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Teacher Trainees' Self-Efficacy in Fostering Critical Thinking and Problem Solving, Creativity and Innovation, and Digital Literacy as 21st Century Core Skills in Ghana

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Abstract
Since the introduction of the Bachelor of Education (B.Ed) programme in Colleges of Education in Ghana it appears studies have not evaluated the self-efficacy of students in the B.Ed programme in delivering the pre-tertiary education curriculum introduced by the National Council for Curriculum and Assessment (NaCCA). Guided by the social cognitive theory, this study sought to fill this gap. A descriptive survey design was used, where a total of 458 teacher trainees responded to a Likert scale questionnaire. Data collected from respondents were analysed using descriptive and inferential statistics. Findings of the study show that teacher trainees have high self-efficacy in fostering Critical Thinking and Problem Solving (CTPS), Creativity and Innovation (CI), and Digital Literacy (DL), with an overall mean self-efficacy given as (M = 3.69, SD = .60). The study also found statistically significant differences in teacher trainees' self-efficacy in terms of CTPS, $t(368.12) = 2.23$, $p = .026$, as well as DL for male and female teacher trainees, $t(355.59) = 2.19$, $p = .029$. Finally, the study found no statistically significant differences in the self-efficacy of respondents in fostering CTPS, CI, and DL based on the progamme of study. The study concluded that teacher trainees have the required self-efficacy to be able to foster 21st-century skills in learners. Findings of the study offer a preliminary understanding that training of teachers aligns with the expectations of the National Teacher Education Curriculum Framework (NTECF).

Introduction
The need to equip learners with global competencies has led NaCCA to introduce a new standards-based curriculum in 2019 for learners at the pre-tertiary levels of Ghana's education system. The curriculum has outlined six core skills for teachers to develop in their learners (Laar, 2024), namely, Critical Thinking and Problem Solving, Creativity and Innovation, Communication and Collaboration, Cultural Identity and Global Citizenship, Personal Development and Leadership, and Digital Literacy. This is to enable the country to nurture what is popularly known as "the dream Ghanaian child". These competencies are also outlined in the NTECF and the National Teaching Standards (NTS) as competencies for teacher trainees to acquire to deliver in classrooms (Ministry of Education, 2017a).

Curricular modifications in various countries have implications for teachers' competence and self-efficacy in implementing 21st-century creative pedagogies (Schleicher, 2012). Teaching 21st-century

skills particularly places fresh duties and responsibilities on schools and teachers (Lamb, 2017; Anagün, 2018), not only to ensure that learners attain academic outcomes in terms of subject content knowledge, but also to demonstrate competence in global/core skills (Ministry of Education of Malaysia, 2013; Gkontelos et al., 2023). While some teachers often demonstrate passion and persistence in implementing educational reforms, some of their peers avoid implementing these reforms (Kwame & Abdulai, 2017). This is partly influenced by their self-efficacy levels. This means that high levels of teacher self-efficacy are essential for the successful implementation of any curriculum (Anagün, 2018; Kholifah et al., 2023).

To the extent that teacher self-efficacy and effectiveness are related variables that impact learning outcomes and the development of students' attitudes and affective domains, it is significant to explore teachers' self-efficacy (Kwame & Abdulai, 2017). According to Kwame and Abdulai (2017), studying the self-efficacy of pre-service teachers, for instance, will enable them to develop greater confidence at the beginning of their careers. There is also a need to further investigate (Schleicher, 2012) and strengthen (Kholifah et al., 2023) teachers' self-efficacy, as they play leading roles in ensuring the success of 21st-century teaching and in developing core competencies in learners.

Tareen (2026) stated that teacher self-efficacy generally shapes how 21st-century skills are factored into curriculum implementation. Evidence shows that countries' attempts to develop core competencies in learners have suffered setbacks due to teachers' limited understanding of these core skills (UNESCO, 2020; Pasha et al., 2019). This attests to the observation made by Orak and İnözü (2021) that, in theory, aspirations for countries to incorporate core competencies into their educational systems through curricular modifications will remain unrealised if teachers are not fully prepared. Despite the importance of self-efficacy for the successful implementation of curricula, few studies have examined teachers' self-efficacy in relation to 21st-century skills and pedagogy (Shafiee & Ghani, 2022). In Ghana, particularly, there seems to be a dearth of studies on the topic. Only a few studies, such as Bentil (2024), examined the topic. This study, therefore, sought to measure the levels of teacher trainees' self-efficacy in fostering critical thinking and problem solving, creativity and innovation, and digital literacy as 21st-century skills. Also, it sought to determine whether there is a statistically significant difference in teacher trainees' self-efficacy in teaching 21st-century core skills based on sex and programme of specialism.

Theoretical Framework

Martin and Mulvihill (2019) observed that teacher self-efficacy is a difficult concept. The construct was introduced by Albert Bandura in his social cognitive theory and has attracted the interest of academics and researchers across diverse disciplines (Genuba & Montejo, 2018). In his theory, Bandura (1977) explained how diverse personal attributes, including self-efficacy, govern behaviour. He indicated that self-efficacy can determine an individual's choice of activities, setting, as well as coping efforts as long as a given action is started.

The concept of self-efficacy has been defined in different ways by scholars and academics. It is a person's belief about his/her ability to handle a task (Bandura, 1986). It describes an individual's belief regarding their ability to carry out behaviours that will result in expected outcomes (Weitin, 2017). Malinauskas (2017) also referred to the concept as a person's belief in his capacity to guide his own actions to accomplish predetermined goals or complete a task. It is associated with a person's inner perception, which changes their motivation, thoughts, feelings, and actions (Ranjbaran, 2022).

Bandura (1977) presented four major sources of personal self-efficacy, namely, performance accomplishments, vicarious learning, verbal persuasions, and physiological state of the individual. According to Bandura, performance accomplishments are based on successes (which increase efficacy)

and failures (which reduce efficacy, especially when they occur at the beginning of the behaviour). Bandura, however, noted that occasional failures overcome through persistence are likely to increase efficacy. Therefore, the consequences of failure for efficacy depend on timing and the aggregate of experiences. Vicarious experience refers to the motivation an observer derives from watching others successfully carry out risky activities without harm. In particular, an individual is likely to repeat an action when he sees others being reinforced for that action (Bandura, 1971) and when the individual perceives himself to be similar to the model (Arhin et al., 2022). Vicarious experience yields equally higher efficacy when the results are clear, contrary to ambiguous actions.

Impact of Teacher Self-Efficacy

A teacher's self-efficacy affects teacher performance and influences students' learning (Jeffri & Hamid, 2022; Barni et al., 2019). Teachers with high self-efficacy demonstrate competence across diverse activities, including learner engagement, teaching approaches, and management of the learning environment, by encouraging learner involvement in lessons (Türkoğlu et al., 2017). It also improves their ability to handle varied learners (Malinauskas, 2017); and capacity to guide students to record good academic performance (Shahzad & Naureen, 2017). Teachers who exhibit high self-efficacy in problem-solving, collaboration, critical thinking, and creativity, among others, are likely to create learning environments that encourage inquiry among their learners (Anagün, 2018). A statistically significant positive correlation has been established between a teacher's self-efficacy and the satisfaction the teacher derives from their work, as found by Türkoğlu et al. (2017). Research findings (Han et al., 2021) indicate both direct and indirect impacts of teachers' self-efficacy on their learners' achievements.

In addition, an educator's efficacy in terms of teaching strategy has consequences for their pedagogical practices in the 21st century (Shafiee & Ghani, 2022). Teachers' use of 21st-century skills increases with a corresponding rise in their perceptions of efficacy (Arslan-Cansever et al., 2021). It ensures teacher's fidelity to curriculum implementation (Bassah, 2021) as it improves the chances of educators applying skills acquired at professional development trainings to their teaching, making it possible for the teachers to produce higher learning outcomes in their students (Bray-Clark, 2003). Self-efficacy also boosts teachers' confidence in their strengths when confronted with learning challenges (Kholifah et al., 2018). Teachers with high self-efficacy exhibit greater resilience when confronted with obstacles to experimenting with new instructional strategies and learning goals (Kwame & Abdulai, 2017). From the foregoing, it can be stated that the successful integration of 21st-century core skills among learners is dependent on high teacher self-efficacy. This is affirmed by Anagün (2018) and Kholifah et al. (2023).

Kholifa et al. (2018) studied the role of self-efficacy in the quality of instruction in 21st-century Indonesia, reporting a significant positive impact of self-efficacy on digital technology intimacy and psychological well-being. Genuba and Montejo (2018) also explored the self-efficacy and 21st-century skills of teachers and college students in the Philippines and reported a significant relationship between the two variables, which was later corroborated by Zorlu and Zorlu (2021). Other scholars have also examined the concept in Malaysia (Ibrahim et al., 2019); Peru (Arce-Saavedra & Blumen, 2020); Europe, Romania, Spain, Italy, Germany, and Poland (Dilekli & Tezci, 2020); and Lesotho (Tseeke, 2021).

21st Century Skills and Core Competences

The 21st century has been marked by globalisation and internationalisation (Fong et al., 2014). This makes the century different, resulting in 'manpower' being substituted for digital technology (Ait et al., 2014; Olabiyi et al., 2025). Learners are expected to demonstrate certain core skills to thrive in the new world (Adeoye & Jimoh, 2023; Patphol, 2020). Education should therefore reflect the need to equip students with the competencies required to function well (Ait et al., 2014) by modifying

curricula, pedagogies and assessment systems to inculcate in learners the requisite core skills that will make them progress from the information age into the conceptual age (Abdullah & Osman, 2010). Worldwide, educational reforms are attempting to meet this demand by focusing on training learners to solve complex problems of the new era (Anagün, 2018).

Aita et al. (2014) contend that there is a significant gap between the knowledge and skills learners acquire in school and those needed in 21st-century workplaces. In the context of Ghana, policy makers and stakeholders have discovered that the objective-based curriculum, which was used in the second half of the 20th century, only led to the attainment of basic knowledge, skills and principles whilst neglecting higher cognitive domains of learning, and the essential social skills that make a responsible and effective citizen (Ministry of Education, 2018). Essel et al. (2018) made a similar observation regarding the absence of 21st-century skills in the basic-level curriculum of Ghana's education system. This follows Antwi (1995), who called for an ideal type of education that would groom all learners in Ghana to fit into 21st-century society amid social and technological change.

The concept of 21st-century skills began to appear in academic circles around the 1990s. Because of the role of these skills in the attainment of the Sustainable Development Goals (SDGs), organisations such as UNESCO and the OECD have suggested the need to incorporate these skills at the core of learning (González-Salamanca et al., 2020). Various countries have since been making efforts to include these skills in their educational policies. Care et al., cited in Brookings Institute (2020), reported that a review of over 150 countries found that more than 75% have clearly outlined 21st-century skills in their education policies, even though only 11% have enshrined these skills in their curricula.

Joynes et al. (2019) surveyed literature on the definition of 21st century skills in low-and middle-income countries and reported that despite an agreement on the need for different learning to handle world problems in the 21st century, there is no one agreed-upon definition of 21st century skills. This affirms observations made by Lamb (2017) and the Global Partnership for Education (GPE) (2020) that, although the concept is widely used in education, it is not specific. Lamb (2017) described the concept as a range of competencies that learners should acquire to excel in life.

Methodology

Research Design

A descriptive survey design was used to carry out the study. Descriptive survey design is often used to identify prevailing conditions and how they compare against given standards (Cohen et al. 2007). A descriptive survey design is justified for this study because it sought to compare student teachers' self-efficacy with the standards and expectations of teachers in relation to the policy guidelines for the teacher education curriculum in Ghana.

Sampling Procedure

The study population comprised final-year teacher trainees (Level 400) in Colleges of Education in the northern part of Ghana. The accessible population for the study comprised final year teacher trainees who were members of the official WhatsApp groups created by the Teacher Trainees Association of Ghana (TTAG). A total of 458 teacher trainees responded to the questionnaire. The sampling procedure used was convenience sampling, in which a Google form was shared in the teacher trainees' WhatsApp groups that the researchers belonged to. This comprised 275 (60.0%) males and 183 (40.0% females). Respondents comprised students offering one of three different Bachelor of Education specialisms namely; Early Grade Education (123 teacher trainees), Primary Education (196 teacher trainees), and JHS Education (139 teacher trainees). Students at levels 100, 200, and 300 were excluded from the study. The study used final year (level 400) students because they had fully undergone the entire NTECF, and were qualified to have written the Ghana Teacher Licensure Examination (GTLE).

The study sought to determine their baseline readiness to deliver 21st-century skills in the pre-tertiary curriculum.

Data Collection Instrument

The study used a closed-ended Likert scale questionnaire adapted from Ravitz (2014) to collect data from respondents. The instrument consisted of two sections (sections A and B). Section A sought demographic information of respondents, such as respondents' sex and programme specialism. Section B of the instrument also contained 19 items categorised into three core skills: Critical Thinking and Problem Solving (CTPS), Creativity and Innovation (CI), and Digital Literacy (DL).

The questionnaire was piloted by engaging 50 final-year teacher trainees from Tumu College of Education to respond to it in July, 2025. The Cronbach's Alpha reliability of the instrument is .89, which is a good reliability statistic for statistical analysis. The reliability coefficient for each of the three dimensions was calculated as follows: Critical Thinking and Problem Solving = .77, Creativity and Innovation = .81, and Digital Literacy = .88. The final instrument was converted into a Google Form and shared via WhatsApp with student teachers in August, 2025. Respondents were given 4 weeks to complete the Google form.

Ethical Considerations

The study used Google Forms to collect data, which helped to address key ethical considerations. Specifically, it ensured anonymity, minimised researcher effect, and allowed for the authenticity of responses, which are also strengths of internet-based surveys (Cohen et al., 2007). Instructions provided on the Google form clearly stated that the questionnaire was targeted at final year teacher trainees who had undergone the NTECF in Colleges of Education in northern Ghana. Other members of the WhatsApp groups who were not teacher trainees or had completed their program were not required to respond to the questionnaire. This was done to ensure that the target respondents were the ones who participated in the study. Additionally, participants' consent was obtained by stating in the introductory section of the questionnaire that participation in the study was voluntary and that respondents could opt out at any stage.

Data Analysis

Data obtained from respondents were coded and analysed using the Statistical Package for Social Sciences (SPSS). Responses were coded on the scale 1 = never confident, 2 = rarely confident, 3 = moderately confident, 4 = highly confident, and 5 = very highly confident. Descriptive statistics were used to analyse respondents' self-efficacy levels in fostering 21st-century skills in learners. This was done by computing the mean of means and the standard deviations of responses for each of the three dimensions: digital literacy, creativity and innovation, and critical thinking and problem solving. Results were interpreted as follows: 1.0–2.49 = Low, 2.50–3.49 = Moderate, and 3.50–5.0 = High. Also, t-tests and ANOVA were conducted to test differences in teacher trainees' levels of self-efficacy in fostering 21st-century skills by sex and programme of study.

Results

The results of the study are organised and presented under three themes based on the research question and hypotheses. The results are presented in tables, and the key statistics are reported as follows.

The Level of Teacher Trainees' Self-efficacy in Teaching 21st-century skills

The study sought to measure teacher trainees' self-efficacy in teaching 21st-century skills. The objective was to identify the baseline readiness of teacher trainees regarding their confidence in implementing the NaCCA curriculum as outlined in the NTS. The specific skills include digital literacy, creativity

and innovation, and critical thinking and problem solving. Data for this question were analysed using means and standard deviations. These are presented in Table 1.

Table 1: Teacher Trainees' Level of Self-Efficacy in Fostering 21st Century Core Skills

Dimension	M	SD	Interpretation
Critical Thinking & Problem Solving (CTPS)	3.61	.66	High
Creativity & Innovation (CI)	3.75	.70	High
Digital Literacy (DL)	3.71	.73	High
Overall Mean	3.69	.60	High

From Table 1, the mean scores and standard deviations in terms of teacher trainees' self-efficacy in fostering the three core skills are CTPS (M=3.61, SD=.66), CI (M=3.75, SD=.70) and, DL (M=3.71, SD = .73). The overall mean self-efficacy of respondents is also given as (M = 3.69, SD = .60). The means and standard deviations show that teacher trainees' self-efficacy is high.

Sex Differences of Teacher Trainees' Self-efficacy in Fostering 21st Century Core Skills

This was tested by using an independent sample t-test. The descriptive statistics for males and females, as well as the results for the independent sample t-test, are presented in Table 2.

Table 2: Sex Differences of Teacher Trainees' Self-Efficacy in Fostering 21st Century Core Skills

Dimension	Male		Female		*T*	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Critical Thinking & Problem Solving (CTPS)	3.67	.636	3.53	.689	2.270	0.024	0.217
Creativity & Innovation (CI)	3.78	0.655	3.71	0.766	1.122	0.262	0.107
Digital Literacy (DL)	3.77	0.687	3.61	0.780	2.246	0.025	0.214

From Table 2, the results show that there was no statistically significant difference in the self-efficacy of male (M = 3.78, SD = .66) and female teacher trainees (M = 3.71, SD = .77) in fostering CI, $t(456) = 1.12$, $p = .262$ (two-tailed). However, there was a statistically significant difference in teacher trainees' self-efficacy in terms of CTPS for male (M = 3.67, SD = .64) and female teacher trainees (M = 3.53, SD = .69), $t(368.12) = 2.23$, $p = .024$ (two-tailed). Also, there was a statistically significant difference in trainees' self-efficacy in terms of DL for male (M = 3.77, SD = .69) and female teacher trainees (M = 3.61, SD = .78), $t(355.59) = 2.25$, $p = .025$ (two-tailed). The decision is to fail to reject the null hypotheses for CTPS and DL. Although the difference was statistically significant, the effect size was small for CTPS (Cohen's d = .217) and DL (Cohen's d = .214). This means that the differences may not be important in practice, since it is not of significant impact.

Teacher Trainees' Self-efficacy in Teaching 21st Century Skills Based on Programme Specialism

This hypothesis was tested using ANOVA. Results are presented in Table 4.

Table 3: ANOVA Pre-service Teachers' Self-efficacy in Teaching 21st Century Core Skills Based on Programme of Study

		Sum of Squares	df	Mean Square	F	Sig.
Critical Thinking & Problem Solving (CTPS)	Between Groups	1.741	2	.870	2.004	.136
	Within Groups	197.602	455	.434		
	Total	199.343	457			
Creativity & Innovation (CI)	Between Groups	2.148	2	1.074	2.194	.113
	Within Groups	222.652	455	.489		
	Total	224.800	457			
Digital Literacy (DL)	Between Groups	2.095	2	1.047	1.980	.139
	Within Groups	240.638	455	.529		
	Total	242.732	457			

From Table 3, the results show that, based on programme of specialism, there were no statistically significant differences in teacher trainees' self-efficacy in CTPS, $F(2, 455) = 2.00$, $p = .136$; CI , $F(2, 455) = 2.19$, $p = .113$; as well as DL, $F(2, 455) = 1.98$, $p = .139$. The decision is to fail to reject the null hypotheses for each of the three skills.

Discussion

Overall, the study's findings show that teacher trainees have high self-efficacy in teaching the three core skills: CTPS, CI, and DL. This finding is consistent with reports of other studies. In particular, it corroborates the view of Cansoy and Türkoğlu (2017), who reported adequate self-efficacy in critical thinking and problem-solving among pre-service teachers. It also agrees with Genuba and Montejo (2018) and Bentil (2024), who found significantly higher levels of self-efficacy among students and teachers. Likewise, these findings align with Tareen (2026), who reported that Afghan teachers' self-efficacy in critical thinking is high. Regarding digital literacy, Arhin et al. (2022) reported similar findings in Ghana. However, findings from studies conducted outside Ghana contradict this study. For instance, Pertiwi et al. (2022) reported medium levels of self-efficacy in core competencies among in-service teachers. Cosby et al. (2023), on the other hand, found that participants in their study had no confidence in carrying out digital literacy activities.

It is also important to highlight that the study's findings affirm Patphol's (2020) finding that participants reported higher self-efficacy in creativity and innovation after undergoing curriculum training. This could suggest that the training that teacher trainees are undergoing in the Colleges of Education is equipping them with the necessary capabilities required to deliver the pre-tertiary education curriculum. It is evident in the work of Patphol (2020), which shows that teacher training in curriculum enhances teachers' self-efficacy. That notwithstanding, the findings of this study regarding creativity and innovation contradict those of Orak and İnözü (2021), who found the confidence levels of Turkish English Language teachers to be inadequate.

The results of the study also show a statistically significant difference in teacher trainees' self-efficacy for CTPS and DL by sex. This means that male and female teacher trainees in Colleges of Education possess different levels of confidence in delivering those dimensions of 21st-century skills. This aligns with the reports by Dilekli and Tezci (2020) and Arce-Saavedra and Blumen (2020) that significant differences exist in teachers' self-efficacy for teaching thinking skills. The findings also agree with the results of a similar study in Ghana (Arhin et al., 2022). This nonetheless disagrees with Bassh (2021).

Also, this study shows that male and female teacher trainees have similar self-efficacy regarding CI. This contradicts He and Wong (2021), who found higher creative self-efficacy among men than among women. It is also at variance with the observation made by Saad et al. (2024) that male primary students performed better in creativity. It is important to concede, however, that differences in

developmental milestones among primary school students and college students could account for these contradictory findings.

The results also show that there was no statistically significant difference in teacher trainees' self-efficacy in fostering CTPS, CI, and DL based on the programme of specialism. This means that trainees pursuing Early Grade, Primary, and JHS education specialisms reported similar self-efficacy in delivering all three dimensions of 21st-century skills. This contradicts the view of Wu et al. (2024), who found a statistically significant difference in STEM education among elementary school teachers compared with teachers at other levels of education. It is, however, consistent with Tareen (2026). This could mean that the NTECF and NTS guidelines for the respective programmes are well implemented in the Colleges of Education, which may explain this finding. In addition, it can be inferred that mentors in partner schools demonstrate sufficient competence in their lesson delivery, thereby fostering high self-efficacy among teacher trainees through vicarious experience. An earlier study by Osman and Dangor (2024) found that teacher trainees perceived mentors in partner schools as demonstrating good pedagogical knowledge. This highlights mentors' role as role models in developing teacher trainees' self-efficacy, as espoused by social cognitive theory. The theory posits that vicarious experiences contribute to the development of self-efficacy.

Conclusion

Based on the study's findings, teacher trainees in Colleges of Education in Ghana reported high self-efficacy in teaching the three dimensions of 21st-century skills: CTPS, CI, and DL. Also, it can be concluded that teacher trainees showed statistically significant differences in CTPS and DL by sex, with males favoured. No statistically significant differences were, however, reported by respondents in the three skills on the basis of the programme of specialism. It means that teacher trainees are confident in their ability to foster these core competencies in learners. These findings can be attributed to a successful implementation of the NTECF and its corresponding standards, such as the NTS, across all areas of specialism.

Noting that male and female teacher trainees reported statistically significant differences in their self-efficacy to foster CTPS and DL, the study recommends that Colleges of Education in the country incorporate more innovative and creative pedagogies across the curriculum to help teacher trainees develop similar self-efficacy in these dimensions. Furthermore, the study recommends that Colleges of Education consider attaching teacher trainees to partner schools with competent female mentors who can provide vicarious experience to female trainees, helping them acquire levels of self-efficacy in CTPS and DL comparable to those of their male peers. Also, agencies such as Transforming Teacher Education and Learning (T-TEL) and the Ghana Tertiary Education Commission (GTEC) are encouraged to evaluate the NTECF to identify barriers to gender inclusion and mitigate them. Lastly, the study recommends that researchers to consider exploring other variables of teacher trainees that relates to integration of 21st century skills at the pre-tertiary levels of education, since it appears this study serves as a pioneering study on the topic since the introduction of B.Ed programmes in Colleges of Education, as well as the introduction of 21st century skills in Ghana's pre-tertiary education curriculum.

References

Abdullah, M., & Osman, K. (2010). 21st century inventive thinking skills among primary students in Malaysia and Brunei. *Procedia Social and Behavioural Sciences 9,* 1646–1651. https://doi.org.10.1016/j.sbspro.2010.12.380

Adeoye, M. A., & Jimoh, H. A. (2023). Problem-solving skills among 21st-century learners toward creative and innovative ideas. *Thinking and Creativity Journal, 6*(1), 52-58. https://doi.org/10.23887/tscj.v6i1.62708

Ait, K., Rannikmäe, M., Soobard, R., Reiska, P., & Holbrook, J. (2015). Students' self-efficacy and values based on a 21st century vision of scientific literacy–A pilot study. *Procedia-Social and Behavioural Sciences*, *177*, 491-495.

Anagün, Ş. S. (2018). Teachers' perceptions about the relationship between 21st-century skills and managing constructive learning environments. *International Journal of Instruction, (11)*14, 23-40.

Antwi, M. K. (1995). *Education, society and development in Ghana.* Unimax Publishers Limited.

Arce-Saavedra, B. J., & Blumen, S. (2022). Critical thinking, creativity, self-efficacy, and teaching practice in Peruvian teacher trainers. *Revista de Psicología, 40*(1), 603-633.

Arhin, D., Kwakye, K., Quaynor, L. Q., Boakye, R. O., & Yeboah, J. A. (2022). Influence of teachers' self-efficacy and attitude towards the integration of ICT into teaching and learning at the basic school level. *American Journal of Education and Practice, (6)*1, 1-17.

Arsad, N. M., Osman, K., & Soh, T. M. T. (2011). Instrument development for 21st-century skills in Biology. *Procedia Social and Behavioural Sciences, 15,* 1470–1474.

Arslan-Cansever, B., Ceylan, B., Çavaş, P. , Ateş-Çobanoğlu, A., & Anagün, Ş. S. (2021). Self-efficacy and teaching skills perceptions of primary school teachers: A predictive study. *International Journal of Education, (9)* 4. 11-25. https://doi.org/10.34293/esducation.v9i4.4142

Bandura, A. (1971). *Social learning theory.* General Learning Corporation.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review, 84(*2), 191-215.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theo*ry. Prentice-Hall, Inc.

Barni, D., Danioni, F., & Benevene, P. (2019). Teachers' self-efficacy: The role of personal values and motivation for teaching. *Front. Psychol., 10*, 1645-1661. https://doi.10.3389/fpsyg.2019.01645

Bassah, M. G. (2021). Teachers' self-efficacy and implementation of the Ghanaian Language and Culture curriculum. *International Journal of Innovative Research and Development, 5*(3), 34-56. https://doi.10.24940/ijird/2021/v10/i8/AUG21033

Bentil, J. (2024). Pre-service social studies teachers' readiness and self-efficacy beliefs to promote 21st century learning in Ghanaian classrooms: evidence from the University of Education, Winneba, Ghana. *Journal of Studies in Social Sciences and Humanities, 10*(2), 75-95.

Bray-Clark, N. (2003). Self-efficacy beliefs and teacher effectiveness: Implications for professional development. *The Professional Educator, (XXVI)*1, 1-23.

Brookings Institute (2020). *Capturing 21st century skills: Analysis of assessments in selected sub-Saharan African countries.* Brookings Institute.

Cansoy, R., & Türkoğlu, M. E. (2017). Examining the relationship between pre-service teachers' critical thinking disposition, problem-solving skills and teacher self-efficacy. *International Education Studies, (10)*6, 1913-9039.

Cohen, L., Manion, L. & Morrison, K. (2007). *Research methods in education (6th edn.)*. Taylor and Francis Group.

Cosby, A., Fogarty, E. S., & Manning, J. (2023). Digital literacy and digital self-efficacy of Australian technology teachers. *Educ. Sci. (13) 530.* https://doi.org/10.3390/educsci13050530.

Demirkol-Orak, S., & İnözü, J. (2021). Teachers' awareness and actual practices of 21st-century learning and innovation skills. *International Online Journal of Education and Teaching (IOJET), 8*(2). 975-997.

Dilekli, Y., & Tezci, E. (2020). A cross-cultural study: Teachers' self-efficacy beliefs for teaching thinking skills. *Thinking Skills and Creativity, 15*(3), 350-370.

Essel, H. B., Tachie-Menson, A., & Ahiaklo-Kuz, N. A. Y. (2018). 21st-century skill deficiency in Ghanaian basic education: A review of basic design and technology, and information and communication technology syllabi. *Indian Journal of Applied Research, 8*(3), 248-250.

Essel, H. B., Tachie-Menson, A., & Ahiaklo-Kuz, N. A. Y. (2018). 21st-century skill set deficiency in Ghanaian basic education: A review of basic design and technology, and information and communications technology syllabi. *Indian Journal of Applied Research, 8*(3), 248-250.

Fong, L. L., Sidhu, G. K., & Fook, C. Y., (2014). Exploring the 21st-century skills among postgraduates in Malaysia. *Procedia - Social and Behavioural Sciences, 12,* 3, 130 – 138.

Genuba, R. L., & Montejo, G. S. (2018). 21st century skills of teachers and self-efficacy of college students. *International Journal of Recent Engineering Research and Development (IJRERD), (03)*5, 1-23.

Gkontelos, A., Vaipoulou, J., & Stamovlasis, D. (2023). Teachers' innovative work behaviour as a function of self-efficacy, burnout, and irrational beliefs: A structural equation model. *Eur. J. Investig. Health Psychol. Educ., 13,* 403–418. https://doi.org/10.3390/ejihpe13020030

Global Partnership for Education (2020). *21st-Century Skills: What potential role for the Global Partnership for Education? A landscape review.* USA.

González-Salamanca, J. C., Agudelo, O. L., & Salinas, J. (2020). Key competences, education for sustainable development and strategies for the development of 21st-century skills. A systematic literature review. *Sustainability, (12), 10366.* https://doi.org.10.3390/su122410366

Han, J., Kelley, T., & Knowles, J. G. (2021). Factors influencing students' STEM learning: Self-efficacy and outcome expectancy, 21st-century skills, and career awareness. *Journal for STEM Education Research, 4*(2), 1-21. https://doi.org/10.1007/s41979-021-00053-3

He, W., & Wong, W. (2021). Gender differences in creative self-efficacy: Findings of mean and variability analyses. *Thinking Skills and Creativity, 42.* https://doi.org/10.1016/j.tsc.2021.100955

Hinson, J., Arthur, C. O., & Bipembi, H. (2022). Mentoring in the colleges of education in Ghana: Challenges and the way forward. *International Journal of Research and Innovation in Social Science (IJRISS), (vi)*x.

Ibrahim, N., Adzra'ai, A., Sueb, R., & Dalim, S. F. (2019). Trainee teachers' readiness towards 21st-century teaching practices. *Asian Journal of University Education,* 109-120.

Jeffri, A. I., & Hamid, A. H. (2022). The relationship between 21st-century instructional leadership and teachers' self-efficacy. *International Journal of Academic Research in Business and Social Sciences, (12)*9.

Joynes, C., Rossignoli, S., & Amonoo-Kuofi, E. F. (2019). *21st century skills: evidence of issues in definition, demand and delivery for development contexts.* Department for International Development (DFID), UK.

Kholifah, N., Kurdi, M. S., Nurtanto, M., Mutohhari, F., Fawaid, M., & Sbramaniam, T. S. (2023). The role of teacher self-efficacy on instructional quality in the 21st century: A study on vocational teachers, Indonesia. *International Journal of Evaluation and Research in Education (IJERE), (12)* 2. https://doi.org.10.11591/ijere.v12i2.23949

Kwame, A. W., & Abdulai, A. (2017). Pre-service teachers' self-efficacy and the implementation of the kindergarten curriculum in Ghana. *International Journal of Development Research, 7*(02), 1-24.

Laar, D. B. (2024). Implementation of the new senior high school standards-based curriculum in Ghana and matters arising: from 21st century skills to a bipolar global problem? *International Journal of Education (IJE), 12*(2), 1-10.

Lamb, S. (2017). *Future Frontiers Analytic Report. Key skills for the 21st century: An evidence-based review.* State of New South Wales, Department of Education.

Malinauskas, R. K. (2017). Enhancing self-efficacy in teacher education students. *European Journal of Contemporary Education, 6*(4), 23-39. https://doi.org.10.13187/ejced.2017.4.732

Martin, L. E., & Mulvihill, T. M. (2019). Voices in education: Teacher self-efficacy in education. *The Teacher Educator, 54(*3), 1-19.

Ministry of Education (2017a). *National teachers' standards for Ghana: Guidelines.* Republic of Ghana.
Ministry of Education (2017b). *The national teacher education curriculum framework.* Republic *of* Ghana.
Ministry of Education (2018). *National pre-tertiary education curriculum framework.* National Council for Curriculum and Assessment: Accra, Ghana.
Ministry of Education Malaysia (2013). Pelan Pembangunan Pendidikan Malaysia. *Universal Journal of Educational Research, 8*(8), 3536-3544.
National Council for Curriculum and Assessment (2019). *Science curriculum for primary schools (basic 1 – 3).* Ministry of Education: Accra, Ghana.
Olabiyi, O. S., Okunuga, R. O., Oji, O. T., & Awofala, A. O. A. (2025). Teachers' knowledge, attitudes, and practices of digital skills in science, technology, engineering, and mathematics in Lagos State secondary schools. *KIU Journal of Education (KJED), 5*(1), 156-166. https://kjed.kiu.ac.ug/
Osman, K., Soh, T. M. T., & Arsad, N. M. (2010). Development and validation of the Malaysian 21st century skills instrument (M-21CSI) for science students. *Procedia Social and Behavioural Sciences, 9,* 599–603. https://doi.org.10.1016/j.sbspro.2010.12.204
Osman, S., & Dangor, K. F. (2024). Tumu College of Education trainee teachers' perceptions of mentors' pedagogical knowledge. *African Journal of Teacher Education, 13*(1), 78-104. https://doi.org/10.21083/ajote.v13i1.7535
Partnership for 21st Century Learning (2007). *Framework for 21st-century learning*. One Massachusetts Avenue, Suite 700: Washington, DC.
Partnership for 21st Century Skills. (2010). *21st-century knowledge and skills in educator preparation*. Partnership for 21st Century Skills.
Pasha, A., Pinjani, A., Bijan, A., & Yousuf, N. (2019). Challenges of developing competencies in students in developing contexts. *Literacy Information and Computer Education Journal (LICEJ), (10)*4, 32-51.
Patphol, M. (2020). Developing a training curriculum to enhancing teachers' learning management skills for promoting learners' creativity and innovation: A case study of Thai teachers. *Advanced Journal of Social Science, 7*(1), 181-187. https://doi.org/10.21467/ajss.7.1.181-187
Pertiwi, U. G., Vebriyanti, E. A., Nurani, L. M., & Waskita, D. (2022). Teachers' self-efficacy on designing digital material in e-learning: A case study in a vocational school. *Advances in Social Science, Education and Humanities Research, (624),* 218-223.
Ranjbaran, F. (2022). English language teachers' digital literacy and self-efficacy in the online education. *Stepping out of the ELT Comfort Zone: Changes in Teaching & Learning Cultures*. Oman 21st International ELT Conference, Sultan Qaboos University.
Ravitz, J. (2014). *A survey for measuring 21st century teaching and learning: West Virginia 21st century teaching and learning survey [WVDE-CIS-28].* West Virginia Department of Education.
Saad, A., Elbashir, A., Abdou, R., Alkhair, S., Ali, R., Parangusan, H., Ahmad, Z., & Al-Thani, N. Exploring the gender variations in 4Cs skills among primary students. *Thinking Skills and Creativity, 52*, 72-98. https://doi.org/10.1016/j.tsc.2024.101510
Schleicher, A. (2012). *Preparing teachers and developing school leaders for the 21st century: Lessons from around the world.* OECD Publishing.
Shafiee, N. S., & Ghani, M. A. (2022). The influence of teacher efficacy on 21st-century pedagogy. *International Journal of Learning, Teaching and Educational Research, (21)*1.
Shahzad, K., & Naureen, A. (2017). Impact of teacher self-efficacy on secondary school students' academic achievement. *Journal of Education and Educational Development, (4)*1, 32-51. https://doi.org/10.22555/joeed.v4i1.1050
Tareen, H. (2026). A study of Afghan lecturers' self-efficacy perceptions in relation to the instruction of 21st-century skills. *Curriculum and Teaching Studies, 13*(1), 24-41.

Tseeke, M. (2021). Teachers' perceived self-efficacy in responding to the needs of learners with visual impairment in Lesotho. *South African Journal of Education, (41)*12.

Türkoğlu, M. E., Cansoy, R., & Parlar, H. (2017). Examining relationship between teachers' self-efficacy and job satisfaction. *Universal Journal of Educational Research, 5*(5), 765-772. https://doi.10.13189/ujer.2017.050509

UNESCO (2020). *Capturing 21st century skills: Analysis of assessment in selected sub-Saharan African countries.* UNESCO and Brookings Institution.

Weitin, W. (2017). *Psychology: Themes and variations (7th ed).* Thomson Learning, Inc.

Wu, X., Liao, H., & Guan, L. (2024). Examining the influencing factors of elementary and high school STEM teachers' self-efficacy: a meta-analysis. *Current Psychology, 43*, 25743–25759. https://doi.org/10.1007/s12144-024-06227-7

Zorlu, Y., & Zorlu, F. (2021). Investigation of the relationship between preservice science teachers' 21st century skills and science learning self-efficacy beliefs with structural equation model. *Journal of Turkish Education, 18*(10), 1-16. https://doi.10.36681/tused.2021.49