

Teachers' 21st-Century Skills and Pupils' Academic Performance

Danilo L. Amandac Jr.^a, Nick C. Pañares^b

^adanilo.amandac001@deped.gov.ph, ^bnick.pañares@deped.gov.ph
Southern de Oro Philippines College – Graduate School, Cagayan de Oro City, Philippines

Abstract

This research investigated the relationship between teachers' 21st-century skills and pupils' academic performance. Descriptive correlational analysis was used in the study. Data gathering involved the utilization of an adapted questionnaire. The academic performance of the students was evaluated using the school's Form 5 School Year 2021–2022. The study contained a total of one hundred (100) teachers from grades four through six from the three (3) schools in the West II district of Cagayan de Oro City. Mean, standard deviation, and Pearson r correlation were used to treat the data. The study discovered that the teachers' Information Literacy Skills have the highest mean. The pupils' academic performance implies that they are Proficient learners. Problem-solving skills of teachers have a significant relationship with the pupils' academic performance. It is recommended that teachers must be engaged in trainings and seminars that offer to retool and upskill problem-solving skills. Pupils shall be exposed to activity-based learning that shall encourage hands-on activities with practical approaches to 21st-century skills to improve learning. Teachers may further develop their 21st-century skills in terms of Information Literacy Skills (ILS) and Critical Thinking Skills (CTS) during School Learning Action Cell (SLAC), Focus Group Discussion (FGD), mentoring, and In-service training.

Keywords: 21st-century skills, problem-solving, information literacy, critical thinking, academic performance.

1. Introduction

From the beginning to the present, studies on teacher training have focused heavily on the competencies expected of teachers. They must now possess both 21st-century abilities and abilities to think critically, especially in monitoring pupils' development in critical thinking and 21st-century skills. These talents are vital for classroom teachers and should be a priority for how teachers apply 21st-century teaching skills, the extent of their critical thinking skills, and the influence of those skills among the learners.

People have felt the need to persevere through hardships in various sectors and develop as people from the past to the present to fulfill the demands of the times. These disagreements have profoundly altered the skills and behaviors people need to fit the various eras in which they live.

Many countries advance for this reason, according to Abdullo et al. (2022). Programs for elementary and secondary education are the focus of most of these changes to a 21st-century education. From early childhood to higher education, every stage emphasizes the significance of teachers' inputs to students' development of 21st-century abilities within the educational process which are crucial for improving students' prospects for a successful future.

They further added that teachers must possess these techniques for the pupils to acquire these skills. Teachers should mentor and promote their pupils' production preparedness, curiosity, problem-solving abilities, and critical thinking. Teachers must be able to impart to the younger 21st-century generation learners the skills necessary for their age. In addition, they should actively produce and use the latest technologies and have influential citizens. Teachers, who bear the impact of the duty in this process, are expected to monitor all global trends closely and guide society in producing the next generation of people

capable of learning skills appropriate to their age and adapting to the neighborhood they live in (Jan 2017). Thus, this research was conducted to determine the teachers' 21st-century skills and pupils' academic performance.

The study was anchored on Lev Vygotsky's Sociocultural Theory of Cognitive Development, particularly the Zone of Proximal Development, which serves as the theoretical foundation for this study. According to this theory, children develop their cultural values, beliefs, and methods for solving problems through cooperative conversations with more experienced members of society. This process is socially mediated.

The Zone of Proximal Development (ZPD), as defined by Sage (2022), is the gap between what a young child can achieve on their own and what they can execute with the assistance of an experienced adult. The ability of the youngster who is just beginning to learn is included in this zone. In a never-ending loop, kids pick up new information from others who are more experienced. In these circumstances, social interaction promotes cognitive progress to bridge the gap between their expertise and the child's knowledge, social partners employ cultural resources like language. The child's zone moves up as they age, enabling them to accomplish more tasks by themselves and engage in higher-order thinking. To promote cognitive development, teachers should plan classes so that they fall within the ZPDs of their students. Since each child has a unique ZPD, teachers should provide both individualized support and group projects in the classroom.

According to Vygotsky's theory, as cited by Daneshfar and Moharami (2018), social and cultural experiences are the most significant way to understand child development, wherein a social connection is considered a growth factor. The child gradually learns to function cognitively on her own with the help of more seasoned members of the social environment. Thus, a person's cognitive growth is mediated by the social world. This method offers new approaches to evaluating children's mental capacity and to teach Reading, Mathematics, and Writing by highlighting the socially mediated nature of cognitive processes.

In addition, teachers may find it helpful to comprehend the Zone of Proximal Development. Teachers may conduct an initial skill level assessment with pupils in classroom settings. Then, teachers may deliver instruction that pushes every student beyond their comfort zone. There might be an initial need for a more knowledgeable teacher or classmate to help the pupil. It will not take long for their zone of proximal development to grow. To support this growth, educators can organize and plan lessons and instruction for the classroom.

For instance, the teacher might divide the class into groups where pupils with lower skill levels are partnered with those with higher ability levels. Assisting children in becoming more capable by giving them hints, cues, and clear instructions and by scaffolding, in which a teacher provides the pupils with explicit instructions to advance steadily toward a goal.

Likewise, Department Order 55 s. 2016, reiterates the importance of 21st-Century Skills which are integrated into the K–12 Curriculum and which the students must acquire. The findings of the different forms of assessment which are done to measure learners' progress in the attainment of learning standards and 21st-Century skills, shall then be utilized to measure the learners' academic performance.

Furthermore, to attain these goals, teachers must be equipped with the necessary skills needed to perform the function of a facilitator of learning whereby pupils depend on for their development. Educators must meet the demands of a world that is continually evolving in the 21st century. By generating relevant learning experiences, integrating technology to progress learning, and serving as role models for 21st-century learning, teachers may provide students with the skills they need to succeed in the 21st century.

The 21st century has a tremendous opportunity to underline the importance of education in preparing students to deal with complex societal, economic, and environmental concerns (Borthwick & Hansen, 2017). Likewise, learners will acquire the competencies and skills necessary for success in the current global economy due to the shift from teacher-led learning to self-directed learning (Elfert, 2019).

The concept of 21st-century skills explains what students must know and be capable of in order to enter the workforce and make judgments (Aleid, 2019). Applying this theory to the present study, a teacher as

a more skilled person can help provide approaches to assist learners in advancing understanding of the knowledge and domain to develop their 21st-century skills. Collaborative learning, discourse, modeling, and scaffolding are some of the strategies which will help support the learners' intellectual knowledge and skills development. They can adapt and make it easier to evaluate both conventional academic subjects and 21st-century abilities, and they will continue to do so. These abilities include innovation, problem-solving, critical thinking, teamwork, information technology proficiency, new kinds of literacy, and social, cultural, and metacognitive awareness.

Digital technologies have a tremendous ability to record both the process of student learning and student achievement. For teachers to use the knowledge in their lessons and for educational institutions to use it in formulating policy, there is an urgency to create new techniques to take advantage of this capacity (Scoular & Care, 2018).

2. Methodology

This study employed the descriptive-correlational research design stated by Rodrigo et al. (2021) that the use of a descriptive-correlational research design is appropriate for quantitative research. The term descriptive-correlational research design refers to a combination of descriptive and correlational research designs that explains a specific phenomenon that appears in the research paper and a systematic inquiry into the interplay between the variables.

The study investigated the interplay between teachers' 21st-century skills and pupils' academic performance; thus, the researcher utilized a quantitative approach, the descriptive-correlational method. In a descriptive correlational study, the researcher's primary goal is to describe connections between variables without demonstrating a causal relationship, according to Katzukov (2020). Data collection from the study's respondents is done via a questionnaire.

This study adopted the quantitative type of research; hence employed quantitative methods in describing and interpreting the teachers' 21st-century skills and pupils' academic performance and the conditions and relationships between the variables presented in the conceptual framework. The research used survey questions. Likewise, the study employed a quantitative method to analyze the data. This is deemed appropriate for this study because it intends to investigate if there is a significant relationship between teachers' 21st-century skills and pupils' academic performance.

Mean and Standard Deviation were utilized for descriptive statistics, data analysis, and interpretation. The teachers' 21st-Century skills and pupils' academic performance were summed up using this method. The Pearson correlation was utilized to establish if there is a correlation between 21st-Century Skills and the teaching performance of West II district public elementary school teachers in the Division of Cagayan de Oro City

3. Results and Discussion

Problem 1: What is the performance level of teachers in 21st-century skills in terms of:

- 1.1 Problem-Solving Skills;
- 1.2 Information Literacy Skills; and
- 1.3 Critical Thinking Skills?

Table 1 presents overall results of the Public Elementary School Teachers' 21st-Century skills: problem-solving; information literacy; critical thinking skills. It has an Overall Mean of 3.85 with SD=0.86, which is described as Agree and interpreted as Highly Observed. This means that the teachers are equipped with 21st-century skills, which are a necessity in teaching 21st-century learners. Through this, they are capacitating themselves in integrating 21st-century skills in the actual class setting. They were all aware of 21st-century skills and their importance to the educational process. They can be considered competent

teachers because they have the ability to contribute to your pupils' achievement through teaching. Every stage of the process, from developing lesson plans and educating pupils to work with parents and school administrators, requires the use of these abilities. To maintain pupils' interest and ensure academic success, effective teaching techniques are crucial. With the issuances and trainings of the Department of Education, teachers will be more equipped with the necessary abilities to engage learners with 21st-century skills. One strategy to help enhance teaching and learning methods is professional development, such as the Department of Education's In-Service Training for Teachers (Tupas & Noderama, (2020).

Table 1

Overall Results of the Public Elementary School Teachers' 21st-Century Skills

21 st Century Skills	Mean	SD	Description	Interpretation
Problem-Solving Skills	3.73	0.98	Agree	Highly Observed
Information Literacy Skills	3.93	0.81	Agree	Highly Observed
Critical Thinking Skills	3.88	0.80	Agree	Highly Observed
Overall Mean	3.85	0.86	Agree	Highly Observed

Note: 4.21 - 5.00 Strongly Agree Very Highly Observed; 3.41 – 4.20 Agree Highly Observed; 2.61 – 3.40 Neither Agree Nor Disagree Moderately Observed; 1.81-2.60 Disagree Lowly Observed; 1.00-1.80 Strongly Disagree Very Lowly Observed

Furthermore, Walag and Fajardo (2020) state that when teachers are knowledgeable about the topic matter, they may clarify students' misunderstandings, which benefits student learning. Additionally, it has been discovered that pupils of teachers who have completed training programs do better than pupils of teachers who have less training.

Further, the variable ,Information literacy skills , got the highest mean of 3.93 with SD=0.81, which is described as Agree and interpreted as Highly Observed. Durodolu and Mojapelo (2020) stated that only if teachers possess these competencies and pursue continuous improvement will it be feasible to avoid the dramatic effects of technology advancements throughout their careers. Although accessing and using digital platforms may seem natural, successful use requires information literacy.

Likewise, Gündüzalp (2021) asserts that information literacy abilities have a more favorable impact on digital literacy abilities, one of today's most crucial competencies. The results showed that information-literate educators are more adept at acting appropriately in online settings. These findings highlight the significance of instructors' information literacy levels, particularly in light of the necessity of digital literacy abilities for success and productivity in digital learning environments.

Among the variables, problem-solving skills, got the lowest Mean of 3.73 with SD=0.98, which is described as Agree and interpreted as Highly Observed. Teachers still find this variable as important in the learning process as evident in their responses. Problem-solving skills were found very relevant to the current work of teachers (Daguplo et al., 2019). To guide their pupils through the teaching-learning process and help them build their problem-solving skills, prospective teachers should possess problem-solving abilities. For instance, a teacher development effort was made in the study by Sandoval et al., (2018), which claimed that teacher thinking and learning had considerable value in stimulating pupils' thought processes, respectively. It was made to change teacher thinking and learning and monitor pupil outcomes.

Problem 2: What are the pupils' academic performance for School Year 2021-2022?

Table 2 presents the frequency and percentage distribution of pupils' academic performance based on School Form 5. For this study, the academic performance of the pupils was the general average as reflected in their School Form-5. The result suggests that most of the learners had acquired the 21st-century skills that are embedded in the K-12 Curriculum (DO. No. 55 s., 2016) and they could transfer their acquired skills from the various classroom assessment into authentic applications but needed assistance from an expert, like teachers (DO. No.8, 2015).

Table 2

Frequency and Percentage Distribution of Pupils' Academic Performance Based on School Form 5

Academic Performance	f	%
Outstanding	12	12
Very Satisfactory	59	59
Satisfactory	29	29
Fairly Satisfactory	0	0
Needs Improvement	0	0

Note: 90-100 Outstanding; 85-89 Very Satisfactory; 80-84 Satisfactory; 75-79 Fairly Satisfactory; Below 75 Needs Improvement.

The academic performance of pupils in different learning areas can be determined by many factors. One of these is the social factor which includes the teacher's assistance. According to O'Connor et al. (2019), pupils' academic success may depend on social factors, which include the teacher's assistance. Opportunity and learning situations must be provided by the school and the teachers for the pupils to showcase their knowledge and skills.

Teachers must be able to produce lessons that will develop their 21st-century skills because as Son & Cho (2020) stated, there is a link between the pupil's academic achievement and the efficiency of the educational materials.

Problem 3: Is there a significant relationship between teachers' 21st-Century skills and pupils' academic performance?

Table 3Correlation Analysis Between *Teachers' 21st-Century Skills* and *Pupils' Academic Performance*

21st Century Skills	r	p
Problem-Solving Skills	0.27	0.006*
Information Literacy Skills	0.14	0.160
Critical Thinking Skills	0.16	0.118

Note: r = Pearson r correlation; P = probability value; Significant at 0.05 level.

Table 3 presents a correlation analysis between teachers' 21st-Century skills and pupils' academic performance. It shows that the p-value of the problem-solving skills is 0.006, which is less than the prescribed margin of error of 0.05, while information literacy skills with a p-value of 0.160 and critical thinking skills with a p-value of 0.118 were higher than 0.05.

Hence, the 21st-century skills of the teachers were not significantly related to the pupils' academic performance. Henceforth, there was no significant relationship between the two variables: the 21st-century skills and the pupils' academic performance. With the result, the null hypothesis was accepted. The table showed that the 21st-century skills of the teachers did not directly influence the pupils' academic performance.

Though it could be noted that teachers are perceived to have high 21st-century skills, Ekici et al. (2017) state that these skills are thought to make people's lives better and promote lifelong learning. The 21st century also called the information era, has simplified the process of obtaining and disseminating information, increasing the demand for experts who can effectively use and reproduce knowledge. Having these skills to satisfy such a need; furthermore, the aim of the Philippine Department of Education's aim is to incorporate 21st-century skills into its K to 12 Education reform goal.

Moreover, the goal of the Basic Education program is to create whole people who are equipped with

21st-century abilities. These include communication, learning, and invention abilities, as well as life and job skills. Therefore, private and public schools should offer professional development courses to help pre-service and in-service educators acquire the 21st-century skills necessary to deliver timely and effective instruction for the twenty-first century. This will help to raise educational standards and improve the quality of instruction, (Molano, 2020).

However, literacy skill has a p-value of 0.160, and is not significantly related to pupils' academic performance, which is contrary to the study (Gu, 2020), where he stated that information literacy among teachers is also increasingly becoming a necessity to support the development of the information society and high standards of education and (Qin et al., 2023) which suggested that people's fundamental ability to adapt to the new digital society is information literacy, which has progressively become the norm.

Subsequently, In the modern period, it has evolved into a crucial indicator for assessing the overall caliber of abilities as well as a critical skill for everyone to have in order to survive, work, and learn in the digital age. In light of this, spreading informational awareness and implementing informative education have become common trends in the globalization of education reform. Additionally, it is becoming a crucial area for innovation in schooling. As the main source of educational growth, teachers serve an important role in furthering education reform and modernization.

Moreover, critical thinking skills, has a p-value of 0.118, which is greater than the prescribed margin of error also suggest that it is not significantly related to the pupil's academic performance, (As'ari et al., 2017) stated that, Critical Thinking Skills (CTS) is not implemented in classrooms when instructor s disregard the value of critical thinking.

However, Cansoy et al. (2018), proposed that the use of critical-thinking skills is growing in the school systems as a benchmark and a guide to creating a future workforce with quality and skills. Consequently, instructions these days are focused on the learning process, especially on how teachers and pupils should build their skills and capabilities in Critical Thinking Skills (CTS) to fix problems.

Among the three 21st-century skills, problem-solving skills was significantly related to the academic performance of the pupils with a p-value of 0.006. Pupils who were exposed by their teacher to this skill in the learning process were more encouraged to study hard and become diligent in their studies. To guide their pupils through the teaching-learning process and help them build their problem-solving skills, prospective teachers should possess problem-solving abilities.

A teacher development effort was made in the study by Sandoval et al. (2018), which claimed that teacher thinking and learning had considerable value in stimulating pupils' thought processes, respectively. It was made to change teacher thinking and learning and monitor student outcomes. Developing problem-solving abilities is one of the aims of 21st-century education (Gunawan et al., 2020). In addition, Nurhayanti et al. (2020) contend that problem-solving abilities represent the highest level of thinking since they involve intricate procedures, including reading, analyzing, and resolving mathematical issues.

4. Conclusions and Recommendations

Based on the findings, the following conclusions have been drawn:

1. The teachers 21st-Century Skills are highly observed.
2. The learners had acquired the fundamental knowledge and skills and can transfer them into authentic tasks with assistance from the teacher.
3. The Teachers' 21st-Century Skills were not significantly related to the Pupils' Academic Performance except for Problem-Solving Skills. This is so, that teachers have done their best and efforts are exerted to transfer these skills to the pupils.

Based on the findings and conclusions, the following recommendations are given:

1. Teachers must be engaged in trainings and seminars that offer to retool and upskilling of 21st-Century Skills.
2. Pupils shall be exposed to activity-based learning that shall encourage hands-on activities with practical applications of 21st-century skills to improve learning.
3. Teachers may further develop their 21st-century skills in terms of Information Literacy Skills and Critical Thinking Skills during School Learning Action Cell (SLAC), Focus Group Discussion (FGD), mentoring and In-service training.

REFERENCES

- Abdulloh, W., Niemted, W., Chusuwan, R., and Tansakul, J. (2022). A second-order confirmatory factor analysis model of primary school administration promoting 21st century skills. *African Educational Research Journal*, 10(1): 28-37.
- Akdemir, M. (2019). Investigation of entrepreneurial characteristics and critical thinking tendencies of geography- teachers [Unpublished master thesis]. Marmara University, İstanbul.
- Aleid, W. A. (2019). Reducing The Rate of Behavioral Problems for Students with ASD & ADHD using the Techniques of FBA. *International Journal for Research in Education*, 43(2), 209-232.
- Anagün, Ş. S. (2018). Teachers' Perceptions about the Relationship between 21st Century Skills and Managing Constructivist Learning Environments. *International Journal of Instruction*, 11(4), 825–840. <https://doi.org/https://doi.org/10.12973/iji.2018.11452a>
- As'ari, A. R., Mahmudi, A., & Nuerlaelah, E. (2017). Our prospective Mathematics teachers are not critical thinkers yet. *Journal on Mathematics Education*, 8(2), 145–156. <https://doi.org/10.22342/jme.8.2.3961.145-156>
- Baik, C., Larcombe, W., & Brooker, A. (2019). How universities can enhance student mental well-being: the student perspective. *Higher Education Research & Development*, 38(4), 674-687. <https://doi.org/10.1080/07294360.2019.1576596>
- Berondo, R. G., & Dela Fuente, J. A. (2021). Technology Exposure: Its Relationship to the Study Habits and Academic Performance of Students. *Utamax : Journal of Ultimate Research and Trends in Education*, 3(3), 125-141. <https://doi.org/10.31849/utamax.v3i3.7280>
- Bingöl, P. (2019). The effect of project-based learning on critical thinking and course achievement in social studies teaching [Unpublished master thesis]. Atatürk University, Erzurum.
- Borthwick, A. C., & Hansen, R. (2017). Digital literacy in teacher education: Are teacher educators competent? *Journal of Digital Learning and Teaching in Education*, 33(5), 46–48
- Cakir, A., & Gungor, M.N. (2017). Pre-service Teachers' Evaluations of Practices in Teaching English to Young Learners in terms of 21st Century Teacher Qualifications. *Journal of Language and Linguistic Studies*, 13(1), 244–259.
- Cansoy, R., Parlar, H., & Polatcan, M. (2018). Teacher candidates' critical thinking tendencies research in Turkey: A content analysis. *Universal Journal of Educational Research*, 6(9), 1974–1980. <https://doi.org/10.13189/ujer.2018.060916>
- Care, E., Kim, H., Vista, A., & Anderson, K. (2018). Education system alignment for 21st-century skills Focuses on assessment. Retrieved 18 July 2019, from <https://www.brookings.edu/research/education-system-alignment-for-21st-century-skills/>
- Çelik, Ö. Çokçalışkan, H. & Yorulmaz, A. (2018). Investigation of the effect of student classroom teachers' critical thinking disposition on their media literacy. *International Journal of Evaluation and Research in Education*, 7(3), 194-202. <https://doi.org/10.11591/ijere.v7.i3.pp194-202>
- Çepni, S., & Ormancı, Ü. (2018). Geleceğin dünyası. In S. Çepni (Ed.), *Kuramdan uygulamaya STEM+A+E eğitimi*. Ankara: Pegem Publishing. <https://doi.org/10.14527/9786052410561>

- Daguplo, M. S., Capili, P. L. G., Estrella, A. R. C., & Bano, A. L. (2019). Tracking the Employment and Employability Characteristics of the Graduates of the College of Teacher Education. *Asia Pacific Journal of Multidisciplinary Research*, 7(2), 67-74.
- Deighton, J., Humphrey, N., Belsky, J., Boehnke, J., Vostanis, P., & Patalay, P. (2017). Longitudinal pathways between mental health difficulties and academic performance during middle childhood and early adolescence. *British Journal Of Developmental Psychology*, 36(1), 110-126. <https://doi.org/10.1111/bjdp.12218>
- Demitra, & Sarjoko. (2018). Effects of handed cooperative learning based on indigenous knowledge on mathematical problem-solving skills. *International Journal of Instruction*, 11(2), 103–114. <https://doi.org/10.12973/iji.2018.1128a>
- Daneshfar S. & Moharami M. (2018) Dynamic Assessment in Vygotsky's Sociocultural Theory: Origins and Main Concepts. <http://www.academypublication.com/issues2/jltr/vol09/03/20.pdf>
- Department of Education (DepEd) Order No. 8 (2015). Policy guidelines on classroom assessment for the k to 12 basic education program.
- Department of Education (DepEd) Order No. 55 (2016). Policy guidelines on the national assessment of student learning for the k to 12 basic education program.
- Durodolu, O. O., & Mojapelo, S. M. (2020). Contextualization of the information literacy environment in the South African education sector. *Electronic Journal of e-Learning*, 18(1), 57–68.
- E. Borja II, Ruben. (2018). Honing the 21st-century characteristics of lecturers in the Faculty of Education for effective job performance. *African Educational Research Journal*. 6. 160-164. 10.30918/AERJ.63.18.054.
- Ekici, G., Abide, Ö. F., Canbolat, Y., & Öztürk, A. (2017). 21.Yüzyıl Becerilerine Ait Veri Kaynaklarının Analizi. *Eğitim ve Öğretim Araştırmaları Dergisi*, 6 (Özel Sayı1), 124-134. <https://arastirmax.com/tr/system/files/dergiler/116393/makaleler/6/1/arastirmax-21yuzuil-becerilerine-ait-veri-kaynaklarinin-analizi.pdf>
- Elfert, M. (2019). Lifelong learning in sustainable development goal 4: What does it mean for UNESCO's rights-based approach to adult learning and education? *International Review of Education*, 65(3), 537–556.
- Elfil, M., & Negida, A. (2017). Sampling methods in clinical research; an educational review. *Emergency*, 5(1).
- Elisanti, E., Sajidan, S., & Prayitno, B. A. (2017). The profile of critical thinking skill students in XI grade of senior high school. In 1st Annual International Conference on Mathematics, Science, and Education (ICoMSE 2017) (pp. 117-121). Atlantis Press.
- Gonzalez, K., & Maxwell, G. M. (2018). Mathematics teachers' efficacy, experience, certification and their impact on student achievement. *Journal of Instructional Pedagogies*, 21, 1–11.
- Gu, Y. (2020). Enhancement of college English teachers' information literacy in an information environment. *International Education Studies*, 13(4), 106–112.
- Gunawan, G., Harjono, A., Nisyah, M. A., Kusdiastuti, M., & Herayanti, L. (2020). Improving students' problem-solving skills using an inquiry learning model combined with an advanced organizer. *International Journal of Instruction*, 13(4), 427-442. <https://doi.org/10.29333/iji.2020.13427a>
- Gündüzalp, S. (2021). 21 st Century Skills for Sustainable Education: Prediction Level of Teachers' Information Literacy Skills on Their Digital Literacy Skills. *Discourse and Communication for Sustainable Education*, 12(1), 85-101.
- Higgins JPTTJ, Chandler J, Cumpston M, Li T, Page MJ, Welch VA(2021). *Cochrane Handbook for Systematic Reviews of Interventions version 6.0*: www.training.cochrane.org/handbook. (Accessed on May 1st, 2021)
- Jan H. (2017). Teacher of 21st Century: Characteristics and Development. NET/JRF, Ph.D Scholar, School of

- Education & Beharioural Sciences, University of Kashmir, Srinagar, J & K, India.
- Jones, W. M., Smith, S., & Cohen, J. (2017). Preservice teachers' beliefs about using maker activities in formal K to 12 educational settings: A multiinstitutional study. *Journal of Research on Technology in Education*, 49(3-4), 134-148.
- Karabacak, Z. I. ., & Sezgin, A. A. (2019). T,rkiyeide dijital d'n,s,m ve dijital okuryazarli . k [Digital transformation and digital literacy in Turkey]. *T,rk I . dare Dergisi [Turkish Administrative Journal]*, 91(488), 320ñ343.
- Katzukov (2020). Descriptive-Correlational Study Design. <https://askinglot.com/what-is-a-descriptive-correlational-study-design>.
- Kember J. (2018). Problem Identification. Illuminate Education.<https://www.illuminateed.com/2018/01/example-of-problem-identification/>
- Kusaeri, K., & Aditomo, A. (2019). Pedagogical beliefs about critical thinking among Indonesian Mathematics pre-service teachers. *International Journal of Instruction*, 12(1), 573–590. [HTTPS://doi.org/10.29333/iji.2019.12137a](https://doi.org/10.29333/iji.2019.12137a)
- Mahinay, R. B., & Pañares, N., & Magnaong, M. (2021). Classroom Teachers' 21st Century Skills in the K to 12 Basic Education Curriculum Implementation: Basis for Policy Review to Increase NAT Scores. Molano, T. C. (2020). The skills of pre-service teachers of region II, Philippines in the 21st century. *International Journal of Scientific and Technology Research*, 9(2), 4108-4110.
- Motallebzadeh, K, Ahmadi, F., & Hosseinnia, M. (2018). Relationship between 21st Century Skills, Speaking and Writing Skills: A Structural Equation Modelling Approach. *International Journal of Instruction*, 11(3), 265- 276. <https://doi.org/10.12973/iji.2018.11319a>
- Nurhayanti, H., Riyadi, & Usodo, B. (2020). Analysis of mathematical problem-solving skills viewed from initial ability and gender differences in an elementary school. *Elementary Education Online*, 19(3), 1127–1141. <https://doi.org/10.17051/ilkonline.2020.716848>
- O'Connor, M., Cloney, D., Kvalsvig, A., & Goldfeld, S. (2019). Positive Mental Health and Academic Achievement in Elementary School: New Evidence From a Matching Analysis. *Educational Researcher*, 48(4), 205- 216.<https://doi.org/10.3102/0013189x19848724>
- Patten, M.L. (2002) Understanding Research Methods. Pyczak Publishing, U.S.A.
- Plotnikova, N. F., & Strukov, E. N. (2019). Integration of teamwork and critical thinking skills in the process of teaching students. *Cypriot Journal of Educational Sciences*, 14(1), 1–10. <https://doi.org/10.18844/cjes.v14i1.4031>
- Qin, Y., Xu, Z., & Wang, X. (2023). A hesitant fuzzy SMART method based on a new score function for information literacy assessment of teachers. *Economic Research-Ekonomiska Istraživanja*, 36(1), 357-382.
- Rodrigo, M.R., Bacus, K.M., Cordova, A.J., Medallo, M., Pacturan, L.D., Enero, D.J (2021); Descriptive-Correlational Study on the effects of E-commerce on the Philippine Economic Performance. <https://www.studocu.com/ph/document/university-of-san-carlos/accountancy/Rodrigo-descriptive-correlational-study-on-the-effects-of-e-commerce-on-the-philippine-economic-performance/13845595>
- Sage, K. (2022). Zone of Proximal Development. Routledge. <https://doi.org/10.4324/9780367198459-REPRW163-1>
- Sağlam, M. K., & Şahin, M. (2017). Inquiry-based professional development practices for science teachers. *Journal of Turkish Science Education*, 14(4), 66-76.
- Sandoval, W. A., Kwako, A., Modrek, A. S. & Kawasaki, J. (2018) Patterns of Classroom Talk Through Participation in Discourse-Focused Teacher Professional Development. *Proceedings of the 13th International Conference of the Learning Sciences*, 2 (pp. 760-767).
- Sarmiento, C. P., Morales, M. P. E., Elipane, L. E., & Palomar, B. C. (2020). Assessment practices in

- Philippine higher STEAM education. *Journal of University Teaching & Learning Practice*, 17(5), 18.
- Scoular, C., & Care, E. (2018). Teaching twenty-first-century skills: Implications at system levels in Australia. In *Assessment and teaching of 21st-century skills* (pp. 145-162). Springer, Cham.
- Shisigu, A., Hailu, A., & Anibo, Z. (2018). Problem-based learning and conceptual understanding of college female students in physics. *Eurasia Journal of Mathematics Science and Technology Education*, 14(1), 145-154.
- Son, B., & Cho, Y. (2020). An Analysis on Factors that Affect Academic Achievement in Globalized Environment. *The Journal of Industrial Distribution & Business*, 11(6), 7–17. <https://doi.org/10.13106/JIDB.2020.VOL11.NO6.7>
- Subekti, H., Susilo, H., Suwono, H., & Purnomo, A. R. (2019). Challenges and Expectations towards Information Literacy Skills: Voices from Teachers' Training of Scientific Writing. *International Journal of Learning, Teaching and Educational Research*, 18(7), 99-114.s
- Subia, G., Salangsang, L. and Medrano, H. (2018) Attitude and Performance in Mathematics of Bachelor of Elementary Education Students: A Correlational Analysis. *American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS)*, 39, 206-213.
- Tupas, F., & Noderama, R. (2020). Looking into In-Service Training for Teachers in the Philippines: Are They Gearing towards Education 4.0?. *Universal Journal of Educational Research*, 8(10), 4651-4660.
- Tus, J. (2020). The Influence of Study Attitudes and Study Habits on the Academic Performance of the Students. 10.6084/m9.figshare.13093391.v1.
- Vula, E., Avdyli, R., Berisha, V., Saqipi, B., & Elezi, S. (2017). The impact of metacognitive strategies and self-regulating processes of solving math word problems. *International Electronic Journal of Elementary Education*, 10(1), 49–59. <https://doi.org/10.26822/iejee.2017131886>
- Walag, A. M. P., & Fajardo, M. T. M. (2020). Rapid Assessment of the Perceived Impacts of an Adult-Education Science Competency-Based Enhancement Training on Alternative Learning System Mobile Teachers and Volunteer Teachers in Cagayan De Oro City, Philippines. *strategies*, 11, 34-38.