



Next Normal Teaching and Learning:
Perceptions and Readiness of Pre-Service
Teachers to Promote Critical and Creative
Thinking

Pornpisut Duangngern, Parama Kwangmuang and
Lan Thi Nguyen

EasyChair preprints are intended for rapid
dissemination of research results and are
integrated with the rest of EasyChair.

July 8, 2023

Next Normal Teaching and Learning: Perceptions and Readiness of Pre-Service Teachers to Promote Critical and Creative Thinking

Pornpisut Duangngern, Parama Kwangmuang*,
Lan Thi Nguyen

Abstract

This study aimed to investigate how pre-service teachers enrolling in Bachelor of Education programs perceived and were prepared for critical and creative thinking, as well as the use of technology based on student ability. The research data set was obtained from self-assessment questionnaire regarding how pre-service teachers perceived critical and creative thinking and the readiness of technology usability. The descriptive statistics from an online survey show that all respondents' level of readiness for teaching critical and creative thinking is at Level 2 and the pre-service teachers tend to integrate a variety of technologies into classroom. It was inferred that the pre-service teachers had challenges in using digital tools as a teaching and learning tool in the classroom. Notwithstanding these challenges, pre-service teacher professional development programs should promote stronger curricula that address critical and creative thinking as well as the integration of technology to enable pre-service teachers to become a powerful agent for promoting change in the classroom.

Keywords: Critical and Creative Thinking, Pre-service Teachers, Perceptions, Readiness

1 Introduction

Advances in science and technology had a big impact on how pre-service preparation programs developed. There were arguments that there are risks in training instructors with lots of theory and little practice have raised concerns [1]. Education must be updated to ensure that future educators can integrate students' prior knowledge with new meaningful learning, pose questions, identify and justify ideas, articulating and designing their lessons with equity in mind, creating equitable learning environments to meet students' individual learning needs, and co-constructing knowledge and learning experiences with their students [2][3][4].

One of the objectives of the teacher preparation system around the world is to enable pre-service teachers think critically and creatively [5]. While this was going on, reports from the 2018-2020 PISA, WEC, and Critical Thinking Global Report indicated that most teacher program in higher education institutions lacked the resources to equip and prepare student teachers for the unprecedented shift to 21st-century personal skills and digital skills [6][7][8]. This means that the ability to apply, design and cope with challenges in our learning environment is only one talent required for the teaching profession [9]. Hoy and Spero [10] explained that for the long-term growth of a teacher's effectiveness, the initial years of teaching may be crucial, and it started with the self-perception of readiness to learn and self-efficacy towards readiness for change [11]. Pre-service teachers must be conscious of this need during their pre-service teacher preparation.

* Lecture, Department of Innovation, Technology and Learning Science. Faculty of Education, Khon Kaen University

As the level of technology use in preservice teachers' courses depends on how confident they are in their ability to use it [12][13]. Moreover, understanding the present teaching and learning management in the Bachelor of Education Curriculum can also support pre-service teachers find innovative solutions and advance their development of critical and creative thinking abilities. Results of the study may profit the Teacher Education Institutions as it may embrace authentic practices and reflects the needs of pre-service teachers on specific teaching critical and creative thinker characteristics.

2 Research Questions

This study aimed at looking closer at the concept of perceptions and readiness from trainees' perspective based on their self-assessment on investigating the extent to which students perceived critical and creative thinking and the readiness of information and communication technology utilization. This study answered the following questions:

- 1) How do the pre-service teachers perceive the capability of critical and creative thinking?
- 2) What are the pre-service teachers' perceptions and readiness about the use of technology?

3 Literature review

Next Normal Teaching and Learning

The ability to address a variety of challenges has been emerging from five-year innovative teaching adjustments brought on by the pandemic [14], which can increase student participation and engagement in the new standard for teaching and learning. Teachers and students quickly switched from in-person or traditional classroom experiences to online communication and technology-based teaching and learning environment [15][16]. The adoption of technology-based teaching techniques in classrooms has been a quick reaction to necessity [17]. New innovative teaching and learning methods and strategies have already been adopted as a new trend which accelerated on account of pandemic, as [18] discussed. With access to technology, educators gained deep insights toward the new way of learning. Students engage in a learning process where they get to practice their cognitive processes by questioning, seeking, planning, brainstorming, getting feedback, predicting, revising, showing development, and reflecting [19]. To drive a more sustainable future, it is time for teacher preparation education to recondition, remodel, and reposition itself to ensure that universities promote effective, efficient teaching and learning procedures in the global online learning environment that works for every learner [20][21]. The idea of fostering pedagogical strategies and approaches for teachers must be included into the innovation of teaching critical and creative thinking in the classroom in order to prepare students to develop higher thinking [22]. Moreover, with Can-Do Statement [23], it becomes obvious that an online environment can foster the development of critical and creative thinking. [24] from connecting with pre-service teachers' theory and standards of teacher training that teacher preparation programs must incorporate pre-service teachers' prior knowledge and understanding, developing new ideas of thought, their theoretical learning management settings, and their effective teaching and learning that future teachers must be facing in the new normal era.

Critical and Creative Thinking for Pre-Service Teachers

Critical and creative thinking are two interwoven cognitive processes that occur back and forth in kids' brains, they cannot be separated [25][26]. Future teachers with the abilities to think critically and creatively affect how students will behave in these unforeseen circumstances [27][28]. During a seamless, unified, and integrated process, students who possess these abilities can evaluate and convey ideas, make a variety of forecasts, and create new perspectives and results while also asking and responding to a variety of difficult questions [29][30][31]. This self-assessment adopted from Critical and Creative Thinking Learning Continuum Scope from Australian Curriculum (ACARA) was divided into four sub-elements which are: 1) inquiring – identifying, exploring, organizing information and ideas; 2) generating ideas, possibilities, and actions; 3) reflecting on thinking and processes; 4) analyzing, synthesizing, and evaluating reasoning and procedures. Each adapted sub-element comprised of seven levels of can-do statements regarding on critical and creative thinking sub-skills as shown in Appendix A.

Perceptions and Readiness for Pre-Service Teachers

A positive preparation in the right direction is the student's capacity for change and adaptability to next normal of instruction. The readiness of pre-service teachers, how they believe in themselves and the effective use of technology, are one of the most significant aspects in this context [32][33]. Perceptions and readiness include a widely acknowledged of students' competencies, qualities, and their personal satisfaction as they are becoming aware of accessibility of objects or their confidence in using technological tools [9][34]. A perceptual set or readiness involves the aspects of observing, recognizing, discriminating, justifying, choosing designing and identify their own strengths and weaknesses [35][36]. Moreover, pre-service teachers who act as change agents for their students must possess the necessary technological abilities that come from their regular usage of technology [37]. Barton and Haydn [38] found a positive correlation between two training preparation elements and the participants' attitudes toward their teaching and use of technology. These two relationships were: (1) the participants' assessment of their own technological proficiency; and (2) the degree of mentor support for technology use in the classroom. For this reason, it is evident that the educational faculties' mission is more important than that of other faculties. To successfully complete the mission, education faculties must prepare and provide the best pre-service teacher education program that keep up with global innovation and change [39][40]. It is necessary for pre-service teachers to acquire various skills, such as inventive, contemporary, critical and creative thinking and knowledge before beginning their teaching careers, which will enable them to shape the future by providing available education to next generations who are valuable to society.

4 Research Methodology

This study used a quantitative method by using a questionnaire to survey the pre-service teachers' perceptions and readiness. The data collection allowed them to reflect on the learning experience to reveal their self-assessment of their perceived critical and creative thinking, utilized technology as a future teacher. Additionally, this study still would take into consideration a wider scope of aspects involved in teacher curriculum.

Population and Sampling

The target population for the study comprised four thousand and fifty (4,050) of four-year undergraduate pre-service teachers pursuing Bachelor of Education in 11 Rajabhat Universities (Northeastern group), Thailand. They were targeted because they will enroll in the Internship Course in coming semester. The assessable population selected from 20 majors.

The samples were chosen based on the formula of Yamane (1976) with the degree of error expected at ($e = .05$) and the Proportional Stratified Random Sampling was performed according to the proportion of population size in each university. As a result, 364 samples selected from pre-service teachers enrolled in the fourth year.

Research Instrument

The questionnaire was divided into two areas namely:

1) Readiness and guidelines for educational management that promotes critical and creative thinking for teaching professional students. Regarding this, respondents were asked to indicate their level of agreement about their readiness and perception on seven can-do statements of perception and readiness level was adapted from Critical and Creative Thinking Learning Continuum Scope from Australian Curriculum [23] with 12 critical and creative thinking items; and the questionnaires had been developed and assessed by three experts. The Index of Concordance (IOC) was between 0.66–1.00 indicating that the developed questionnaire was appropriately consistent can be used to collect data.

2) The readiness and ability to use educational technology – Participants showed their opinions of their use and perceptions of technology use, which included the use of several technologies through 29 items. For example, the ability to use video conferencing tools used in online learning of students, the ability to use interactive tools for classroom engagement and the ability to use collaboration tools. The tool used was a questionnaire created by the researcher, verified its content validity by three experts. The questionnaire received IOC between 0.67-1.00 and the reliability at 0.78.

Data Collection

An online survey was conducted to gather information to assess perception and readiness levels. Respondents received the questionnaire through Google forms. From the online survey, a total of 364 questionnaires were received.

Data Analysis

The collected data was divided into two parts and analyzed using frequencies, percentages (%), averages (\bar{x}) and standard deviations (S.D.). The data from students' self-assessment indicated the level of perceptions and readiness to which they assessed their own performance with the provided can-do statements. The can-do statement score range derived and adapted from Wiersma, 2000 [41] showed how they assessed their own critical and creative thinking. The score range was applied and the results were interpreted as follows: Cannot-Do Level: Not applicable, Level 1 (1.00-1.82), Level 2 (1.82-2.65), Level 3 (2.66-3.48), Level 4 (3.49-4.31), Level 5 (4.32-5.14), and Level 6 (5.15-6.00).

5 Research results

The findings are divided into two parts. The first part focuses on perceptions and readiness of 364 pre-service teachers to promote critical and creative thinking in the classroom. The second part reveals their perceptions of the capability to use and integrate technology into the lessons. The results for both results of data are as presented below.

Perception and readiness to promote critical and creative thinking.

Table 1 Pre-service teachers' self-assessment on perception and readiness to promote critical and creative thinking.

Can-Do Statement	Cannot-Do	Level 1 (%)	Level 2 (%)	Level 3 (%)	Level 4 (%)	Level 5 (%)	Level 6 (%)	\bar{X}
Sub-element: Inquiring – identifying, exploring, and organizing information and ideas								

Can-Do Statement	Cannot-Do	Level 1 (%)	Level 2 (%)	Level 3 (%)	Level 4 (%)	Level 5 (%)	Level 6 (%)	\bar{X}
1) Pose questions	13 (3.57)	162 (44.51)	121 (33.24)	27 (7.42)	21 (5.77)	10 (2.75)	10 (2.75)	1.86
2) Identify and clarify information and ideas	14 (3.85)	127 (34.89)	93 (25.55)	76 (20.88)	28 (7.69)	20 (5.49)	6 (1.65)	2.16
3) Organize and process information	11 (3.02)	168 (46.15)	92 (25.27)	38 (10.44)	18 (4.95)	23 (6.32)	14 (3.85)	2.02
Sub-element: Generating ideas, possibilities, and actions								
4) Imagine possibilities and connect ideas	12 (9.30)	148 (40.66)	108 (29.67)	45 (12.36)	23 (6.32)	18 (4.95)	10 (2.75)	2.03
5) Consider alternatives	11 (3.02)	129 (35.44)	142 (39.01)	19 (5.22)	19 (5.22)	18 (4.95)	26 (7.14)	2.17
6) Seek solutions and put ideas into action	3 (0.82)	128 (35.16)	96 (26.37)	91 (25.00)	11 (3.02)	16 (4.40)	19 (5.22)	2.28
Sub-element: Reflecting on thinking and processes								
7) Think about thinking (meta-cognition)	6 (1.65)	133 (36.54)	91 (25.00)	72 (19.78)	28 (7.69)	19 (5.22)	15 (4.12)	2.27
8) Reflect on processes	6 (1.65)	120 (32.97)	134 (36.81)	47 (12.91)	33 (9.07)	17 (4.67)	7 (1.92)	2.16
9) Transfer knowledge into new contexts	21 (5.77)	105 (28.85)	101 (27.75)	72 (19.78)	26 (7.14)	28 (7.69)	11 (3.02)	2.29
Sub-element: Analyzing, synthesizing and evaluating reasoning and procedures								
10) Apply logic and reasoning	14 (3.85)	176 (48.35)	80 (21.98)	43 (11.81)	20 (5.49)	11 (3.02)	20 (5.49)	1.97
11) Draw conclusions and design a course of action	10 (2.75)	156 (42.86)	109 (29.95)	36 (9.89)	30 (8.24)	11 (3.02)	12 (3.30)	2.00
12) Evaluate procedures and outcomes	10 (2.75)	133 (36.54)	123 (33.79)	47 (12.91)	20 (5.49)	17 (4.67)	14 (3.85)	2.11

The self-assessment results in Table 1 showed that Pose questions in Inquiring – identifying, exploring, and organizing information and ideas, pre-service teachers accounted for the highest percentage at Level 1 with 44.51%, followed by 33.24% at Level 2; meanwhile, the level 6 had the lowest percentage at 2.75%. Similar to Identify and Clarify Information and Ideas, Level 1 respondents made up the biggest percentage (34.89%), followed by Level 2 respondents (25.55%), and Level 6 respondents (1.65%). Examining each of its sub-elements in 'Generating ideas, possibilities, and actions'. The findings revealed that Level 1 had the highest percentage of Imagine possibilities and link ideas (40.66%), followed by Level 2 (29.67%), and Level 6 had the lowest percentage (2.75%). Furthermore, Level 2 (39.01%) and Level 1 (35.44%) had the largest percentages of "Consider Alternatives," while 11% of pre-service teachers reported being in the "Cannot-Do" level. The level with the highest percentage for the sub-element "Seek solutions and put ideas into action" was Level 1 (35.16%), followed by Level 2 with a percentage of 26.37. The study "Think about thinking (meta-cognition)" found that Level 1 had the highest percentage (36.54%), followed by Level 2 (25%). Moreover, pre-service teachers made up the largest number at Level 2 (368.1%), followed by Level 1 (32.97%), in Reflect on Processes. For the sub-element of Transfer knowledge into new contexts, the maximum percentage (28.85%) and the lowest percentage (27.75%) were at Level 1 and Level 2, respectively. Unexpectedly, the Cannot-Do Level was 5.77%. The last sub-element, Analyzing, Synthesizing and Evaluating Reasoning and Procedures, found that the respondents for Apply Logic and

Reasoning at Level 1 accounted for the highest proportion, 48.35, followed by 21.98 at Level 2. The percentage for Draw conclusions and design a course of action was 42.86 at Level 1 and 29.95 at Level 2, with Level 1 having the highest proportion. According to the sub-element "Evaluate procedures and outcomes," pre-service teachers accounted for the highest percentage at Level 1 (36.54%), followed by Level 2 (33.79%), while the percentage at "Cannot-Do" level was at 2.75%.

From these results, the data in Figure 1. show that slightly more than 40% of the students self-assessed their perception and readiness at Level 2. These findings are consistent with research by [42][43], which found that students expressed low levels of thinking abilities, as well as a lack of learning innovation in terms of instructional strategy and media that can teach students to think logically and creatively.

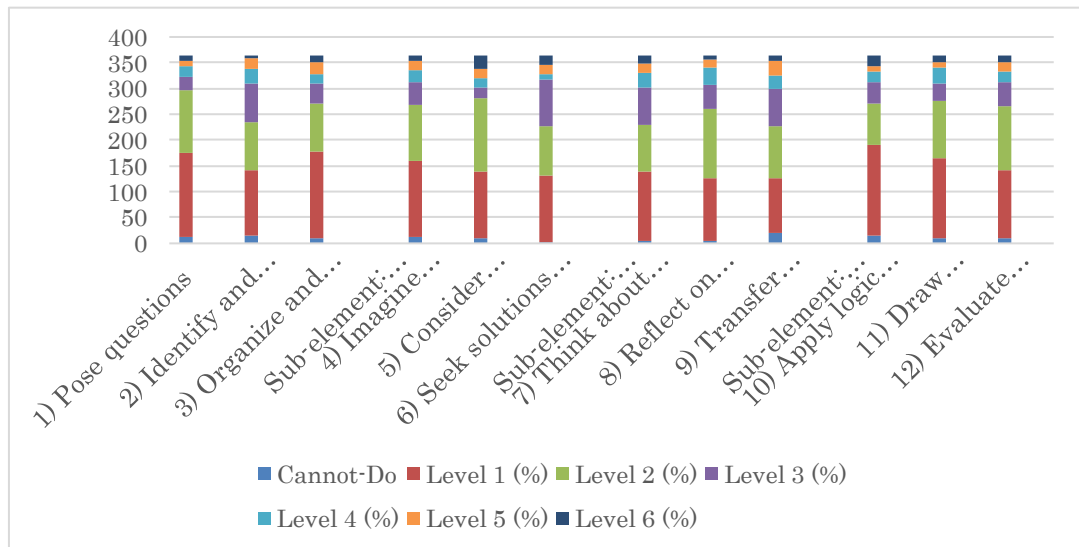


Figure 1: Perception and readiness to promote critical and creative thinking

The readiness and the use of technology

Based on the statistical data, it found that most pre-service teachers have computer skills experiences from 6-10 years with 37.90%, and more than 10 years with 32.97%. In terms of the digital devices possession, the results showed that all pre-service teachers have their own smart phones and iPad; meanwhile, the personal computer possession ratio made up 90.38%. For the purpose to assess pre-service teachers' technological aptitude. Based on their use and perceptions, Respondents selected multiple answers from a predetermined list of options.

Table 2 The ability to use technologies.

The Ability to Use Technologies							
Learning Management System (LMS)	Response/Percentage (%)	Video Conferencing Tools	Response/Percentage (%)	Communication Tools	Response/Percentage (%)	Presentation Tools	Response/Percentage (%)
Google Classroom	282 (77.47)	Google Meet	188 (51.65)	Microsoft Teams	15 (4.12)	PowerPoint and Google Slides	216 (59.34)
Microsoft Teams	54 (14.83)	Microsoft Teams	45 (12.36)	Email	25 (6.87)	Prezi	4 (1.10)
Blackboard	0	ZOOM	102 (28.02)	Facebook	113 (31.04)	Canva	132 (36.26)

The Ability to Use Technologies							
Moodle	0	Facebook Live or YouTube Live	10 (2.74)	Line	159 (43.68)	Visme	0
Discord	15 (4.12)	Webex Meet	10 (2.74)	Discord	43 (11.81)	Keynote	12 (3.30)
University E-Learning	13 (3.57)	Skype	6 (1.64)	WeChat	9 (2.47)	Slide Layouts	0
Have a limit usability	0	Have a limit usability	3 (0.82)	Have a limit usability	0	Have a limit usability	0
Interactive Tools for Classroom Engagement	Response/Percentage (%)	Collaboration Tools	Response/Percentage (%)	Digital Notebook	Response/Percentage (%)	Word processor	Response/Percentage (%)
Kahoot	152 (41.76)	Miro	45 (12.36)	GoodNotes	154 (42.30)	Google Docs	121 (33.24)
Gimkit	50 (13.74)	Jamboard	91 (25.00)	Clickable notebook	12 (3.30)	Microsoft Word Online	231 (63.46)
Socrative	12 (3.30)	Whiteboard	12 (3.30)	Notability	28 (7.69)	Zoho Writer	0
Padlet	104 (28.57)	Collaboard	8 (2.20)	OneNote	34 (9.34)	ON-LYOFFICE	0
Mentimeter	23 (6.31)	Trello	3 (0.82)	Google Keep	86 (23.62)	Apple Page	12 (3.30)
Quizlet	18 (4.95)	Flipgrid	77 (21.15)	Evernote	33 (9.06)	Open Office Writer	0
Have a limit usability	5 (1.37)	Have a limit usability	128 (35.16)	Have a limit usability	17 (4.67)	Have a limit usability	0

According to the ability to use technologies in Table 2, 77.47% of pre-service teachers favored Google Classroom and evaluated their usability. For the ability to use Video Conference Tools used in online learning found that the majority of students (51.65%) can use Google Meet, whereas 0.82% have a limit usability. As for Presentation Tools, 59.34% indicated the ability to use them. The highest utility of the Interactive Tools for classroom engagement was Kahoot (41.76%) considering that there was 1.37% of samples did not use them.

Another finding indicated that 35.16% (128 samples) did not use any Collaboration Tools. In addition, 42.30% of users of Digital Notebook were more likely to utilize GoodNotes. The word processor that was used the most overall, according to an analysis, was Microsoft Word Online (63.46%).

Also, this study concentrated on the samples' usage of technology. The most popular video creation tools for teachers and students were Screencastify (63.9%) and Kinemaster (50.8%). On the other hand, their usability was limited when it came to animation, audio recording, and editing tools. 63.9% of web design apps and websites used Google Sites, and 93.4% of searches used Google Search.

In terms of the utilization of games and online assessment tools, Kahoot received the highest usage percentage (55.7%). Like Canvas, 39.3% of online learning platforms were utilized. The results of this study support the findings of [44] that pre-service teachers lacked the technical skills needed to use technology effectively for classroom instruction because of the lack of technical training which is missing from the curriculum for training. It was suggested that technology in courses brought the awareness of how the benefits of technology in the classroom affects teachers' professional careers [45]. The quality of educational activities in the classroom and the development of curricula were more likely to be impacted by the inclusion of technology in teacher education programs [46][47].

Conclusion and Discussion

As shown above, there were two self-assessment survey that were significantly different. Inferences could be drawn based on the evidence presented by this study's findings. First, it is indicated by the average perception and readiness among 364 pre-service teachers from 11 Rajabhat University (Northeastern group). The outcomes of the pre-service teachers' self-assessment were at Level 2 for every sub-element. This could mean that, particularly in higher education, where it enhances university students' ability to find job in the future. Future educators should have access to thinking approaches to develop instructional strategies for using skills in unexpected contexts [48][49]. Additionally, pre-service teachers also need to be aware of 21st century thinking capacity.

Second, in general, it can be concluded that teacher trainees perceive themselves that preservice teachers need to have technology knowledge. Champa et al. [50] examined teacher readiness for ICT integration into the teaching and learning procedure and quantified it using three factors: ICT attitude, ICT training, and ICT knowledge. The researchers were recognized that pre-service teachers used technology more frequently. Even though there were some of the main barriers to the implementation of digital tools in classrooms. Some of the barriers identified in this study correspond to the use of Interactive Tools for Classroom Engagement, Collaboration Tools, and Video Creation Tools. The respondents' use of technology appears to be rather limited. They don't employ a wide variety of technology. For instance, people frequently favor Kahoot over other interactive tools when it comes to class activities. However, this might be a factor in the reported changes of students' perception and readiness toward utilizing technology to promote critical and creative thinking in the classroom. Previous studies recommended that the training ought to start in provide technology preparation programs at the pre-service level to enforce the attitudes of pre-service teachers regarding the significance of integrating technology and digital tool; varied according to their level of their expertise [51][52][53].

In conclusion, this research showed that early technology use can promote the development of cognitive skills [54]. Technology must continue to be used and integrated in the classroom. Beyond the fact that it is a requirement for learning, there are numerous benefits that teachers and students can learn from.

3) Suggestion

Based on the results obtained in the study, perception and readiness of pre-service teachers is most impressionable in teaching and the early years of teaching. Teacher preparation programs must examine how ready their pre-service teachers are to perform and how confidently prepared they think they are. To achieve quality education, teacher preparation programs should place great emphasis in training teachers who are able to integrate technology in teaching and learning to promote higher order thinking skills in the next normal era. Therefore, the researcher suggests considering developing models by designing learning innovation that would require more in-depth practical skill training for pre-service teachers.

Acknowledgement

This work was supported by Innovation and Cognitive Technology Research Center, Faculty of Education, Khon Kaen University. Moreover, the authors would like to acknowledge all the pre-service teachers who volunteered to participate in this study as respondents to the research tools.

References

- [1] Ramirez IAL. Teaching Preparedness of Pre-Service Teachers: Perception to Practice. *International Journal of Studies in Education and Science* [cited 2023 Jan 12]. 2020;1(1):15–35; <https://doi.org/10.46328/ijses.6>.
- [2] Warren JM, Robinson GG. A Consensual Inquiry of Teachers' Responses to Classroom Situations: Implications for School Counselors. *Journal of Educational Research and Practice*. 2018 Feb 13;8(1).
- [3] Esteban-Guitart M, Monreal-Bosch P, Palma M, González-Ceballos I. Sustaining Students' Identities within the Context of Participatory Culture. Designing, Implementing and Evaluation an Interactive Learning Activity. *Sustainability*. 2020 Jun 15;12(12):4870.
- [4] Bamrungsin P, Khampirat B. Improving Professional Skills of Pre-Service Teachers Using Online Training: Applying Work-Integrated Learning Approaches through a Quasi-Experimental Study. *Sustainability*. 2022 Apr 6;14(7):4362.
- [5] Dummett P, Hughes J. *Critical thinking in ELT: a working model for the classroom*. Boston, Ma: Cengage Learning, Inc; 2019.
- [6] OECD. *PISA 2018 Results*. Vol. 1, PISA. OECD; 2019.
- [7] Schwab K, Zahidi S. *The Future of Jobs Report 2020* [Internet]. World Economic Forum. 2020 Oct. Available from: https://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf
- [8] The Critical Thinking Global Report | Gunung.org [Internet]. 2020. Available from: <https://www.gunung.org/critical-thinking-global-report/>.
- [9] Straková Z. The perception of readiness for teaching profession: a case of pre-service trainees. *Journal of Language and Cultural Education*. 2015 Jan 1;3(1):32–42.
- [10] Hoy AW, Spero RB. Changes in teacher efficacy during the early years of teaching: A comparison of four measures. *Teaching and Teacher Education*. 2005 May;21(4):343–56.
- [11] Alfaiz A, Rafiola RH, Hariko R, Zulfikar Z. Condition and Shaping of Student Personality in Educational Process Through Transpersonal Psychology Perspective [cited 2023 Apr 9]. p. 1–4. Available from: <https://www.atlantis-press.com/proceedings/icet-17/25883491>.
- [12] Agustin RR, Liliyasi L. Investigating Pre-Service Science Teachers (PSTs)' Technological Pedagogical Content Knowledge Through Extended Content Representation (CoRe). *Journal of Physics: Conference Series*. 2017 Feb; 812:012103.
- [13] Watson JH, Rockinson-Szapkiw A. Predicting preservice teachers' intention to use technology-enabled learning. *Computers & Education*. 2021 Jul; 168:104207.
- [14] Howe ER, Watson GC. Finding Our Way Through a Pandemic: Teaching in Alternate Modes of Delivery. *Frontiers in Education*. 2021 May 24;6.
- [15] Tumbull, D., Chugh, R. & Luck, J. Transitioning to E-Learning during the COVID-19 pandemic: How have Higher Education Institutions responded to the challenge?. *Educ Inf Technol* 26, 6401–6419 (2021); <https://doi.org/10.1007/s10639-021-10633-w>.
- [16] Zhang Y. The Effect of on Educational Technology on EFL Learners' Self-Efficacy. *Frontiers in Psychology*. 2022 Apr 13;13.

- [17] Glantz E, Gamrat C, Lenze L, Bardzell J. Improved Student Engagement in Higher Education's Next Normal. *er.educause.edu*. 2021. Available from: <https://er.educause.edu/articles/2021/3/improved-student-engagement-in-higher-educations-next-normal>.
- [18] Bozkurt A, Sharma RC. Emergency remote teaching in a time of global crisis due to CoronaVirus pandemic. *AsianJDE* [Internet]. 2020Apr.30 [cited 2023Apr.11];15(1):i-vi. Available from: <https://www.asianjde.com/ojs/index.php/AsianJDE/article/view/447>.
- [19] Becky Green. Shifting From Lessons to Learning Experiences: Designing for Deeper Learning [Internet]. GOA. [cited 2023 Apr 2]. Available from: <https://globalonlineacademy.org/in-sights/articles/shifting-from-lessons-to-learning-experiences-designing-for-deeper-learning>.
- [20] Hoi VN. Online Learning Environments and Student Engagement: Meeting the Psychological Needs of Learners during the COVID-19 Pandemic. *Global Perspectives on Educational Innovations for Emergency Situations*. 2022;253–63.
- [21] Pérez-Gracia E, Serrano-Rodríguez R, Pontes-Pedrajas A. Building EFL Preservice Teachers' Professional Identity: Does Gender Matter? Profile: Issues in Teachers' Professional Development. 2022 Jul 27;24(2):117–31.
- [22] Vincent-Lancrin S, González-Sancho C, Bouckaert M, de Luca F, Fernández-Barrerra M, Jacotin G, et al. Fostering students' creativity and critical thinking: What it means in school. OECD; 2019.
- [23] Australian Curriculum and Assessment & Reporting Authority (ACARA). (2020b). The Critical and Creative Thinking Learning Continuum. [cited 2023 Jan 15]; from <https://www.australiancurriculum.edu.au/media/1072/generalcapabilities-creative-and-critical-thinking-learning-continuum.pdf>.
- [24] Nussbaum, M., Barahona, C., Rodriguez, F. et al. Taking critical thinking, creativity and grit online. *Education Tech Research Dev* 69, 201–206 (2021). <https://doi.org/10.1007/s11423-020-09867-1>.
- [25] Paul R. *Critical Thinking*. Sonoma State University, Center for Critical Thinking & Moral Critique; 1993.
- [26] Paul R, Elder L, Amazon.com (Firm. *Critical thinking: tools for taking charge of your professional and personal life*. Upper Saddle River, N.J.: Pearson Education; 2002.
- [27] Kuan C, Tsai. Being a Critical and Creative Thinker: A Balanced Thinking Mode. *Asian Journal of Humanities and Social Sciences (AJHSS)*. 2013 [cited 2023 Jan 19];1(2). Available from: <http://ajhss.org/pdfs-1/Being%20a%20Critical%20and%20Creative%20Thinker.....pdf>.
- [28] Kasirer A, Shnitzer-Meirovich S. The perception of creativity and creative abilities among general education and special education teachers. *Thinking Skills and Creativity*. 2021 Mar;100820; <https://doi.org/10.1016/j.tsc.2021.100820>.
- [29] Chadwick C. A Conceptual Model for Teaching Critical Thinking in a Knowledge Economy. *Educational Technology* [Internet]. 2011 [cited 2023 Feb 11];51(3):37–42. Available from: <https://eric.ed.gov/?id=EJ936515>.
- [30] Kuan Chen Tsai. *REATIVE TEACHING AND TEACHING EXCELLENCE* [Inter

- net]. 2013 [cited 2023 Feb 2]. Available from: <http://www.kiecon.org/Creativity%20Book%202013%20KUAN%20TSAL.pdf>.
- [31] Andrew Gurevich. Week 2 - Creative and Critical Thinking [Internet]. Humanities LibreTexts. 2021. Available from: [https://human.libretexts.org/Bookshelves/Composition/Advanced_Composition/Book%3A_Critical_Thinking_\(Gurevich\)/01%3A_Chapters/1.02%3A_Week_2_-_Creative_and_Critical_Thinking](https://human.libretexts.org/Bookshelves/Composition/Advanced_Composition/Book%3A_Critical_Thinking_(Gurevich)/01%3A_Chapters/1.02%3A_Week_2_-_Creative_and_Critical_Thinking).
- [32] Smart KL, Cappel JJ. Students' Perceptions of Online Learning: A Comparative Study. *Journal of Information Technology Education: Research* [Internet]. 2006 Jan 1;5(1):201–19. Available from: <https://www.learntechlib.org/p/111541/>.
- [33] Mark Mishwo. Pre-Service Teachers' Perceptions of College Tutors' Use of Student-Centred Approach of Teaching and Learning Mathematics. *British Journal of Education*. 2022 Mar 15;10(3):115–25.
- [34] Martin F, Hunt B, Wang C, Brooks E. Middle School Student Perception of Technology Use and Digital Citizenship Practices. *Computers in the Schools*. 2020 Aug 4;37(3):1–20.
- [35] Linjawi AI, Alfadda LS. Students' perception, attitudes, and readiness toward online learning in dental education in Saudi Arabia: a cohort study. *Adv Med Educ Pract*. 2018 Nov 22;9:855-863. doi: 10.2147/AMEP.S175395. PMID: 30538597; PMCID: PMC6254499.
- [36] Utkarsh Shukla. Perceptual Readiness Meaning And Significance [Internet]. www.tutorialspoint.com. [cited 2023 Apr 7]. Available from: <https://www.tutorialspoint.com/perceptual-readiness-meaning-and-significance>.
- [37] Polly D. Modeling the Influence of Calculator Use and Teacher Effects on First Grade Students' Mathematics Achievement. *Journal of Computers in Mathematics and Science Teaching* [Internet]. 2008 Jul 1 [cited 2023 Apr 3];27(3):245–63. Available from: <https://www.learntechlib.org/primary/p/24459/>.
- [38] Barton R, Haydn T. Trainee teachers' views on what helps them to use information and communication technology effectively in their subject teaching. *Journal of Computer Assisted Learning*. 2006 Jul 5;22(4):257–72.
- [39] Ismail Elmahdi and Hala Fawzi. Pre-service Teachers' Perception of Readiness to Teach in Light of Teachers' Standards. *American Journal of Educational Research*. 2019; 7(4):304-308; doi: 10.12691/education-7-4-1.
- [40] Ramirez, I. A. L. Teaching preparedness of pre-service teachers: Perception to practice. *International Journal of Studies in Education and Science (IJSES)*. 2020; 1(1), 15-35; doi: <https://doi.org/10.46328/ijses>.
- [41] Wiersma W, Internet Archive. *Research methods in education: an introduction* [Internet]. Internet Archive. Boston: Allyn and Bacon; 1995 [cited 2023 April 20]. Available from: <https://archive.org/details/researchmethods06edwier>.
- [42] Rahayu RP, Wirza Y. Teachers' Perception of Online Learning during Pandemic Covid-19. *Jurnal Penelitian Pendidikan*. 2020 Dec 31;20(3):392–406; <https://doi.org/10.17509/jpp.v20i3.29226>.
- [43] Namsaeng P. Thai EFL Trainee Teachers' Perceptions on Teacher Training. *gshskku* [Internet]. 2022 Jun. 26 [cited 2023 Apr. 7];11(1):202-27. Available from: <https://so03.tci->

thaijo.org/index.php/gshskku/article/view/257942.

- [44] Bernard Wiafe Akaadom (PhD). " Pre-service teachers' technology skills and its effects in using technology for instruction: In pursuit for quality teacher training." *International Journal of Engineering and Science*, vol. 10, no. 09, 2020, pp. 18-28.
- [45] Bornschlegl, Caltabiano Bornschlegl, Madeleine, and Nerina Jane Caltabiano. "Increasing Accessibility to Academic Support in Higher Education for Diverse Student Cohorts." *Teaching & Learning Inquiry*. 2020; <https://doi.org/10.20343/teachlearningqu.10.13>.
- [46] Chen RJ. Investigating models for preservice teachers' use of technology to support student-centered learning. *Computers & Education*. 2010 Aug;55(1):32–42; <https://doi.org/10.1016/j.compedu.2009.11.015>.
- [47] Christina Wekerle & Ingo Kollar. Using technology to promote student learning? An analysis of pre- and in-service teachers' lesson plans, *Technology, Pedagogy and Education*, 31:5, 597-614, DOI: 10.1080/1475939X.2022.2083669.
- [48] Levanon M. "The possibility to be creative is the reason I want to teach": Pre-service teachers' perceptions of creative teaching and philosophical education. *Social Sciences & Humanities Open*. 2021;4(1):100190.
- [49] Valli P, Perkkilä P, Valli R. Adult Pre-Service Teachers Applying 21st Century Skills in the Practice. *ATHENS JOURNAL OF EDUCATION*. 2014 Apr 30;1(2):115–30.
- [50] Champa RA, Rochsantiningsih D, Kristiana D. Teachers' Readiness Indicators on ICT Integration into their Teaching. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*. 2019 Nov 5;2(4):195–203.
- [51] Lamb, T. E. (2011). Fragile identities: Exploring learner identity, learner autonomy and motivation through young learners' voices. *The Canadian Journal of Applied Linguistics, Special Issue*, 14(2): 68–85; <https://journals.lib.unb.ca/index.php/CJAL/article/view/19858>.
- [52] Kolb A, Kolb D. Experiential Learning Theory as a Guide for Experiential Educators in Higher Education. *Experiential Learning & Teaching in Higher Education* [Internet]. 2017 Jun 1;1(1):7–44. Available from: <https://nsuworks.nova.edu/elthe/vol1/iss1/7>.
- [53] Alelaimat AM, Ihmeideh FM, Alkhalwaldeh MF. Preparing Preservice Teachers for Technology and Digital Media Integration: Implications for Early Childhood Teacher Education Programs. *International Journal of Early Childhood*. 2020 Dec;52(3):299–317.
- [54] Acarapol Chaiyachok. Creative Use of Technology to Foster Young Children in the 21st Century [Internet]. *Chula Digital Collections*. 2019 [cited 2023 Jan 12]. Available from: <https://digital.car.chula.ac.th/educujournal/vol47/iss4/27/>.