the first semester and one on curricular structures and lesson planning in the second semester. In the third year, they take two courses: educational measurement, assessment, and research in the first semester and building relationships with parents and communities in the second. In the

first semester of the fourth year, they take a course on teaching rehearsal. The second semester of the fourth year is devoted to a school-based practicum.

Participants

The targeted group for this study comprised all preservice teachers majoring in physics (N = 6: three males and three females) and biology (N = 31: six males and 25 females). These preservice teachers entered the program in 2021. Using convenience sampling, they were selected because they had taken two courses—one on curricular structures and lesson planning and another on teaching rehearsal—taught by the first author during their second and fourth years, respectively. All but one female agreed to participate in the study, providing consent after being informed of its objective (i.e., tracking their professional identities over time) and committing to provide data for the research. However, due to the long duration of the study, only 23 of the 37 participants completed all four measurements: two females majoring in physics and three males and 18 females majoring in biology. Hence, data from these participants were used to address the research question.

Instrument

The unidimensional scale developed by Karwowski (2016) was used to assess participants' creative self-efficacy. This scale was chosen because it is designed to measure creative self-efficacy in general contexts—that is, it does not specify a particular task requiring creativity. Consequently, the term related to teaching was added to the scale, as indicated by square brackets in Table 1, to better align it with the purpose of the present study. The scale used for this study comprised six items. As in the original, each item asked participants to indicate their level of agreement on a 7-point scale ranging from 1 to 7. After the scale was translated from English to Thai, it was reviewed by three experts and revised to ensure equivalence in meaning between the two languages. The scale was then piloted with 39 preservice teachers at another university. The results indicated that the scale demonstrated acceptable reliability, with a Cronbach's alpha of 0.86 exceeding the standard level (0.70).

Table 1
Items Measuring Creative Self-Efficacy

No.	Item
1	I know I can efficiently solve even complicated problems [related to teaching].
2	I trust my creative abilities [in teaching].
3	My imagination and ingenuity distinguishes me from my friends.
4	Many times, I have proven that I can cope with difficult situations [in teaching].
5	I am sure I can deal with problems [in teaching that require] creative thinking.
6	I am good at proposing original solutions to problems [in teaching].

Data Collection

Data were collected at four timepoints: at the beginning and at the end of two courses—one on curricular structures and lesson planning (hereafter Course A) and another on teaching rehearsal (hereafter Course B). At each timepoint, participants spent about five minutes completing the instruments via a digital platform during class sessions. Given this timeframe, descriptions of each course are worth noting. In Course A, participants learned about the goals and structures of the national curriculum, relevant instructional methods, and how to write a lesson plan. Due to its extensive content, Course A was delivered mainly through lectures and discussions. At the end, each participant created a lesson plan for a final assignment. In Course B, participants created their lesson plans on self-selected topics and took turns enacting those lessons with classmates acting as students. Thus, although both courses required participants to be creative in designing their lessons, they varied in whether participants' creativity was put into action.

Data Analysis

Data were analyzed using descriptive and inferential statistics computed in JASP software (Goss-Sampson, 2020). First, the reliability of the instrument was assessed at each timepoint, resulting in Cronbach's alphas of 0.99, 0.99, 0.98, and 0.94 for the four measurements taken in order. Descriptive statistics were then calculated to obtain the means and standard deviations (SDs) of the scores at each timepoint. Subsequently, inferential statistics were used to compare the means across the four timepoints. Although the data were normally distributed according to Shapiro–Wilk tests ($p > .05$), Mauchly's test indicated a violation of the sphericity assumption ($p < .05$). Consequently, the Friedman test was applied instead of repeated-measures ANOVA (Okoye & Hosseini, 2024). When a significant difference was detected, Conover's post-hoc comparisons were conducted to determine which pairs differed significantly. For all inferential analyses, the significance threshold was set at .05.

Results

Using a Likert-type scale comprising six items, this study examined 23 preservice teachers' creative self-efficacy across four timepoints during their second and fourth years in a teacher education program. Upon averaging the scores on the six items (with a full score of 7), descriptive analyses indicated that participants' creative self-efficacy was rather stable during Course A and before Course B, with means of 4.68 (SD = 1.00), 4.70 (SD = 0.97), and 4.54 (SD = 0.94) at the first, second, and third timepoints, respectively (see Figure 1). However, their creative self-efficacy improved to reach a mean of 5.17 (SD = 0.70) after Course B. The Friedman test revealed a significant difference across these timepoints: ($\chi^2(3) = 13.722$, $p = .003$, with an effect size of 0.20 as calculated by Kendall's W. Conover's post-hoc comparisons indicated that only the mean at the fourth timepoint significantly differed from the means at the previous timepoints. The results of these statistical analyses are summarized in Table 2.

Figure 1
Changes in Participants' Creative Self-Efficacy

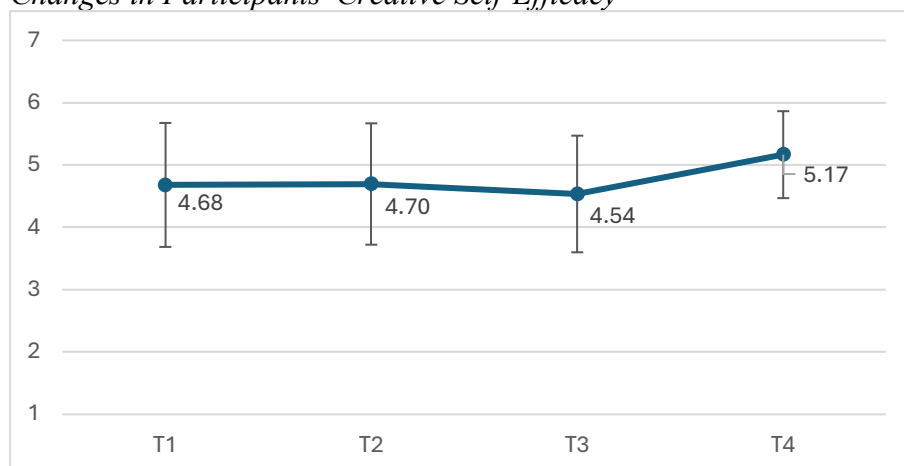


Table 2
Results of Conover's Post-hoc Comparisons

Timepoint	T-Stat	df	W_i	W_j	r_{rb}	p
T1	3.675	66	46.500	75.500	0.729	< .001
T4	2.155	66	58.500	75.500	0.542	.035
T3	3295	66	49.500	75.500	0.852	.002

Discussion

This study explored 23 preservice teachers' creative self-efficacy over the course of a teacher education program in Thailand. Data were collected from these participants using a Likert-type scale at four timepoints during their second and fourth years in the program. Statistical analyses revealed that the participants' creative self-efficacy remained relatively stable over time, except during the period when they took a teaching-methods course. Given the lack of longitudinal research on preservice teachers' creative self-efficacy in teacher education programs, this study provides evidence that such programs may not sufficiently support the development of preservice teachers' creative self-efficacy. The lack of this development may, in turn, limit preservice teachers' ability to foster students' creativity (Cayirdag, 2017) through designing innovative lessons, demonstrating creative behaviors, and establishing environments supportive of creativity (Huang et al., 2019; Li et al., 2017).

Since participants' creative self-efficacy improved across Course B but not across Course A, the differing characteristics of these courses warrant special attention. According to Faikhamta et al. (2018), teacher education programs in Thailand have traditionally followed a theory-into-practice model, in which preservice teachers take university-based courses to acquire theoretical knowledge outlined by the Teachers' Council of Thailand (2019) before applying such knowledge in school-based practicums. Thus, most university-based courses emphasize theory over practice (Rupavijetra & Rupavijetra, 2022). With this emphasis on theoretical learning, university-based courses may not provide preservice teachers with sufficient opportunities to exercise their creativity. Consequently, their creative self-efficacy tends to

remain stable throughout the years of university-based coursework, as demonstrated in this study.

However, Course B showed the potential to promote preservice teachers' creative self-efficacy. This course was a teaching-methods course in which participants designed lessons and engaged in teaching rehearsals. This finding aligns with Liu et al. (2024), who found that preservice teachers' creative self-efficacy improves through experiences in designing instructional materials, courseware, and micro-lessons within a course focused on educational technology. In contrast, Course A, which also involved lesson design, did not appear to produce a similar improvement. The different outcomes of these two courses suggest that preservice teachers' creative self-efficacy is more likely to improve when their lesson designs are implemented rather than merely drafted. This explanation can be further understood through considering the sources of self-efficacy in general and the sources of creative self-efficacy in particular.

According to Bandura (1978), individuals develop self-efficacy for any task through four primary sources: mastery experiences, vicarious experiences, social persuasion, and emotional arousal. Similarly, creative self-efficacy develops mainly through these sources in relation to the use of creativity (Mathisen & Bronnick, 2009). In this regard, design provides a context for applying creativity (Ladachart et al., 2022, 2024). Based on these insights, Course B likely offered participants richer mastery experiences in using creativity to design lessons, more opportunities to observe creativity in classmates' teaching rehearsals, and more creativity-supportive feedback than Course A did. These factors may have contributed to the significant improvement in participants' creative self-efficacy across Course B. By contrast, Course A might have offered participants fewer opportunities to experience or observe creativity in their own and others' teaching practice, which could likely explain the absence of a similar increase in their creative self-efficacy.

Implications

The results of this study have several implications. Given that participants' creative self-efficacy remained relatively stable over time, teacher education programs should place more explicit emphasis on developing this characteristic among preservice teachers. As this study and prior research (Eyup, 2023; Liu et al., 2024) have shown, such development can be promoted by providing preservice teachers with opportunities to use creativity in their coursework. Although courses may differ in how creativity is applied (e.g., designing lessons, using educational technologies, or developing assessments), it is crucial that preservice teachers actively engage in creative practices. By doing so, they are likely to gain mastery and vicarious experiences, as well as receive social persuasion to use creativity. Without these resources, preservice teachers are unlikely to develop creative self-efficacy, which reduces their ability to nurture students' creativity—a human asset that is becoming increasingly essential in the 21st century.

Limitations

This study has several limitations. It was conducted in Thailand with a small group of preservice teachers who were conveniently selected; therefore, the results may not be generalizable to other preservice teachers. Moreover, owing to the longitudinal timeframe, it was not possible to fully control conditions under the investigation, and certain threats to validity (e.g., history, maturation, and retesting) may have affected the results (Ohlund & Yu, n.d.). Additionally, a single scale was used to measure creative self-efficacy. Consequently, the

findings of this study should be regarded as descriptive insights rather than definitive conclusions. Further research is needed to examine preservice teachers' creative self-efficacy in other contexts. The results of such studies would help verify or refute the findings of this study, particularly regarding the stability of creative self-efficacy throughout teacher education programs and the impact of creative practices in lesson design and enactment on its development.

Conclusion

Given the crucial role of teachers' creative self-efficacy in promoting students' creativity, this study employed a Likert-type scale to longitudinally explore how 23 preservice teachers developed their creative self-efficacy during the second and fourth years in a teacher education program in Thailand. The findings revealed that their creative self-efficacy generally remained stable over time, with the exception of a teaching-methods course (Course B) that focused on lesson design and implementation. These results suggest that Course B provided a context for applying creativity in practice. Through this engagement, participants had opportunities to gain mastery and vicarious experiences, as well as social persuasion to use creativity, all of which might have contributed to their development of creative self-efficacy. While further research is needed to verify these insights, the study highlights the importance of offering such opportunities in other courses of teacher education programs for such development.

Acknowledgements

This research was supported by Thailand Science Research and Innovation's Fundamental Fund B.E. 2568 (FF68) through the University of Phayao under Order No. 5117/2567. It was conducted in accordance with the ethical principles approved by the University of Phayao's Human Ethics Committee under code UP-HEC 2.2/044/66.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The authors declare that ChatGPT was used in proofreading and refining the language used in the manuscript. The usage was limited to enhancing the manuscript's readability. The final version of the manuscript was edited by humans. The authors further declare that apart from ChatGPT, no other AI or AI-assisted technologies have been used to modify the manuscript's content. The ideas, design, procedures, findings, analyses, and discussion are originally written and derive from careful and systematic conduct of the research.

References

- Arzi, H. J. (1988). From short- to long-term: Studying science education longitudinally. *Studies in Science Education*, 15(1), 17–53. <https://doi.org/10.1080/03057268808559947>
- Bandura, A. (1978). Self-efficacy: Toward a unifying theory of behavioral change. *Advances in Behaviour Research and Therapy*, 1(4), 139–161. [https://doi.org/10.1016/0146-6402\(78\)90002-4](https://doi.org/10.1016/0146-6402(78)90002-4)
- Bandura, A. (1982). Self-efficacy mechanisms in human agency. *American Psychologist*, 37(2), 122–147. <https://doi.org/10.1037/0003-066X.37.2.122>
- Cayirdag, N. (2017). Creativity fostering teaching: Impact of creative self-efficacy and teacher efficacy. *Educational Sciences: Theory & Practice*, 17(6), 1959–1975. <http://dx.doi.org/10.12738/estp.2017.6.0437>
- Creely, E., Henriksen, D., Crawford, R., & Henderson, M. (2021). Exploring creative risk-taking and productive failure in classroom practice: A case study of the perceived self-efficacy and agency of teachers at one school. *Thinking Skills and Creativity*, 42, 100951. <https://doi.org/10.1016/j.tsc.2021.100951>
- Eyup, B. (2023). The effect of creative drama on the creative self-efficacy of pre-service teachers. *Journal of Pedagogical Research*, 7(4), 48–74. <https://doi.org/10.33902/JPR.202321418>
- Faikhamta, C., Ketsing, J., Tanak, A., & Chamrat, S. (2018). Science teacher education in Thailand: A challenging journey. *Asia-Pacific Science Education*, 4(1), 1–18. <https://doi.org/10.1186/s41029-018-0021-8>
- Fasko, D. (2001). Education and creativity. *Creativity Research Journal*, 13(3–4), 317–327. https://doi.org/10.1207/S15326934CRJ1334_09
- Goss-Sampson, M. A. (2020). *Statistical analysis in JASP: A guide for students*. <https://jasp-stats.org/wp-content/uploads/2020/11/Statistical-Analysis-in-JASP-A-Students-Guide-v14-Nov2020.pdf>
- Henriksen, D., Gretter, S., & Richardson, C. (2020). Design thinking and the practicing teacher: Addressing problems of practice in teacher education. *Teaching Education*, 31(2), 209–229. <https://doi.org/10.1080/10476210.2018.1531841>
- Huang, Z., Lee, J. C., & Yang, X. (2019). What really counts? Investigating the effects of creative role identity and self-efficacy on teachers' attitudes toward the implementation of teaching for creativity. *Teaching and Teacher Education*, 84, 57–65. <https://doi.org/10.1016/j.tate.2019.04.017>
- Jordan, M. E. (2016). Teaching as designing: Preparing pre-service teachers for adaptive teaching. *Theory into Practice*, 55(3), 197–206. <https://doi.org/10.1080/00405841.2016.1176812>

- Karwowski, M. (2016). The dynamics of creative self-concept: Changes and reciprocal relations between creative self-efficacy and creative personal identity. *Creativity Research Journal*, 28(1), 99–104. <https://doi.org/10.1080/10400419.2016.1125254>
- Kelley, T., & Kelley, D. (2013). *Creative confidence: Unleashing the creative potential within us all*. William Collins.
- Ladachart, L., Cholsin, J., Kwanpet, S., Teerapanpong, R., Dessi, A., Phuangsuwan, L., & Phothong, W. (2022). Ninth-grade students' perceptions on the design-thinking mindset in the context of reverse engineering. *International Journal of Technology and Design Education*, 32(5), 2445–2465. <https://doi.org/10.1007/s10798-021-09701-6>
- Ladachart, L., Radchanet, V., Phothong, W., & Ladachart, L. (2024). Nurturing middle school students' creative confidence through design-based learning. *Research in Science and Technological Education*, 42(4), 1250–1263. <https://doi.org/10.1080/02635143.2023.2221199>
- Laurillard, D. (2012). *Teaching as a design science: Building pedagogical patterns for learning and technology*. Routledge.
- Li, M., Lin, Y., Liu, L., & Wang, Z. (2017). Proactive personality and innovative work behavior: The mediating effects of affective states and creative self-efficacy in teachers. *Current Psychology*, 36(4), 697–706. <https://doi.org/10.1007/s12144-016-9457-8>
- Liu, X., Gu, J., & Xu, J. (2024). The impact of the design thinking model on pre-service teachers' creative self-efficacy, inventive problem-solving skills, and technology-related motivation. *International Journal of Technology and Design Education*, 34(1), 167–190. <https://doi.org/10.1007/s10798-023-09809-x>
- Mathisen, G. E., & Bronnick, K. S. (2009). Creative self-efficacy: An intervention study. *International Journal of Educational Research*, 48(1), 21–29. <https://doi.org/10.1016/j.ijer.2009.02.009>
- Mellou, E. (1996). Can creativity be nurtured in young children? *Early Child Development and Care*, 119(1), 119–130. <https://doi.org/10.1080/0300443961190109>
- Nemerzitski, S., & Heinla, E. (2020). Teachers' creative self-efficacy, self-esteem, and creative teaching in Estonia: A framework for understanding teachers' creativity-supportive behavior. *Creativity: Theories–Research–Applications*, 7(1), 183–207. <https://doi.org/10.2478/ctra-2020-0011>
- Newton, L. D., & Newton, D. P. (2014). Creativity in 21st-century education. *Prospects*, 44(4), 575–589. <https://doi.org/10.1007/s11125-014-9322-1>
- Noddings, N. (2013). Standardized curriculum and loss of creativity. *Theory into Practice*, 52(3), 210–215. <https://doi.org/10.1080/00405841.2013.804315>

- Ohlund, B., & Yu, C. (n.d.). *Threats to validity of research design*.
<https://web.pdx.edu/~stipakb/download/PA555/ResearchDesign.html>
- Okoye, K., & Hosseini, S. (2024). Choosing between parametric and non-parametric tests in statistical data analysis. In K. Okoye, & S. Hosseini (Eds.), *R programming: Statistical data analysis research* (pp. 87–98). Springer. https://doi.org/10.1007/978-981-97-3385-9_4
- Paek, S. H., & Summers, S. E. (2019). The indirect effect of teachers' creative mindsets on teaching creativity. *Journal of Creative Behavior*, 53(3), 298–311.
<https://doi.org/10.1002/jocb.180>
- Puente-Diaz, R. (2016). Creative self-efficacy: An exploration of its antecedents, consequences, and applied implications. *The Journal of Psychology*, 15(2), 175–195.
<https://doi.org/10.1080/00223980.2015.1051498>
- Rupavijetra, P., & Rupavijetra, P. (2022). Changes in teacher education requirements in Thailand in the twenty-first century. In M. S. Khine & Y. Liu (Eds.), *Handbook of research on teacher education: Innovations and practices in Asia* (pp. 607–632). Springer. https://doi.org/10.1007/978-981-16-9785-2_30
- Soh, K. (2017). Fostering student creativity through teacher behaviors. *Thinking Skills and Creativity*, 23, 58–66. <https://doi.org/10.1016/j.tsc.2016.11.002>
- Teachers' Council of Thailand. (2019). *Regulation of the Teachers' Council of Thailand: On professional standards (No. 4), B.E. 2562 (2019)*. <https://news.ksp.or.th/en/wp-content/uploads/2024/11/4RegulationNo4.pdf>
- Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Its potential antecedents and relationship to creative performance. *Academy of Management Journal*, 45(6), 1137–1148. <https://doi.org/10.2307/3069429>
- Treffinger, D. J. (1993). Creative problem solving: Overview and educational implications. *Educational Psychology Review*, 7(3), 301–312. <https://doi.org/10.1007/BF02213375>
- Tytler, R. (2009). Longitudinal studies into science learning. In M. C. Shelley II, L. D. Yore, & B. Hand (Eds.), *Quality research in literacy and science education: International perspectives and gold standards* (pp. 83–105). Springer. https://doi.org/10.1007/978-1-4020-8427-0_5
- Unal, A., & Tasar, M. F. (2021). A systematic review of creative self-efficacy literature in education. *Eurasia Journal of Mathematics, Science and Technology Education*, 17(12), em2050. <https://doi.org/10.29333/ejmste/11404>
- White, R. T., & Arzi, H. J. (2005). Longitudinal studies: Designs, validity, practicality, and value. *Research in Science Education*, 35(1), 137–149.
<https://doi.org/10.1007/s11165-004-3437-y>

Yuce, E., Kruk, M., & Derakhshan, A. (2023). Metacognitive knowledge and openness to diversity and challenge among Turkish pre-service EFL teachers: The mediating role of creative self-efficacy. *Thinking Skills and Creativity*, 50, 101386.
<https://doi.org/10.1016/j.tsc.2023.101386>

Contact email: ladapa23@gmail.com