



## **Pre-Service Teachers' Academic Performance and Competence on 21<sup>st</sup> Century Learning Skills**

Danao, John Leif B., Barua, Raihanah M., Bitamug, Princess B., Calagui, Joana Carla N., Carragayan, Angeline, Ladia, Jessa Mae C., Lana, Krisha T., Lauigan, Catherine D., Clemente, Beatriz G., & Clemente, Romeo C.

Cagayan State University  
[bethclemente@yahoo.com](mailto:bethclemente@yahoo.com)

### **Abstract**

This study examined the academic performance and 21st-century skill competence of Bachelor of Secondary Education major in Social Studies pre-service teachers at Cagayan State University (AY 2024–2025). Focusing on the 6Cs, critical thinking, collaboration, creativity, communication, connectivity, and culture, the study employed a descriptive-correlational design using surveys and academic records. Results showed that pre-service teachers had "Very Good" academic performance and were rated as highly competent in all six 21st-century skills. No significant differences were found based on profile variables such as sex, gadget ownership, or internet access. However, a positive relationship was established between academic performance and 21st-century skill competence. These findings highlight the importance of embedding 21st-century learning skills into teacher education curricula to enhance both pedagogical effectiveness and academic achievement, while also pointing to the need for focused interventions in specific areas such as feedback, conflict resolution, and real-world creativity.

**Keywords:** *Academic performance, competence, pre-service teachers, 21st century skills, 21st century skills competence*

### **Suggested citation:**

Danao, John Leif B., Barua, Raihanah M., Bitamug, Princess B., Calagui, Joana Carla N., Carragayan, Angeline, Ladia, Jessa Mae C., Lana, Krisha T., Lauigan, Catherine D., Clemente, Beatriz G., & Clemente, Romeo C. (2025). Pre-Service Teachers' Academic Performance and Competence on 21<sup>st</sup> Century Learning Skills. *Studies in Interdisciplinary Horizons*. 1 (2) 32-44 . <https://doi.org/10.64358/x29hdf70>

## **Introduction**

The evolving world of the 21st century has continued to embrace advancement, and education in this view has to undergo some reforms in the height of the 21st century learning skills. The 6C's in this context serve as a framework that can likewise advance learner's academic performance.

The 21st Century Learning Skills, represented by the collaboration, communication, creativity, critical thinking, citizenship, and character are essential for equipping students to thrive in a globalized, technology-driven world. Researches emphasize these competencies as crucial for deep learning, with a strong focus on fostering student engagement and real-world problem-solving.

Globally, Anggraeni et al. (2019) highlight how these skills prepare students for future work environments, while locally, Philippines viewed this as a crucial component of its education system, which give emphasis to the role of these skills in improving students' global competencies and holistic development.

In the teacher education program, which is responsible for molding pre-service teachers, the role in teacher preparation is viewed to be crucial and one of the most rigorous professional programs. Educators are supposed to model strategies consistently that resemble the 21st century learning skills.

Within the K to 12 curriculum, there is a pressing need to develop 21st century learning skills among learners. This educational reform framework aims to equip students not only with academic content knowledge but also with key skills for life and work in the 21st century. In this context, future teachers must be adequately prepared, as they are expected to become the implementers of K to 12 pedagogies and skill integration in real classroom settings (CMO No. 75, s. 2017). Consequently, pre-service teachers must internalize and model these competencies, ensuring that their future students acquire the skills needed to thrive in modern, diverse, and rapidly changing environments.

As reflected in the Cagayan State University's (CSU) intended graduate attributes, the university highly emphasizes the word competence. "Competence" is defined as critical thinker, creative problem solver, competitive performer, regionally, nationally, and globally. Additionally, the College of Teacher Education (CTE) particularly the Bachelor of Secondary Education (BSED) Program's outcomes, highlight the development of highly motivated and competent teachers specializing in the content and pedagogy in the secondary education. At present, the program has undergone various developments in the teaching practices and instructions, which includes the qualifying exams that are given annually. After graduation, BSED graduates are expected to demonstrate expertise in teaching their field of specialization, effectively guide learners in their life and career choices, and exhibit competence in dealing with adolescent's behavior.

These changes have visibly influenced the 21st century learning skills that Pre-Service teachers must acquire before undertaking their field study courses in their fourth year of the program. They should be competent in integrating these body of knowledge in their lessons and pedagogical approaches.

Thus, 21st century learning skills should be reflected in their academic performance. Their academic performance encompasses three dimensions of grading systems which includes; field of specialization, general education and professional education courses. Recent studies have investigated the relationship between academic performance and teaching readiness in the 22nd century among pre-service teachers, revealing a positive correlation between pedagogical competence and academic performance. Pre-service teachers who exhibit exceptional pedagogical skills also tend to demonstrate excellent academic performance (Fabelico & Afalla, 2023).

However, researchers revealed that pre-service teachers may have acquired a lot of theoretical knowledge of the 21st century learning skills (critical thinking, collaboration, communication, and creativity), but they may face challenges when it comes to applying this knowledge in actual teaching situations. Transferring 21st century skills into visible pedagogical activity demands the pre-service teachers not only awareness of the skills but also of pedagogical thinking, and the ability to bridge theory and practice. Further, pre-service teachers found the pedagogical training efficient in promoting cognitive skills but only average in information literacy and problem-solving skills, lacking in fostering communication skills.

In addition, Parcasian (2020) revealed that pre-service teachers at Benguet State University demonstrated readiness in 21st-century skills. However, there is a need for enhancements in areas like communication, learning, role modeling, and leading. This result is congruent with Ocampo (2021) who stated that pre-service teachers used cognitive skills at a high level; however, their use of other skills, such as collaboration and flexibility skills to solve real-life issues is at the intermediate level only.

Thus, this study determined the academic performance and competence of the pre-service teachers major in Social Studies of the 21st century learning skills.

## **METHODOLOGY**

### **Research Design**

This study used a descriptive correlational research design. The quantitative method was used to determine the profile of the pre-service teachers in terms of sex, gadgets owned, internet connectivity at home, number of hours spent in reading, exposure to reading materials and availability of reading materials. It was also used for the level of competence of BSED pre-service teachers on the 21st Century learning skills. There were 61 from the BSED Social Studies Pre-Service Teachers and 57 Resource Teachers. A survey questionnaire on the competence of pre-service teachers on 21st-century learning skills was utilized. The researchers adapted the survey questionnaire from various sources. For critical thinking, collaboration, creativity and communication, the items 1.1-4.6 were taken from Pacheco et al., (2020). For connectivity, items 5.1-5.6 were adapted from Diquito et al., (2022), and for culture, items 6.1-6.6 were adapted from Kamaruddin et al.,(2023). Thus, the survey questionnaire has a total items of 36. The survey questionnaire has undergone further validation by experts.

Descriptive statistics like frequency count and percentage distribution were used for the profile variables, and weighted mean for the 6Cs (Critical thinking, Collaboration, Communication, Creativity, Connectivity, and Culture). Moreover, inferential statistics like t-test and the analysis of variance (ANOVA) were used to test the significant difference in the assessment on the level of competence of the pre-service teachers on 21st century learning skills when they are grouped according to profile variables and significant relationship on the level of competence of the pre-Service teachers on 21st century learning skills and academic performance. A 4-point Likert scale was used for the level of competence on 21st-century learning skills.

## **DISCUSSION**

### **Profile of the Pre-Service Teachers**

Table 1. Frequency and Percentage Distribution of the Respondents in terms of Sex

Sex	Frequency	Percentage
Male	15	24.59
Female	46	75.41
TOTAL	61	100.00

Table 1 reveals that the majority of the respondents are female, comprising 75.41%, while 24.59% are male. This reveal that the BSED Social Studies Pre-service teachers deployed in the DepEd Division of Tuguegarao City and Cagayan are predominantly females

Table 2. Frequency and Percentage Distribution of the Respondents in terms of Gadgets Owned

Gadgets Owned	Frequency	Percentage
Smartphones	58	95.08
Tablets	6	9.84
Laptop	51	83.61
Desktop	3	4.92

Table 2 presents the frequency and percentage distribution of gadgets owned by the respondents. The data indicate that dominant number or 95.08% of the pre-service teachers posses smartphones, while 83.61% among them own laptop highlighting their reliance on these devices for academic purposes. This suggests that smartphones and laptops are preferred due to their convenience and portability, enabling pre-service teachers to use them flexibly across various settings. Conversely, only a small proportion of respondents own tablets (9.84%) and desktop computers (4.92%). These findings imply that tablets are less preferred for use due to their higher cost, while desktop computers are less favored due to their lack of portability and practicality.

Table 3. Frequency and Percentage Distribution of the Respondents in terms of Internet Connectivity at Home

Internet Connectivity	Frequency	Percentage
None	1	1.64
Mobile Data	48	78.69
Wifi	34	55.74

Table 3 reveals that dominant number of respondents or 78.69% rely on mobile data for internet connectivity, while 55.74% have access to Wi-Fi at home. Notably, 1.64% or 1 of the respondents was observed hardly having access to internet connectivity. This finding underscores a digital divide that may impact the online learning experiences and the development of digital literacy among pre-service teachers. The high reliance on mobile data can be attributed to its flexibility and usability outside the home, despite being more expensive than Wi-Fi.

### 1.1 Number of Hours Spent in Reading

Table 4. Frequency and Percentage Distribution of the Respondents in terms of Number of Hours Spent in Reading

Number of Hours Spent in Reading Per Day	Frequency	Percentage
1	12	19.67
2	36	59.02
3	10	16.39
4	3	4.92
TOTAL	61	100.00

The results from table 4 show that majority of pre-service teachers by 59.02% spend 2 hours per day on reading, while 19.67% of them just spend an hour. This implies the considerable number that the pre-service teachers hardly manage their reading time. However, it is noticed that 16.39% and only 4.92% have at least 3 to 4 hours reading time, respectively. This clearly implies that most pre-service teachers just have an hour or two for their chance of reading and likely to develop a limited understanding of key educational concepts. This lack of depth can leave them ill-equipped to handle the complex realities of the classroom. Minimal reading also restricts their ability to engage in meaningful reflection, weakens their academic skills, and undermines their capacity to implement high-quality instruction.

Table 5. Frequency and Percentage Distribution of the Respondents in terms of Exposure to Reading Materials

Exposure to Reading Materials	Frequency	Percentage
Books	12	78.69
E-Books	36	44.26
Online Articles	49	80.33
Journals	20	31.15
Newspapers/Magazines	8	13.11

The results from table 5 show that dominant number or 80.33% of the pre-service teachers subscribe to online articles, followed by 78.69% of them who are dependent on books for their studies. This supports the earlier finding that pre-service teachers regard their smartphones and laptops as their gadgets, which help them have quick access to e-resources. Books and online articles provide important academic content, helping them build a strong knowledge base. However, only 31.15% of them subscribe on journal, while only 13.11% of them rely to newspapers and magazines. This recalls that while they heavily rely on formal academic texts, they may miss out valuable real-world perspectives that are important for their field of study.

Table 6. Frequency and Percentage Distribution of the Respondents in terms of Availability of Reading Materials at Home

Availability to Reading Materials	Frequency	Percentage
Always Available	12	78.69

Sometimes Available	36	44.26
Total	61	100.00

Table 6 reveals that a majority (73.77%) of pre-service teachers report that reading materials are sometimes available in their homes, while only 26.23% indicate that such materials are always accessible. This suggests a notable limitation in consistent access to reading resources within the home environment. Limited and inconsistent access to reading materials—whether print or digital—at home may hinder the development of essential literacy skills, critical thinking, and content knowledge among pre-service teachers. Since reading habits and academic engagement often begin in the home, such a constraint may contribute to reduced opportunities for self-directed learning and intellectual curiosity. It is important to emphasize that the term reading materials in this context encompasses both print (e.g., books, newspapers, magazines) and electronic formats (e.g., e-books, online articles, academic databases). This limited access may hinder their intellectual enrichment and preparedness for professional demands in the teaching field.

### Level of Academic Performance

Table 7. Level of Academic Performance Along General Education

General Education			
Category	Descriptive Interpretation	Frequency	Percentage
85-87	Good	4	6.56
88-90	Very Good	26	42.62
91-93	Outstanding	23	37.70
90-96	Very Outstanding	8	13.11
General Education Mean		90.3	Very Good

As shown in the table 7, the most of the pre-service teachers or 42.62% of the respondents fall under the Very Good category with a grade range of 88–90, followed by 37.70% who achieved an Outstanding performance within the 91–93 grade range. The very good rating of 90.3 in General Education implies that pre-service teachers have mastered foundational skills such as critical thinking, effective communication, cultural awareness, collaboration, and creativity. However, with 6.56% of the students still rated as "Good," there is room for improvement, particularly in areas like critical thinking and collaboration, which are essential for higher performance. The high ratings, represented by 42.62% of students in the "Very Good" category and 37.70% in the "Outstanding" category, show a grasp of these skills, yet to reach the "Very Outstanding" level, further emphasis on enhancing problem-solving abilities, interpersonal communication, and innovative thinking is needed. Strengthening these skills will help all pre-service teachers achieve the highest level of competence, ensuring their readiness for complex and diverse educational challenges. The data reflect that a generally strong performance among pre-service teachers but also indicates that targeted support in higher-order skills is essential for elevating all students to the highest standard of professional readiness.

Table 8. Level of Academic Performance Along Professional Education

Professional Education			
Category	Descriptive Interpretation	Frequency	Percentage
85-87	Good	10	16.39
88-90	Very Good	28	45.90
91-93	Outstanding	20	32.79
90-96	Very Outstanding	3	4.92
<b>Professional Education Mean</b>		<b>89.50</b>	<b>Very Good</b>

Table 8 shows the Academic Performance along Professional Education reveals that the majority of the pre-service teachers (45.90%) fall under the Very Good category. This is followed by 32.79% who achieved an Outstanding performance (grades 91–93), and 16.39% who are categorized as Good (grades 85–87). Only 4.92% of the respondents attained a Very Outstanding performance within the grade range of 90–96.

The Very Good rating of 89.5 in Professional Education reflects that pre-service teachers have achieved a grasp of pedagogical skills, including critical thinking, creativity, communication, collaboration, and cultural awareness. However, with 16.39% of students still rated as "Good," there is potential for growth, particularly in enhancing their critical thinking and collaborative skills, which are essential for higher achievement. The high ratings, with 45.90% of students in the "Very Good" category and 32.79% in the "Outstanding" category, demonstrate solid competence. To reach the "Very Outstanding" level, students should focus on advancing their problem-solving skills, leadership qualities, and the ability to navigate complex cultural situations. These improvements will enable all pre-service teachers to reach the highest level of expertise and preparedness for the challenges they will face in education.

Table 9. Level of Academic Performance Along Field of Specialization

Field of Specialization			
Category	Descriptive Interpretation	Frequency	Percentage
85-87	Good	4	4.56
88-90	Very Good	26	42.62
91-93	Outstanding	23	37.70
90-96	Very Outstanding	8	13.11
<b>Field of Specialization Mean</b>		<b>88.3</b>	<b>Very Good</b>

Table 9 shows that less than half of pre-service teachers (42.62%) fall within the "Very Good" category (88–90), followed by 37.70% in the "Outstanding" range (91–93). Only 4.56% are categorized as "Good" (85–87), while 13.11% achieved "Very Outstanding" performance (90–96). The Very Good rating of 88.3% in Field of Specialization reflects that pre-service teachers possess strong capabilities in key areas such as content skills, analysis (critical thinking), problem-solving and innovation (critical thinking, creativity), effective communication (communication), leadership and teamwork (collaboration), and adaptability in diverse environments (connectivity, collaboration). The majority of students performed well, with 42.62% rated as Very Good and 37.70% as Outstanding, indicating solid competence in their specialization. However, with 4.56% still rated as Good, there remains room for growth, particularly in strengthening critical thinking

and creativity skills essential for higher performance. To reach the Very Outstanding level, where only 13.11% currently stand, students should focus on advancing their analytical reasoning, innovation, and leadership abilities. These improvements will help ensure that all pre-service teachers are equipped with the advanced skill set needed for success in their future professional practice.

Table 10. Summary of the Academic Performance

Category	General Education	Professional Education	Field of Specialization
Mean	90.3	89.5	88.3
<b>Overall Mean</b>	<b>89.4</b>		<b>Very Good</b>

Table 10 presents the summary of academic performance of pre-service teachers across three domains. The academic performance has an overall mean of 89.4 categorized as Very Good, reflects a strong academic foundation across all key areas of their teacher education program. The highest mean score, 90.3, was recorded in General Education, followed by Professional Education at 89.5, and the lowest mean, 88.3 was in the Field of Specialization. This suggests that while the students are performing well across all areas, there are slight variations in their proficiency, with general academic knowledge and pedagogical skills being their strengths, and specialized subject knowledge being slightly weaker. These findings reveal disparities in subject mastery (Field of Specialization) and pedagogical competence (Professional Education), alongside foundational skills (General Education), all of which are crucial for effective 21st-century teaching. This suggests areas where improvements in teacher training programs could be targeted to ensure well-rounded competence along the three domain of academic performance among future educators.

The results align with Yurt's (2021) findings, emphasizing the necessity of integrating 21st-century skills into teacher training programs. Such integration is essential for enhancing the academic performance and overall readiness of pre-service teachers to meet modern educational challenges.

### Level of Competence on 21<sup>st</sup> Century Learning Skills

Table 11. Level of Competence on 21st Century Learning Skills as Assessed by Themselves and by their Resource Teachers

21 <sup>st</sup> Century Learning Skills	Pre-Service Teachers	Descriptive Interpretation	Resource Teachers	Descriptive Interpretation
Critical Thinking	3.65	VHC	3.68	VHC
Collaboration	3.44	VHC	3.67	VHC
Creativity	3.78	VHC	3.68	VHC
Communication	3.33	VHC	3.68	VHC
Connectivity	3.63	VHC	3.67	VHC
Culture	3.88	VHC	3.69	VHC

The table presents the summary of the 6Cs of 21st Century Learning Skills. Both self-assessments by pre-service teachers and assessments by their resource teachers consistently yield a "Very High Competence" descriptive interpretation of the pre-service teachers' skills. Culture



emerges as the highest-rated skill by the pre-service teachers, with a mean of 3.88, and by the resource teachers with a mean of 3.69.

Communication skill is the lowest-rated, with pre-service teachers giving a mean of 3.33, while resource teachers rated collaboration and connectivity, with a mean of 3.67 with descriptive interpretation for the three skills as very high competence. Despite these minor differences, both groups largely assessed an overall competence of the pre-service teachers in 21st-century learning skills as very high.

These results contrast with the findings of Miterianifa et al. (2021), who identified Critical Thinking as the highest-rated 21st-century skill, emphasizing the importance of Higher Order Thinking Skills (HOTS), particularly for future educators. Similarly, Annan-Brew et al. (2024) supported these findings, noting that Communication was one of the least-rated skills among the 21st-century learning skills, observing that communication skills are less frequently applied in practical settings.

#### 4. Significant Difference on the Level of Competence of the Pre-Service Teachers on 21st Century Learning Skills as Assessed by the two groups of Respondents

Table 12. Significant Difference on the Level of Competence of the Pre-Service Teachers on 21<sup>st</sup> century Learning Skills as Assessed by Themselves and by their Resource Teachers

21 <sup>st</sup> Century Learning Skills	Pre-Service Teachers (Mean)	Resource Teachers (Mean)	T-Value	P-Value	Decision
Critical Thinking	3.65	3.68	0.707	0.519	Not Significant
Collaboration	3.44	3.67	1.981	0.156	Not Significant
Creativity	3.78	3.68	-0.872	0.45	Not Significant
Communication	3.33	3.68	1.567	0.209	Not Significant
Connectivity	3.63	3.67	0.374	0.739	Not Significant
Culture	3.88	3.69	-1.218	0.32	Not Significant

Table 18 presents the significant difference on the level of competence of the pre-service teachers on 21st century learning skills as assessed by themselves and by their resource teachers. The probability values of 0.519 for critical thinking, 0.156 for collaboration, 0.45 for creativity, 0.209 for communication, 0.739 for connectivity, and 0.32 for culture are greater than the 0.05 level of significance. Hence, the null hypothesis is accepted. This means that there are no significant differences on the level of competence of the pre-service teachers on 21st century learning skills as assessed by themselves and by their resource teachers. This implies that both groups possess relatively similar assessment of the 21st century learning skills among pre-service teachers.

Conversely, Pui et al. (2020) and Asli et al., (2022) found disparity (in perceived competence levels) in self-assessment scores, particularly in the domains of Communication and Critical Thinking.

#### 5. Significant Difference on the Level of Competence of the Pre-Service Teachers on the 21st Century Learning Skills when grouped according to Profile Variables

Table 13. Significant Difference on the Level of Competence of the Pre-Service Teachers on 21<sup>st</sup> century Learning Skills when grouped according to Profile Variables

Profile Variables	P-value	Decision
Sex	0.294	Not Significant
Gadgets Owned	0.32	Not Significant
Internet Connectivity	0.34	Not Significant
Hours Spent in Reading	0.315	Not Significant
Exposure to Reading Materials	0.33	Not Significant
Availability of Materials	0.35	Not Significant

Table 19 presents the test for difference on the level of competence of the pre-service teachers on the 21st century skills when grouped by profile variables. The p-values of the profile variables are greater than the 0.05 level of significance, hence the null hypotheses are accepted. This shows that there are no significant differences on the level of 21st-century skills' competence of the pre-service teachers across the profile variables which are sex, gadgets owned, internet connectivity, reading hours, exposure, and availability of materials. In other words these variables do not create measurable differences in how pre-service or resource teachers demonstrate skills.

This could suggest that 21st-century learning skills are being developed or acquired consistently across diverse groups, regardless of their background or access to resources. This suggests that these factors do not significantly influence competency levels. Similar conclusions were drawn by Kocaman, (2022), while, Kol & Tunceli (2022) found significant differences based on sex wherein female demonstrated higher competence in these skills compared to male.

## 6. Test on Significant Relationship between Academic Performance and the 21st Century Skills

Table 14. Correlation Results Between Academic Performance and the 21<sup>st</sup> Century Learning Skills

Academic Performance Vs. 21 <sup>st</sup> Century Skills	Correlation Coefficient (r)	Interpretation	P-value	Decision
Critical Thinking	0.45	Moderate positive correlation,	0.002	Significant
Collaboration	0.39	Moderate positive correlation	0.010	Significant
Creativity	0.52	Strong positive correlation	0.001	Significant
Communication	0.47	Moderate positive correlation	0.003	Significant
Connectivity	0.35	Weak positive correlation	0.015	Significant

Culture	0.41	Moderate positive correlation,	0.002	Significant
---------	------	--------------------------------	-------	-------------

The results from the table 20 affirm that all six 21st-century skills- critical thinking, collaboration, creativity, communication, connectivity, and cultural awareness- are significantly and positively correlated with the academic performance of BSED Social Studies Pre-service teachers. Notably, Creativity yielded the highest correlation ( $r = 0.52$ ), interpreted as a strong positive relationship. This suggests that students who demonstrate greater creative thinking skills tend to perform better academically, underscoring creativity's critical role not only in knowledge acquisition but also in problem-solving, innovation, and adaptive thinking in teaching and learning contexts.

These findings support the goals outlined in CHED Memorandum Order (CMO) No. 75, Series of 2017, which emphasizes the importance of equipping future educators with 21st-century competencies. The BSED curriculum is designed around three major domains- General Education, Professional Education, and the Field of Specialization- each aiming to nurture these essential skills. In particular, creativity is fostered in both General Education and Field of Specialization through tasks that demand originality, contextual thinking, and the development of learner-centered instructional strategies.

The link between creativity and academic performance implies that innovative thinking and flexible approaches to problem-solving are key drivers of success for pre-service teachers, especially in Social Studies, where learners are expected to analyze complex social issues, propose solutions, and create engaging, meaningful learning experiences. It also reflects the evolving demands of the teaching profession, where educators must be not only content experts but also creative facilitators of 21st-century learning environments.

On the contrary, according to Varona (2020), she reported no significant correlation between overall 21st-century skills and academic performance, with only communication skills showing a significant relationship.

## CONCLUSION

This study examined the academic performance and competence of pre-service teachers in 21st-century learning skills. The results indicate that pre-service teachers perform well academically, with most categorized as having "Very Good" academic performance. Their self-assessments, along with the assessment of the resource teachers show that the pre-service teachers have very high competence along critical thinking, collaboration, creativity, communication, connectivity, and cultural awareness. These findings suggest a link between 21st century learning skills and academic performance. However, there are areas for improvement, such as providing constructive feedback, resolving conflicts, and applying creativity in real-life situations. Additionally, the study found no significant differences on the competency levels based on profile variables, such as sex, gadgets owned, or internet connectivity. Finally, the research reveals a significant relationship between academic performance and the acquisition of 21st-century skills among pre-service teachers, highlighting the importance of these skills in their overall success.

## Funding

This research received no external funding.

## Acknowledgment

Gabayan, S.D. et al., Dominant Temperament Traits and Student Challenges Among Science Education Majors at Ifugao State University

This study would have not been a success if not with the unconditional moral and technical support of the family members of the researchers, their adviser, research professor and the panel members and the office of the College of Teacher Education who refined this academic endeavor.

### Conflicts of Interests

The author declares no conflict of interest.

### References

Anggraeni, P., Sunendar, D., Maftuh, B., & Sopandi, W. (2023). *How Do 6Cs Appearance at Elementary Schools Learning?* DWIJA CENDEKIA: Jurnal Riset Pedagogik.

Annan-Brew, R., Ezugwu, I. J., Hughey Surman, S., & Dadzie, J. (2024). *Enhancing pre-service teacher effectiveness: Integration of 21st-century skills during off-campus teaching experiences.* European Journal of Education.

Apaydın, S., & Güven, S. (2022). *Pre-Service Teachers' Evaluations of Creativity in Higher Education. Educational Policy Analysis and Strategic Research.*

Asli, Koculu., Mustafa, Sami, Topçu., Ayse, H, Ciftci.(2022). *The Effect of STEM Education on Pre- Service Science Teachers' Perceptions of 21st Century Skills and Competences and Problem Solving Skills.* OpenJournal for Educational Research, 6(2):165-172.

Commission on Higher Education. (2017). CHED Memorandum Order (CMO) No. 75, Series of 2017:

Revised Policies, Standards, and Guidelines for Bachelor of Secondary Education

Fabelico, F.L., & Afalla, B.T. (2023). *Revisiting the curriculum: Insights from pedagogical competence and academic performance of preservice teachers.* Cogent Education, 10

Hodges, T. S., Scott, C. E., Washburn, E. K., Matthews, S. D., & Gould, C. (2019). *Developing Pre- Service Teachers' Critical Thinking and Assessment Skills With Reflective Writing.* In G. Mariano & F. Figliano (Eds.), *Handbook of Research on Critical Thinking Strategies in Pre-Service Learning Environments* (pp. 146-173).

Kocaman, B. (2022). *Investigating Secondary School Students' Level of 21st Century Skills.* Asian Research Journal of Arts & Social Sciences.

Kol, S., & Tunçeli, H. İ. (2022, December 15). *Examination of 21st-century skills in early childhood in terms of different variables.* Sakarya University Journal of Education.

Lehman(2024). *Multicultural Competence:A Comprehensive Review Supporting Perception Focused Training for Preservice Teachers Teaching Diverse Students*

Miterianifa, M., Ashadi, A., Sulisty, S., & Suciati, S. (2021). *Higher order thinking skills in the 21st century: Critical thinking.* EAI Endorsed Transactions on Educational Technologies, 8(30).

Gabayan, S.D. et al., Dominant Temperament Traits and Student Challenges Among Science Education Majors at Ifugao State University

Ocampo, D.J., & Buenviaje, J. (2021). *Basic Education in the Philippines*. International Handbook on Education in South East Asia.

Parcasion, I. G. (2020). *Readiness of Benguet State University pre-service teachers in the 21st-century teaching environment*. Retrieved from readiness-of benguet-state university-pre-service-teachers-43ko9co35q.

Pui, P., Yuen, B., & Goh, H. (2020). *Using a criterion-referenced rubric to enhance student learning: a case study in a critical thinking and writing module*. Higher Education Research & Development, 40(5), 1056-1069. <https://doi.org/10.1080/07294360.2020.1795811>

VARONA, P. L. (2020). *21st Century Skills: Influence on Students' Academic Performance*. SMCC Higher Education Research Journal (Teacher Education Journal), 2(1).

Yurt, E. (2021). *The effect of 21st-century skills on pre-service teachers' professional competence*. International Journal of Education in Mathematics, Science, and Technology (IJEMST), 9(1), 56–69.