

# Digital Literacy Among Teachers in Public Secondary Schools in Allen District 1, Division of Northern Samar

LUZ G. RESULTA  
LORDELYN T. ALMASCO  
ARBIE M. ESTINOPO

Northwest Samar State University, Graduate Studies

[luzresulta7@gmail.com](mailto:luzresulta7@gmail.com)  
[lordelynalmasco151@gmail.com](mailto:lordelynalmasco151@gmail.com)

*Abstract* — To overcome challenges, teachers have adopted various coping mechanisms, with a strong focus on motivating colleagues and parents to see the benefits of ICT. Engaging with school leadership to improve the school's digital infrastructure and seeking support for better access to electricity and technology are among the most common strategies employed. These efforts reflect the teachers' proactive approach in addressing the barriers to ICT integration and ensuring that both the school community and broader educational environment are aligned with the goal of improving digital literacy.

Interestingly, while efforts to procure more devices and improve internet connectivity are important, teachers place greater emphasis on attitudinal shifts and community engagement. This suggests that teachers recognize the need for collective buy-in and support from all stakeholders to create an environment conducive to digital learning.

Despite challenges, the data indicates that teachers possess a solid foundation of digital literacy across various domains, including information retrieval, usage, and creation. However, there remain areas for improvement, especially in areas like multimedia content creation, understanding legal issues related to digital content, and refining advanced search strategies. Teachers show strong capabilities in using digital tools for information retrieval and basic content creation, but they need further training in more specialized areas to truly enhance their digital pedagogy.

The absence of significant relationships between demographic factors (such as age, gender, or experience) and digital literacy levels suggests that factors such as personal motivation, access to resources, and institutional support are likely more significant determinants of digital literacy than traditional characteristics. This implies that digital literacy initiatives should be universal and tailored to meet the needs of all teachers, regardless of their demographic profiles, and should emphasize continuous professional development and peer collaboration.

The study indicates that while teachers exhibit a strong foundation in digital literacy, significant barriers remain that hinder their full potential. The primary challenges are resource-related and stem from a lack of content, clear pedagogical models, and insufficient technical support. To address these issues, a comprehensive approach is required, one that includes ongoing professional development, institutional support for infrastructure, and incentives for attitude change toward technology.

*Keywords* — *Digital literacy among Teachers in Public Secondary schools*

---

## I. Introduction

In the 21st century, the swift advancement of digital technologies has greatly changed educational systems worldwide. Digital literacy has become an essential skill that educators need to effectively teach, manage classrooms, and engage students in interactive and meaningful ways. Worldwide, educational organizations have embraced different frameworks and approaches to boost teachers' digital skills, acknowledging that digital literacy is crucial not just for improving learning results but also for equipping students for a technology-oriented future.

In the Philippines, the Department of Education (DepEd) has highlighted the incorporation of information and communication technology (ICT) in fundamental education via multiple programs and initiatives, including the DepEd Computerization Program and the Digital Rise initiative. These initiatives seek to provide educators and learners with the essential resources and abilities to succeed in a digital landscape. Even with these national advancements, inequalities in access, infrastructure, and teacher readiness remain, particularly in rural and under-resourced regions.

At the local level, particularly in the Division of Northern Samar, issues concerning digital literacy among public school teachers are still apparent. In Allen District 1, numerous schools struggle with limitations in technological infrastructure, training options, and access to digital resources, raising significant concerns about teachers' ability to effectively incorporate technology into their teaching. An analysis of current literature shows that the majority of research on digital literacy focuses on urban and more technologically developed areas, resulting in a demographic disparity in rural regions like Allen 1. This highlights the necessity to assess and tackle the specific digital literacy issues faced by teachers in these situations.

This research is based on the Technological Pedagogical Content Knowledge (TPACK) framework introduced by Mishra and Koehler (2006), highlighting the convergence of technological, pedagogical, and content knowledge as vital for successful technology integration in education. The TPACK model is additionally backed by constructivist learning theory, emphasizing the significance of active, student-centered settings, and the SAMR model, which classifies technology integration stages from enhancement to transformation. These frameworks together direct the research in evaluating teachers' digital literacy and recognizing pertinent professional development requirements.

Consequently, this research seeks to evaluate the degree of digital literacy among public secondary school educators in Allen District 1, Northern Samar Division, and to suggest a training initiative that will enhance their digital skills. The results will help close the gaps in research and populations by delivering localized information and practical suggestions specifically designed for the requirements of educators in rural schools.

## Review of Literature

**Conceptual Literature.** The ability to access, evaluate, use, create, and communicate information using digital technologies is commonly known as digital literacy, and it is recognized as a crucial competency in education for the twenty-first century (Eshet, 2012). Digital literacy, according to Tican and Deniz (2018), encompasses using information responsibly, managing online personas, and navigating digital platforms. These skills are particularly important for teachers, who must use technology in their lessons and act responsibly online.

Mishra and Koehler's (2006) TPACK framework serves as a foundation for understanding how technological, pedagogical, and content knowledge converge. This model highlights that effective digital instruction necessitates a blend of pedagogical knowledge and subject expertise, not just technical skills.

Puentedura's SAMR model enhances TPACK by offering a structured method for technology integration: Substitution, Augmentation, Modification, and Redefinition. These tiers help teachers assess and enhance their implementation of digital tools in the classroom.

According to Tomczyk and Fedeli (2021), existing frameworks for digital literacy vary in their focus and often do not have a unified assessment model, especially for educators. According to their research, models that consider the educational use of ICTs in real-world teaching settings are necessary.

Global research shows that teachers' levels of digital literacy vary, often influenced by their geographic location, the infrastructure they have access to, and the support they receive from their institutions. Tomczyk (2020) found that many teachers in Poland overestimated their digital skills, particularly with regard to software use. Similar differences were observed in Turkey, where Ongoren (2021) linked digital literacy to readiness for instruction, showing that confidence levels were significantly influenced by training and technology availability.

Soekamto et al. (2022) highlighted the difficulties faced by rural teachers in Indonesia as a result of outdated infrastructure and inadequate training. These findings are consistent with the situation in the Philippines' rural areas, where the digital divide is made worse by comparable disadvantages.

Vidal (2020) found that although teachers in Cavite used digital tools to a moderate extent, they lacked sophisticated integration skills. Even though national programs like DepEd's Digital Rise aim to bridge these gaps, implementation in rural areas continues to differ significantly.

A performance model for assessing pre-service teachers' digital literacy was validated by Peled et al. in 2021. In order to ensure digital readiness in real classrooms, their research highlights the significance of continuous professional development and institutional support.

In the Philippines, Lestari et al. (2020) observed that although some elementary school educators exhibited average digital skills, they were deficient in advanced abilities like content creation, copyright ethics, and critical source evaluation—capabilities necessary for effective digital instruction.

A significant research gap exists in the literature focusing on the digital literacy of educators in rural or under-resourced regions such as Allen District 1. The majority of studies in the Philippines concentrate on urban environments or pre-service teachers, resulting in insufficient exploration of the needs and circumstances of in-service educators in rural areas.

**Research Literature.** According to Tomczyk (2020), the goal was to evaluate Polish teachers' proficiency with digital literacy. Safe logging-in, assessing the accuracy of information, protecting anonymity in the digital world, secure online communication, intellectual property, and ICT ergonomics were the six main areas in which the study assessed DL. Gender had no bearing on the level of knowledge and abilities. The Dunning-Kruger effect was found in teachers' evaluations of DL in connection to digital safety. Schools now face significant challenges in recognizing and fostering the growth of DL, which is considered a critical safeguard in digital safety.

Ongoren (2021) investigated the connection between the digital literacy and teaching readiness levels of prospective preschool teachers in Turkey. Participants in the study included instructors in their third and fourth years from four state institutions. The study found that there was a somewhat positive relationship between teaching preparation levels and digital literacy, with no significant differences by gender or grade level. The findings indicate that digital literacy and instructional readiness are critical traits of preschool teachers who are prepared for the future.

A study on the self-efficacy of pre-service teachers in digital literacy was carried out by Aslan (2021) at a public university in Turkey. The findings demonstrated that teachers' digital literacy self-efficacy was significantly impacted by department, gender, and home computer and internet access. However, there was no discernible difference in teachers' self-efficacy according to their class level, type of university entrance exam, or reasons for using technology. The study emphasizes how critical it is to comprehend and deal with these elements in the field of digital literacy.

A thorough examination of the tools used to assess teachers' digital competency from 2011 to 2022. According to the findings, researchers concentrate on how teachers use educational technology, teaching and learning, professional development, and learner support in order to demonstrate digital proficiency. Some academics draw attention to the ways in which teachers can use technology to assess the learning outcomes of their students or give them the resources they need to use technology to enhance their education. Despite the prevalence of self-assessment tools, some studies advocate for both subjective and objective evaluation (Nguyen and Habok, 2023).

Widana (2020) evaluated the impact of digital literacy on the ability of math teachers in senior high school and vocational high schools to develop HOTS-based tests in the provinces of Bali, West Nusa Tenggara, and East Nusa Tenggara. This survey-based study makes use of questionnaires, multistage random sampling, and fundamental regression analysis methods. According to the results, digital literacy has a 13.2% influence on instructors' ability to develop HOTS-based assessments. Other factors, like digital literacy, also have an impact on how HOTS-based evaluation has developed. The study recommends more research to identify additional variables that affect teachers' ability to develop assessments based on HOTS.

According to a 2017 study by Sakarya University College of Education, Cam and Kiyici examined the digital literacy of prospective teachers. The computer education and instructional technology departments had high levels of digital literacy. Digital literacy was higher among male instructors and instructors who had continuous access to computers or the internet. Furthermore, there was no discernible correlation between teachers' personal income and their level of digital literacy. The findings indicate that raising digital literacy is necessary to improve educational outcomes.

Digital literacy and technological skills are essential components of pedagogy in the field of education. Primary school teachers in Almaty, Kazakhstan, took part in a study to assess their pedagogical, technical, and digital literacy abilities. Teachers' technical, pedagogical, and digital literacy skills were compared by gender and professional seniority. Additionally, while pedagogical competencies were high, digital literacy and technology competencies were found to be modest. The findings highlight how important it is for teachers to master these subjects (Orakova et al., 2024).

A study looked at teachers' evaluations of their digital literacy skills. It revealed that Malaysian teachers believe they are very tech-savvy. Developing appropriate policies and strategies for instructors to evaluate the quality of information and improve their ability to find relevant information using the best search technique is essential to achieving the highest level of digital literacy (Baharuddin et al., 2023).

The study on the Digital Divide in Ghanaian elementary schools, according to Quaicoe and Pata (2020), focuses on teachers' use of technology and digital literacy. According to the report, school-based management governance needs to be changed in order to address these problems. Despite their high level of digital proficiency, the study emphasizes that teachers need to take the initiative to use ICT tools for professional practice.

Because it helps people adapt to new technologies, digital literacy is essential to humanity in the twenty-first century. Nations are realizing how important it is to provide high-quality education while integrating technology into the classroom. When creating teacher education programs, it is essential to ascertain the digital literacy levels of students, instructors, and preservice teachers. A study that translated the digital literacy scale into Turkish and included 979

junior and senior pre-service science instructors from state universities found that their skills are generally adequate. The study highlights the significance of developing digital literacy skills for the twenty-first century, according to Ustundag et al. (2017).

According to the study, there is no one-size-fits-all approach to assessing DL among instructors, even though the majority of frameworks have precisely defined DL regions and degrees. DL is integrated into the teaching process and is measured through self-declaration. Teachers' DL differs from that of other professional groups due to the nature of their work. Disparities in the creation of generally accepted theoretical frameworks may be due to the diverse definitions of DL and viewpoints regarding the computerization of education. Commonalities among the frameworks under examination include the incorporation of DL with methodological elements and the development of teachers and learners (Tomczyk and Fedeli, 2021).

Soekamto et al. (2022) examined the professional development of rural educators in Russia, Indonesia, and the Middle East based on digital literacy. The study assesses the instructors' present proficiency and level of digital literacy in addition to the amount of training they have received. The study highlights the challenges faced by educators in rural areas when implementing digitalization, as well as the differences in access to digital literacy training in these regions. The report claims that integrating digital literacy in developing regions is more challenging when there is insufficient digital infrastructure. Russia has access to adequate hardware and infrastructure, while Indonesia and the Middle East lag behind. The report recommends that basic online courses be taken by instructors in rural areas.

A performance statement inventory for the digital literacy abilities needed by pre-service teachers was verified by Peled, et al. (2021). Factor analysis and structural equation modeling validated the inventory's validity. Strong statistical validity is shown by the findings, which demonstrate a multi-layered model with all domains favorably related. Teachers may modify their pedagogy and instructional resources to meet the school's requirements for digital readiness by using the inventory to evaluate their preparedness on a regular basis.

Tomczyk (2020) identified a number of problems with pre-service teachers' digital literacy. Data was gathered in 2019 from Polish pedagogical studies professors. The study was carried out at the Pedagogical School of Cracow, Poland's largest teacher training institution. The content describes problems with self-assessment of digital literacy in the use of spreadsheets, text editors, and presentation and graphic software. They also discuss e-learning experiences, such as taking free and paid e-learning courses, participating in unofficial study groups, conducting online subject research, and enrolling in required online courses.

Digital literacy is the ability to obtain, understand, and apply knowledge from digital sources. As the fourth revolution progresses, the government is mandating that educators use digital technology and assess the accuracy of information. This study used a qualitative research approach to understand the information literacy skills of the primary school teachers in Bogor.

Regarding knowledge assembly, content appraisal, hypertextual navigation, and internet searching, the study found that Bogor elementary school teachers have a mediocre level of digital literacy. Using a stratified random sample approach, 104 teachers from five elementary schools took part in the study (Lestari et al., 2020).

The digital literacy of Turkish pre-service teachers (PTs) through the use of various digital tools. It was found that knowledge, application, critical thinking, creativity, and teamwork are all components of PTs' digital literacy. University professors play a crucial role in improving the digital literacy of PTs. PTs use social media extensively for a number of reasons, but in order to support their professional development, they need more guidance. The findings shed light on the current digital literacy skills of PTs in Turkey, which will be useful to educational policy makers and teacher trainers in the twenty-first century. The findings will be advantageous for teacher education in the twenty-first century (Akayoglu et al., 2020).

Higher education is moving away from conventional institutions due to the quick speed of technology progress, necessitating a change in the ways that teaching and learning are conducted. The results show that literacy abilities and digital technologies have a complicated connection; information literacy directly affects intention to use, while digital literacy has no direct effect on intention to use. To increase people's willingness to utilize digital technologies in higher education settings (Nikou and Aavakare, 2021).

The significance of teachers' digital literacy in the Russian digital economy and the need for advanced training were covered by Kulikova, et al. (2020). It suggests a strategy that uses broad scientific techniques like analysis, synthesis, generalization, and comparison to improve the digital literacy of aspiring teachers. The significance of a system approach—which takes into account the relationships and interdependencies of all the parts under study—is also emphasized in the essay. Additionally, important are empirical techniques such as measurement, comparison, description, and surveys. It suggests a method for raising the digital literacy of aspiring educators that is founded on the real-world creation of interactive online learning environments. This method's efficacy was verified by experimentation, and it was assessed for bachelor's degree candidates in their final year.

## II. Methodology

This research employed a qualitative case study approach to investigate and comprehend the digital literacy experiences of public secondary school educators in Allen District 1, Northern Samar Division. A case study method is suitable for this research since it facilitates a thorough, contextual analysis of participants' actual experiences with digital technologies in their teaching practices. To enhance the data collection process and deliver more profound insights, the photo-voice approach was incorporated into the design. Photo-voice is a participatory research method that allows participants to share their viewpoints by taking photos that represent their experiences,

obstacles, and approaches concerning digital literacy. These images act as visual stories, enhanced by comprehensive interviews that explore their significance. This approach not only enables teachers to communicate their real-life experiences but also increases the depth of the data by integrating visual proof with personal stories. This design seeks to reveal the intricacies of digital literacy within a rural educational setting and to aid in creating a framework that caters to the unique requirements of educators in underfunded public schools.

### **III. Results and Discussion**

Information and communication technology (ICT) integration in the classroom has become crucial in the digital age. Nevertheless, despite the possible advantages, implementing and successfully utilizing ICT in the classroom presents a number of difficulties for many teachers in Allen District 1, Division of Northern Samar's public secondary schools. Lack of proper resources, inadequate technical assistance, and the requirement for instructional models on how to successfully integrate ICT into their classes are some of these difficulties. Furthermore, it's possible that a large number of educators lack the abilities needed to use digital resources and platforms that improve instruction. This training program intends to give secondary school teachers thorough instruction on digital tools, platforms, and best practices for incorporating technology into the curriculum in order to address these issues and give them the skills they need to be digitally literate. Teachers will be better equipped to engage students, create a more dynamic learning environment, and get past obstacles to ICT adoption if they improve their digital literacy.

The goal of this training program is to give secondary school teachers in Northern Samar's Allen District 1 the digital literacy skills they need to improve their instruction. The program will empower teachers to confidently incorporate ICT into their lessons by emphasizing both theoretical knowledge and practical tools related to digital citizenship. This will create an engaging, interactive, and technology-driven learning environment. Apart from augmenting digital literacy, this endeavor will help cultivate an educational experience that is more inventive, inclusive, and accessible for both educators and learners. The program's ultimate goal is to equip teachers with the digital skills they need to facilitate 21st-century learning and adjust to the changing needs of contemporary education.

### **REFERENCES**

- [1] Akayoglu, S., Satar, H., Dikilitas, K., Cirit, N., & Korkmazgil, S. (2020). Digital literacy practices of Turkish pre-service EFL teachers.
- [2] Altun, D. (2019). Investigating pre-service early childhood education teachers' technological pedagogical content knowledge (TPACK) competencies regarding digital literacy skills and their technology attitudes and usage. *Journal of Education and Learning*, 8(1), 249.

- [3] Arfani, S., Rosalinah, Y., Subroto, I., Rahayuningsih, R., & Lestari, R. (2023). Exploring the proficiency of English teachers in digital literacy.
- [4] Aslan, S. (2021). Analysis of digital literacy self-efficacy levels of pre-service teachers. ERIC. <https://eric.ed.gov/?id=EJ1286441>
- [5] Atmojo, I., Ardiansyah, R., & Wulandari, W. (2022). Classroom teacher's digital literacy level based on Instant Digital Competence Assessment (IDCA) perspective.
- [6] Baharuddin, M. F., Masrek, M. N., & Mohamed Shuhidan, S. (2023). Assessing the level of digital literacy among selected Malaysian school teachers. *Journal of Information and Knowledge Management (JIKM)*, 2, 451–462. <https://doi.org/xxxxxx> (insert DOI if available)
- [7] Cam, E., & Kiyici, M. (2017). Perceptions of prospective teachers on digital literacy.
- [8] Eshet, T. (2012). Thinking in the digital era: A revised model for digital literacy. *Issues in Informing Science and Information Technology*, 9, 267–276.
- [9] Eshet, Y. (2012). Thinking in the digital era: A revised model for digital literacy. *Issues in Informing Science and Information Technology*, 9, 267–276. <https://doi.org/10.28945/1621>
- [10] Esteban, A. M., Vergara, C. R., & Tanghal, A. B. (2023). Technology proficiency and academic stress level of pre-service teachers under the new normal. *Advances in Social Science, Education and Humanities Research*, 501–512.
- [11] Gómez-Trigueros, I. M., Ruiz-Bañuls, M., & Ortega-Sánchez, D. (2019). Digital literacy of teachers in training: Moving from ICTs (information and communication technologies) to LKTs (learning and knowledge technologies). *Education Sciences*, 9(4), 274.
- [12] Hassan, M. M., & Mirza, T. (2021). The digital literacy in teachers of the schools of Rajouri (J&K)-India: Teachers' perspective. *International Journal of Education and Management Engineering*, 11(1), 28.
- [13] Jung, J., Choi, S., & Fanguy, M. (2024). *International Review of Research in Open and Distributed Learning*.
- [14] Korkmaz, M., & Akcay, A. (2024). Determining the digital literacy levels of primary school teachers.
- [15] Kulikova, T. A., Poddubnaya, N. A., Bagdasaryan, L., & Ardeev, A. H. (2020). The technique for future teachers' digital literacy development.
- [16] Laerd Dissertation. (2012). Purposive sampling. <https://dissertation.laerd.com>
- [17] Lestari, D., Rahayu, D., & Kartowagiran, B. (2020). Digital literacy of elementary school teachers in Bogor, Indonesia. *International Journal of Instruction*, 13(1), 701–718. <https://doi.org/10.29333/iji.2020.13145a>
- [18] Lestari, H., Siskandar, R., & Rahmawati, I. (2020). Digital literacy skills of teachers in elementary school in the Revolution 4.0.
- [19] Li, W., Gao, W., Fu, W., & Chen, Y. (2021). A moderated mediation model of the relationship between primary and secondary school teachers' digital competence and online teaching behavior. *Frontiers in Education*, 6.
- [20] Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054.
- [21] Nguyen, L., & Habok, A. (2023). Tools for assessing teacher digital literacy: A review.
- [22] Nikou, S., & Aavakare, M. (2021). An assessment of the interplay between literacy and digital technology in higher education.
- [23] Ongoren, S. (2021). Investigation of digital literacy levels and teaching readiness of pre-service preschool teachers. *Journal of Education and Learning*, 10(1), 36–45. <https://doi.org/10.5539/jel.v10n1p36>

- [24] Ongoren, S. (2021). Investigation of prospective preschool teachers' digital literacy and teacher readiness levels.
- [25] Orakova, A., Nametkulova, F., Issayeva, G., Mukhambetzhanova, S., Galimzhanova, M., & Rezuanova, G. (2024). The relationships between pedagogical and technological competence and digital literacy level of teachers.
- [26] Peled, Y., Blau, I., & Grinberg, R. (2021). Validating a model for assessing the digital literacy of pre-service teachers. *Education and Information Technologies*, 26, 2935–2951. <https://doi.org/10.1007/s10639-020-10360-y>
- [27] Peled, Y., Kurtz, G., & Avidov-Ungar, O. (2021). Pathways to a knowledge society: A proposal for a hierarchical model for measuring digital literacy among Israeli pre-service teachers.
- [28] Puentedura, R. R. (2009). Transformation, technology, and education. Hippasus Blog. <http://hippasus.com/resources/tte/>
- [29] Pumayanti, D. (2022). The challenges of implementing digital literacy in teaching and learning activities for EFL learners in Indonesia.
- [30] Quaicoe, J., & Pata, K. (2020). Teachers' digital literacy and digital activity as digital divide components among basic schools in Ghana.
- [31] Sanchez-Cruzado, C., Campion, R. S., & Sanchez-Compana, M. T. (2021). Teacher digital literacy: The indisputable challenge after COVID-19.
- [32] Schroter, T., & Grafe, S. (2020). Digital literacy and digital competency of university teachers: A systematic analysis of frameworks.
- [33] Shulman, S. L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1–22.
- [34] Soekamto, H., Nikolaeva, I., Abbood, A., Grachev, D., Kosov, M., Yumashev, A., Kostyrin, E., Lazareva, N., Kvitkovskaja, A., & Nikitina, N. (2022). Professional development of rural teachers based on digital literacy.
- [35] Soekamto, H., Nurcahyono, A., & Rachmadtullah, R. (2022). Digital literacy training in rural areas: A comparative study between Indonesia, Russia, and the Middle East. *Journal of Education and E-Learning Research*, 9(2), 84–90. <https://doi.org/10.20448/journal.509.2022.92.84.90>
- [36] Tican, C., & Deniz, S. (2018). Pre-service teachers' opinions about the use of 21st-century learner and 21st-century teacher skills. *European Journal of Educational Research*, 8(1), 181–197.
- [37] Tinmaz, H., Lee, Y., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy.
- [38] Tomczyk, L. (2019). Skills in the area of digital safety as a key component of digital literacy among teachers.
- [39] Tomczyk, L. (2020). Digital literacy and e-learning experiences among the pre-service teacher's data.
- [40] Tomczyk, Ł. (2020). Digital literacy and e-safety: Methodological and empirical perspective of the assessment of digital competences of teachers in Poland. *Education and Information Technologies*, 25(6), 4695–4710. <https://doi.org/10.1007/s10639-020-10172-y>
- [41] Tomczyk, L., & Fedeli, L. (2021). Digital literacy among teachers – Mapping theoretical frameworks: TPACK, DigCompEdu, UNESCO, NETS-T, DigiLit Leicester.

- [42] Tomczyk, Ł., & Fedeli, M. (2021). Digital literacy models in education: What are they for? *Education and Information Technologies*, 26, 643–660. <https://doi.org/10.1007/s10639-020-10239-w>
- [43] Ustundag, M. T., Gunes, E., & Eralp, B. (2017). Turkish adaptation of digital literacy scale and investigating pre-service science teachers' digital literacy.
- [44] Vidal, C. (2020). Digital literacy skills and engagement on the advanced classroom tools and softwares of elementary teachers in relation to their coping skills. *Computational Intelligence and Machine Learning*.
- [45] Vidal, M. E. (2020). Digital literacy of teachers in private schools in Cavite. *International Journal of Multidisciplinary: Applied Business and Education Research*, 1(1), 45–55.
- [46] Widana, I. (2020). The effect of digital literacy on the ability of teachers to develop HOTS-based assessment.
- [47] Yazon, A., Manaig, K., Buama, C. A., & Tesoro, J. (2019). Digital literacy, digital competence and research productivity of educators. *Universal Journal of Educational Research*, 7, 1734–1743. <https://doi.org/10.13189/ujer.2019.070812>