



Digital Literacy, Pedagogical Knowledge, and Research Skill: A Structural Equation Model in Professional Competence of Teachers

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Authors' contributions

This work was carried out in collaboration between both authors. Author MPD wrote the entire manuscript and conducted the gathering of data. Author MYL guided the author MPD in writing the study all throughout. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: To determine the levels of digital literacy, pedagogical knowledge, and research skills and to identify the best-fit model of professional competence of elementary and high school teachers in Southern Mindanao Region, Philippines.

Study Design: Quantitative-causal research design utilizing the Structural Equation Model.

Place and Duration of Study: Southern Mindanao Region, The Philippines, during the school year 2022-2023.

Methodology: Stratified random sampling technique was used to determine the 400 elementary and secondary Filipino teachers. Only those respondents who agreed to be part of the study were included. However, this study did not have teachers not handling Filipino subjects; those teaching in college; teaching outside Region XI; or training in the previous school year. The respondents came

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from different divisions of Davao City, Davao del Norte, Davao del Sur, Davao Occidental, Davao de Oro, Davao Oriental, Digos City, Mati City, Panabo City, Island Garden of Samal, and Tagum City.

Results: Filipino teachers' digital literacy, pedagogical knowledge, and research skills were very high. It indicated that digital literacy, pedagogical knowledge, and research skills were observed. Likewise, my professional competence was also very high. It was an indication that the respondents paid much attention to professional abilities. It also revealed that digital literacy, pedagogical knowledge, research skills, and professional competence had a significant relationship. Among the five models tested, hypothesized model 5 was the best-fitted model. Digital literacy exhibited the effect, making it a significant predictor of professional competence. In contrast, pedagogical knowledge shows eligible results, which means partly a predictor of professional competence. Moreover, the research skill shows a negligible direct effect on professional competence.

Conclusion: Model 5 was the most appropriate model for the teachers' professional competence, and the study indicated that Filipino teachers in Southern Mindanao Region had very high levels of digital literacy, pedagogical knowledge, research skill, and professional competence. It implies that teachers must maintain substantial and relevant teaching-learning activities to gain professional competence. It shows further that these three independent variables may be used as a starting point for future research and as a resource when creating prospectuses for students enrolling in education programs.

Keywords: Digital literacy; pedagogical knowledge; research skill; professional competence; technological content; knowledge; structural equation model; southern Mindanao region.

1. INTRODUCTION

Lack of knowledge and skill as elements in professional competence are teachers' dilemmas in teaching [1]. In addition, insufficient and unsuitable strategies in teaching, as well as inappropriate numbers of activities along with incompetent teachers, resulted in low-quality learning among learners [2]. It is a manifestation of the inability among teachers to be creative, innovative, and have critical thinking [3], lack of pedagogical knowledge, and no systematic approach to research [4].

According to the US National Education Association, teachers must use pedagogy and strategy in professional competence to impart knowledge to learners [5]. In Greece, teachers must have qualifications and expertise in professional competence among teachers to attain pedagogical effectiveness and a deductive way of teaching [6].

1.1 Research Objectives

This study aimed to determine the best model suited for the professional competence of teachers. Specifically, the study aimed to:

1. Determine the level of digital literacy in teaching in terms of:

1.1. understanding digital practices;

1.2. Finding Information;

1.3. Using Information;

1.4. Creating Information;

1.5. Professional engagement;

1.6. Digital resources;

1.7. Using digital in teaching and learning;

1.8. Assessment of learning; and

1.9. Empowering learners.

2. Determine the level of pedagogical knowledge of teachers in terms of:

2.1. Teacher education;

2.2. Related theories in teaching language;

2.3. Relevant discipline;

2.4. Technology;

2.5. Context;

2.6. Research;

2.7. Collegiality;

2.8. language-related issues;

2.9. Reflection;

2.10. Teachers; and

2.11. socio-political issues.

3. Determine the level of research skill of teachers in terms of:

3.1. Processing scientific Information;

3.2. Managing scientific Information; and

3.3. Developing scientific Information.

4. Determine the level of professional competence of teachers in terms of:
 - 4.1. Teaching methodology;
 - 4.2. Curriculum;
 - 4.3. Learners;
 - 4.4. Classroom management;
 - 4.5. Context; and
 - 4.6. Self.
5. Determine the significant relationship between:
 - 5.1. Digital literacy and professional competence of the teachers;
 - 5.2. Pedagogical knowledge and professional competence of the teachers; and
 - 5.3. Research skills and professional competence of the teachers;
6. Determine the combined and single influence of digital literacy, pedagogical knowledge, research skill, and professional competence of the teachers.
7. Determine the best-fit model of professional competence of the teachers.

The relationship between digital literacy and professional competence as a dependent variable is the deep and relevant understanding and mastery of using technology in processing Information, communication, and problem-solving. Digital literacy aims to address the challenges in the professional competence of teachers in using technology [7]. It increases knowledge of how to utilize technologies as tools in the teaching-learning process [8]. It provides interactive and open discussions, search Information, and learners' knowledge in all fields [9]. Moreover, the conceptualization of professional knowledge recognizes the effects and contributions of digital literacy, which help develop and improve the skills in using innovations of technology that have enormous influence and impact on teachers [10].

Furthermore, pedagogical knowledge enormously influences teachers' professional competence [11]. It shows a high understanding of the processes, practices, and methodologies in teaching and learning the learners. It includes the overall goal of apprehension of how the learners translate, improve classroom management, make suitable lesson plans, and assess for learning [12]. The relationship of pedagogical knowledge to the professional competence of the teachers is rooted in the

ability to impart knowledge to the learners [13]. A great connection in professional competence pertains to the processes and activities during the teaching-learning engagements. It also includes the students' learning, planning strategies and implementations, and how further to evaluate the performance of the learners [10].

On the other hand, in the study of Ward et al. [14], teachers' experiences and being part of research contribute to learning, especially in their professional competence. It includes teaching strategies that are suited and that help improve the culture of research skills [15]. Research skills are connected to professional competence by determining the qualities of teachers using research in teaching-learning processes. It showed that professional competence was influenced by utilizing analysis and joining research activities such as making policies, organizing, and choosing appropriate steps and strategies for teaching. It will improve teachers' research skills and significantly impact their professional competence [11].

The study is anchored on Technological Pedagogical Content Knowledge Theory that emphasizes the terms: technology, pedagogy, content, and context. It includes the content of the curriculum and specific methods in pedagogy, which makes effective discipline in the professional competence of the teachers. There are three interconnected components of teachers' knowledge mentioned in this theory: first, is the content knowledge; second, is the pedagogical knowledge; and third, is the technological knowledge combined to give massive influence in the contextual knowledge or professional competence [16].

Another theory that can be connected to the study is the Theory of the Committee on Information Technology Literacy of the National Research Council on Fluency of Information Technology which shows more profound and higher importance in understanding professional competence using technology for processing Information, communication, and problem-solving. Moreover, this conceptualization recognizes the development and innovations of using technology which influences the teachers' professional competence [10].

In this connection, the American of Teacher Education proposition determines the set of standards that develops the professional competence of the teachers. It includes the standards in various aspects such as

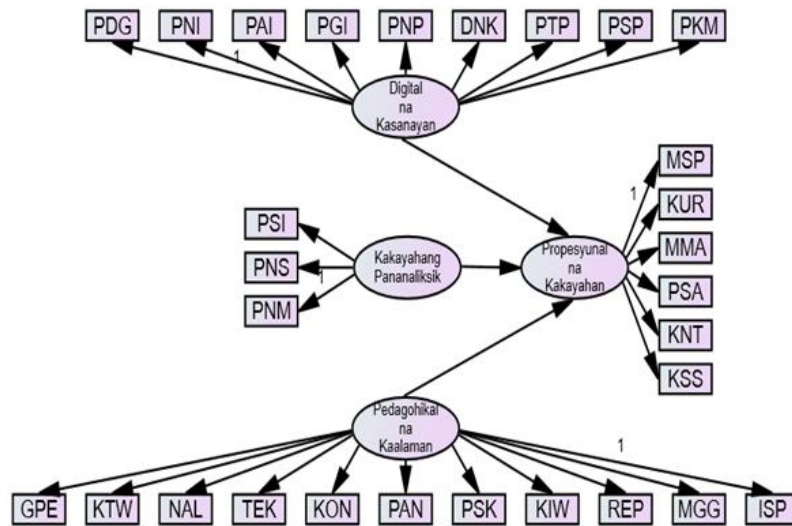


Fig. 1. Conceptual framework of the study

instructional competence, research skills, technological skills, and knowledge in assessing programs and professional development of the teachers [11].

It is investigated in this study the link between the exogenous and endogenous variables, namely: digital literacy, pedagogical knowledge, research skill, and professional competence. Digital literacy unfolded that understanding, finding, using, and creating Information using technology contribute positively to the skills of the teachers. The following are the indicators of digital literacy: understanding digital practices; finding Information; using Information; creating Information; professional engagement; digital resources; using digital in teaching and learning; assessment of learning; and empowering learners [17].

For pedagogical knowledge, it uncovered contributions to a more profound understanding of the processes, practices, and methods in teaching and learning of the learners. The indicators are teacher education; related theories in teaching language; relevant discipline; technology; context; research; collegiality; language-related issues; reflection; teachers; and socio-political issues. Pedagogical knowledge highlights educational goals, intentions, and aims that influence the professional competence of teachers [12].

While the research skill has indicators: processing scientific Information, managing scientific Information, and developing scientific

Information, it takes into account the contemporary research Information using technology which helps improve the skills in the decision-making of the teachers [18].

The diagram above shows the connection between the digital literacy, pedagogical knowledge, research skill, and professional competence of the teachers.

2. MATERIALS AND METHODS

2.1 Respondents

The study's respondents were the 400 teachers teaching Filipino subjects from both elementary and secondary schools in Region XI during the school year 2022-2023. The number of respondents in every school differs based on the population of Filipino teachers. The respondents were selected through stratified random sampling to associate items of the entire population called strata based on similar characteristics. They were chosen to determine the level of digital literacy, pedagogical knowledge, research skill, and professional competence.

Only those respondents who agreed to be part of the study were included in this study. However, this study did not have teachers not handling Filipino subjects; those teaching in college; teaching outside Region XI; or teaching in the previous school year. Others who wished to back out were approved. If ever there were problems arising during the conduct of the study, the researcher automatically replaced the

respondents. Teachers were not forced to answer the questionnaire given through google forms. The respondents came from different divisions of Davao City, Davao del Norte, Davao del Sur Davao Occidental, Davao de Oro Davao Oriental, Digos City, Mati City, Panabo City, Island Garden of Samal, and Tagum City. Due to this limitation, San Jose et al. [19] mentioned that the results might only apply to the respondents and location of the study and only to some Filipino teachers. A more extensive study may be conducted to confirm or challenge the results.

2.2 Research Instrument

This study used downloaded questionnaires adapted from web sources and modified by the researcher with the help of 6 validators. The questionnaire was about to determine the teachers' level of digital literacy, pedagogical knowledge, research skill, and professional competence.

The first part of the questionnaire was about Digital Literacy, Digital Competence, and Research Productivity of Educators [17], which has 46 items. The indicators are: understanding digital practices; finding Information; creating Information; professional engagement; digital resources; using digital in teaching and learning; assessment of education; and empowering learners. Second was the Language teacher educators' pedagogical knowledge: Validating a proposed model by [11] that has 46 items and with indicators: teacher education; related theories in teaching language; relevant discipline; technology; context; research; collegiality; language-related issues; reflection; teachers; and socio-political issues. The Third was about the Design and Validation of a Questionnaire to Measure Research Skills: Experience with Engineering Students of [20] with 20 items and indicators: processing, managing, and developing scientific Information. And lastly was about The Professional Competence of Teachers by [6] with 38 items and indicators: teaching methodology; curriculum; learners; classroom management: context; and self. All item statements were given a corresponding score from 1-5.

During the questionnaire verification, the mean score was 4.5, which is very good. After the validation, the efficiency of the questionnaires was tested through pilot testing using Cronbach Alpha to assess its accuracy. The pilot testing

was done and undergone with Chronbach Alpha reaching 0.944, 0.978, 0.983, and 0.936, respectively, all excellent results.

2.3 Research Design and Methodology

The study used a quantitative-causal research design utilizing the Structural Equation Model to determine the best model. In the investigation, it is essential to analyze the factors hidden in the variables which suggest the cut-off value of 0.50 while using the 0.45 in modeling the culture of the safe basis of construction. The value of the cut-off is affected by the large sample. However, the range of 0.45 to 0.50 is considered best and appropriate. To obtain a broader and more meaningful interpretation of the study's data, the researcher used *means* to describe the level of digital literacy, pedagogical knowledge, research skill, and professional competence of the teachers teaching Filipino.

On the other hand, the standard deviation was utilized to measure how far each value in the frequency distribution was. In contrast, the *Pearson Product Moment Correlation* was used to determine the significant relationship between and among the independent and dependent variables. Also, the *multiple regression analysis* was utilized to determine the significant predictor in the professional competence of the teachers teaching Filipino.

The study followed all the procedures in gathering the data, along with the observance of the protocol in analyzing the standardized processes, especially in determining the study population. After the questionnaire was validated, data was gathered to secure a certificate from the university with some attachments like a certificate of appearance, and approval was given with UMERC Protocol No. UMERC-2022-272.

After such, the researcher asked permission from the office of the Department of Education, the Regional Director, and the Chief of Curriculum Implementation. It was then followed by asking permission from each Division Superintendent in Region XI; attached is the list of teachers who were qualified to be the respondents. Next to that was asking permission from the school principals, and lastly was asking permission from the respondents. The letters used in asking permission were checked and verified by the SVP of the Academic Affairs of the University of Mindanao-Professional Schools.

Afterward, some selected respondents were administered a questionnaire using google forms for pilot testing. After the results were secured and verified, the questionnaires were distributed to the respondents using google forms. After administering the questionnaire, the researcher collected and tabulated it, followed by the

statistician's data analysis. The interpretation was made by the researcher supported by the related and existing studies. All the results were treated with the utmost confidentiality. Giving meaning, recommendations, and conclusions of the study's findings were made.

Chart 1. List of scale used, description, and interpretation of the data collected in the four variables of the study

Scale	Description	Interpretation
4.20-5.00	Very High	Digital literacy, pedagogical knowledge, research skill, and professional competence are always observed.
3.40-4.19	High	Digital literacy, pedagogical knowledge, research skill, and professional competence are often observed.
2.60-3.39	Moderate	Digital literacy, pedagogical knowledge, research skill, and professional competence are sometimes observed.
1.80-2.59	Low	Digital literacy, pedagogical knowledge, research skill, and professional competence are rarely observed.
1.00-1.79	Very Low	Digital literacy, pedagogical knowledge, research skill, and professional competence are never observed.

3. RESULTS AND DISCUSSION

3.1 Level of Digital Literacy in Teaching among Teachers

Table 1. Level of Digital Literacy in Teaching among Teachers

Indicators	SD	Mean	Descriptive Level
Understanding Digital Practices	0.50	4.43	Very High
Finding Information	0.50	4.40	Very High
Using Information	0.50	4.33	Very High
Creating Information	0.56	4.37	Very High
Professional Engagement	0.46	4.43	Very High
Digital Resources	0.49	4.40	Very High
Using Digital in Teaching and Learning	0.51	4.33	Very High
Assessment of Learning	0.72	4.21	Very High
Empowering Learners	0.58	4.42	Very High
Overall	0.39	4.37	Very High

Table 2. Level of Pedagogical Knowledge in Teaching among Teachers

Indicators	SD	Mean	Descriptive Level
Teacher Education	0.43	4.47	Very High
Related Theories in Teaching Language	0.53	4.55	Very High
Relevant Discipline	0.37	4.61	Very High
Technology	0.63	3.88	High
Context	0.55	4.28	Very High
Research	0.66	4.14	High
Collegiality	0.51	4.29	Very High
Language Related Issues	0.54	4.36	Very High
Reflection	0.58	4.23	Very High
Teachers	0.54	4.27	Very High
Socio-political Issues	0.55	4.25	Very High
Overall	0.38	4.30	Very High

As shown in Table 1, the study's results regarding the digital literacy of Filipino teachers in Region XI showed an overall mean score of 4.37, a very high level with a standard deviation of 0.39. It implies that Filipino teachers constantly observe all the indicators of digital literacy. The results can be associated with one of the studies about unfolding the increase of understanding in digital practices, finding, using, and creating Information while utilizing digital technologies to search for Information. Having performed the said indicators largely contribute to improving the learners, especially in their quest for education and future opportunities. Digital skills among the respondents in terms of searching for Information is a need to perform the tasks appropriately and successfully. Having skills in gaining Information using digital skills is necessary for society [21].

Moreover, the results unfolded can be related to using Information. The European Commission (EC) gave importance to digital skills with a belief and critical use of Information Society Technology (IST) in job, entertainment, and communication. The skills are aligned to Information and Communication Technology (ICT), such as how the respondents use computers in searching, analyzing, putting, making, presenting, and changing Information, either communicating or joining collaborative usage of the internet [22].

On the other hand, creating Information using digital literacy in searching for Information provides excellent opportunities to everyone in becoming active. In this aspect, the digital literacy of the respondents is seen in creating social morals among individuals who can use digital resources anchored to the level of the students [23]. In addition, there is a significant role among teacher-respondents inside the class. The result showed that the learners' learning becomes meaningful if there is engagement. Connecting to the teacher-respondents is one of the factors in achieving tremendous and enjoyable activities, active participation, and appropriate implementation of courses for the learners [24]. Regarding digital resources, it showed that the respondents need to discover more digital resources that will be utilized in finding content, searching, managing, creating and analyzing, and synthesizing data and Information. It requires enough knowledge and skills in the field of technology, which comprises various disciplines such as computer,

technology, Information, media, visual and communication skills [25].

Furthermore, the results illustrated that the respondents are seen to be skillful and effective in using technology while researching, finding information, and writing, and having the skill to choose and make their own decisions. This skill connects to choosing and seeing what is exact and necessary Information from diverse networks. Lastly, the results disclosed that the respondents always practice assessment of learning of the learners as one of the indicators of digital literacy. It refers to the strategies designed to determine the learners' learning, to show the results, or if the learning outcomes are achieved in the class. Based on the results, these unveiled a very high level of designs by the respondents as evidence of the success of the collaboration of the parents, teachers, and co-learners [26].

3.2 Level of Pedagogical Knowledge in Teaching among Teachers

Table 2 unfolds the study results in terms of the level of pedagogical knowledge of Filipino teachers in Region XI, with an overall mean score of 4.30 and a standard deviation of 0.38 with a very high descriptive level. It means that the overall pedagogical knowledge of the teachers is always observed in teaching.

As presented in the table, indicators of teacher education, related theories in teaching language, relevant discipline, context, collegiality, language-related issues, reflection, teachers, and socio-political issues garnered a very high level, which means these are always observed among the teachers in teaching. At the same time, the technology and research were high, implying that these are often regarded among the respondents.

The results of the study indicate that the overall pedagogical knowledge of the teachers is always observed in the class. It proves that teacher-respondents can teach pedagogy among diverse types of learners. Learners will have meaningful learning, especially if teachers have very high knowledge of pedagogy. Through the help of pedagogical knowledge, the needs of the learners, whatever level they belong, will be addressed.

Pedagogical knowledge has a higher understanding of the processes, practices, and methodologies in teaching and learners' learning. It consists of general objectives about education, goals, and purposes. A significant relationship of this knowledge can be associated with professional competence in how the learners learn the lessons, improve skills in classroom management, and make suitable and appropriate lesson plans and assessments for learners [12]. In this study, indicator teacher education obtained a very high level mainly because teachers not only limit their knowledge in curriculum and instructional materials but also immerse themselves in an organization of teachers who run and implement education programs. Teachers are expected to have adequate knowledge of how to present educational activities in a way easily understood by those who want to become teachers. Teacher educators must have skills how in assessing those aspirant teachers and colleagues. They must have enough knowledge of how to evaluate the process and progress of development to determine possibilities in the future [11].

Furthermore, an indicator-relevant discipline next to teacher education displayed significant results in the teachers' pedagogical knowledge. It can be associated with a disciplined inquiry that contributes knowledge about schooling [11]. It refers to the context of academic activities that are being studied. The emphasis is on the discipline taught to the learners [27]. In addition, it is related to the actions performed by the teachers in schools imparted to the learners or group of learners appertaining to the lesson's focus. It highlights the topics found in the subject taught among learners [28].

The third indicator that obtained a very high level is the related theories in teaching language. It illustrated significant results in the teachers' pedagogical knowledge because this pertains to how the teachers further understand and explain clearly and possibly the teaching and learning processes using language. That is why there is a need to learn the meaning, definition, and nature using the theories of language to expand the skills and awareness of pedagogical knowledge. The knowledge and skills will be widened through related theories, particularly emphasizing

reading, writing, speaking, and listening, including pronunciation, spelling, sound recognition, and sentence structures [29]. However, the study's results divulged two indicators, the technology, and research with high-level means teachers often observe these in their teaching. Although the results are not alarming, this can still be associated with the finding of the study that unveils that technology needs to be given more focus and attention. With the advent of technological development, there is a significant impact in the field of education, yet need more emphasis on this knowledge. There is no doubt why this component gained only a high level in this study. On the other note, knowing technology provides quality among teacher educators, for they are seen to have not just the familiarization of the resources but also to have adequate knowledge in explaining to other teachers and colleagues how to operate and use technology inside the classes [30].

Similarly, one of the studies revealed that teachers have mastery in finding Information, but they need to gain the skills in using online research methods. Even though these are the words to be used while researching online or on social networking sites, they still need to know when and how to strategize doing research [17]. Also, teachers' knowledge of research still needs focus and attention. Qualitative and quantitative types of research need to be recognized. These types of research posit knowledge on how to do studies, what theoretical framework needs to be used, what methodologies need to be considered, and how to identify problematic situations of the target study [11]. Through this, knowledge of research is vital as it involves systematic processes in discovering future Information and concepts. Also, it helps solve problems and contribute innovative ideas to the teachers' pedagogical knowledge [31].

3.3 Level of Research Skill in Teaching among Teachers

Table 3 discloses the study results regarding the research skills of Filipino teachers in Region XI. It has an overall mean score of 4.54 and a standard deviation of 0.32, with a very high level. It means that all statements in the three indicators of research skill are always observed by the teachers in their teaching.

Table 3. Level of Research Skill In Teaching among Teachers

Indicators	SD	Mean	Descriptive Level
Processing Scientific Information	0.40	4.60	Very High
Managing Scientific Information	0.47	4.46	Very High
Developing Scientific Information	0.41	4.56	Very High
Overall	0.32	4.54	Very High

The unfolded results above can be connected to the experiences and engagements in research, which resulted in the learning and professional competence of the teachers in their teaching practices. It is believed that learning is anchored in conducting research which is one of the strategies that suits the development of research skill culture [18].

As unlocked in the table, all indicators of research skill got a very high level. However, they differ in terms of mean scores. Processing scientific Information reached the highest among the three due to the different strategies that may be utilized in the present state of teachers while ensuring improvements in learners' academic journey. The scientific research process aims to accomplish and perform the tasks like submission of the needs of the study [15]. In addition, the continuous advancement of skills in processing scientific Information is a challenge in the teaching methodology as it aims to develop thinking skills. Doing this motivates and encourages us to give importance to processing teaching skills [32].

Furthermore, developing scientific Information manifested significance in the research skill among teachers. It establishes studies that aim to improve skills necessary for investigations, critical thinking, synthesis, analysis, and others. With the help of the teachers, learners can express and share their knowledge in research as the basis of lifetime activity [15]. Conversely, the last indicator based on the mean result was managing scientific Information. This skill provides a broader and higher understanding of collaboration of strategies and develops skills in sharing and presentation of Information in research among learners. It gives freedom and opportunities among learners based on the management of the teachers and teaching competence resulting in the learning of designed activities that further supports accomplishing the students' research [33].

3.4 Level of Professional Competence in Teaching among Teachers

Table 4 uncovers the results regarding the level of professional competence in teaching among Filipino teachers in Region XI. The results illustrate a 4.26 overall mean score and 0.51 standard deviation with a very high level. It means that the teachers, in their teaching practices, always observe the overall result in professional competence. The professional competence of the teachers exhibits enormous contributions to the teaching-learning processes. It is an indication that the respondents pay much attention to professional abilities.

As observed in the results of the level of professional competence of the teachers, the indicator curriculum gained only a high level with a mean score of 4.18. This result means that teachers often observed items in the curriculum. It is believed that curriculum in schools is one strategy that determines the deductive teaching choices among teachers. Teachers must have enough curriculum knowledge, learning resources, rules in the class, and systematic implementation of the duties and responsibilities in education. It includes the need for a critical methodology or strategy in the curriculum in its scope [34]. More so, one of the significant results in the professional competence of the teachers is the indicator of classroom management. The respondents can be figured out to have always observed managing the class in their teaching. This competence among teachers is essential in achieving successful and creative education. A teacher can be identified as having professional competence if they possess knowledge in classroom management. According to Liakopoulou [6], competence in classroom management is an organization of the classrooms, having motivational appeal, stable learning goals, focused on learners, with enough learning resources, with theories of learning and pedagogical approach. Added to these, knowledge about classroom management ensures that planning in classes serves as a guide for the teachers.

Table 4. Level of Professional Competence in Teaching among Teachers

Indicators	SD	Mean	Descriptive Level
Teaching Methodology	0.53	4.24	Very High
Curriculum	0.56	4.18	High
Learners	0.58	4.25	Very High
Classroom Management	0.54	4.31	Very High
Context	0.56	4.30	Very High
Knowledge of Self	0.69	4.30	Very High
Overall	0.51	4.26	Very High

Also, one notable result is the context. It refers to the environment and the various encounters that teachers must consider. It includes the knowledge about the learners' origin, family background, the community where they live, a system of education, classroom management, history and philosophies of education, and others that make the way of achieving positive educational outcomes. In addition, having professional competence, one of the major qualifications of teachers is knowing self. It is associated with perceptions, duties and responsibilities, training, and rights in professional development. Lastly, professional competence deals with teachers' reflection on teaching-learning processes based on the teachers' experiences following the curriculum implementation and work-related environments [6].

3.5 Significant Relationship between Digital Literacy and Professional Competence in Teaching among Teachers

Table 5 presents the significant relationship between the teachers' digital literacy and professional competence with an r-value of .504 with an equivalent probability of .000, which is lower than .05 of the cut-off level in this study. Based on the result, the hypothesis is rejected and agrees with the alternative hypothesis with a significant relationship between digital literacy and the professional competence of the teachers. This only means that if the digital literacy of the teachers in teaching is high, the professional competence of the teachers observed is also high.

Table 5. Significant Relationship between Digital Literacy and Professional Competence in Teaching among Teachers

Digital Literacy	Professional Competence						
	MSP	KUR	MMA	PSA	KNT	KSS	Overall
PDG	.369** .000	.374** .000	.288** .000	.268** .000	.297** .000	.233** .000	.339** .000
PNI	.410** .000	.405** .000	.307** .000	.290** .000	.312** .000	.276** .000	.371** .000
PAI	.533** .000	.529** .000	.418** .000	.388** .000	.428** .000	.351** .000	.491** .000
PGI	.309** .000	.353** .000	.291** .000	.231** .000	.241** .000	.119* .018	.283** .000
PNP	.454** .000	.455** .000	.404** .000	.394** .000	.428** .000	.304** .000	.452** .000
DNK	.319** .000	.374** .000	.316** .000	.267** .000	.304** .000	.235** .000	.338** .000
PTP	.462** .000	.476** .000	.421** .000	.371** .000	.389** .000	.353** .000	.460** .000
PSP	.357** .000	.353** .000	.314** .000	.265** .000	.265** .000	.211** .000	.327** .000
PKM	.355** .000	.323** .000	.273** .000	.268** .000	.240** .000	.222** .000	.311** .000
Overall	.535** .000	.545** .000	.455** .000	.410** .000	.432** .000	.343** .000	.504** .000

Based on the correlation, there is a significant relationship between the indicators of digital literacy in terms of understanding digital practices, finding Information, using Information, creating Information, collegiality, digital resources, using technology in teaching and learning, assessment of learning and empowering learners to the professional competence of the teachers in terms of teaching methodology, curriculum, learners, classroom management, context and knowledge of self.

Significant relations with digital literacy and professional competence show that teaching learners are only appropriately done if teachers know digital skills, especially when appropriate strategies are required. It means that, in the current school year, digital literacy is very vital among teachers teaching in the 21st century and the learning of 21st-century learners.

From the result of the study, the high level of understanding, finding, using, and creating Information using technology has significantly contributed to the professional competence of the teachers to make, create, present, and publish Information or even particular research article. Also, the teachers' digital literacy has a great relationship with productive research-making; it shows knowledge, skills, and behavior on the job as well as in the life and development of the learners [17].

Furthermore, digital literacy provides interactive and accessible collaboration and contributes to finding Information and learning the learners in all fields using technology. Knowing digital literacy has a massive impact on teachers since it gives opportunities for learners to value and apply their acquired knowledge with the help of effective designs and strategies and appropriate teaching methods [35].

3.6 Significant Relationship between Pedagogical Knowledge and Professional Competence in Teaching among Teachers

Table 6 unveils the significant relationship between teachers' pedagogical knowledge and professional competence in teaching with an r-value of .559 with an equivalent probability value of .000, which is lower than the .05 cut-off level. Based on the results, the hypothesis is rejected,

and agrees to the alternative hypothesis with a significant relationship between pedagogical knowledge and professional competence of the teachers. It means that if the teachers' pedagogical knowledge is high, the professional competence of the teachers observed in teaching is also high.

Based on the overall result of the study, all indicators of pedagogical knowledge in terms of teacher education, related theories in teaching language, relevant discipline, technology, context, research, collegiality, associated issues in language, reflection, teachers, and socio-political problems have a significant relationship to the professional competence of the teachers in terms of teaching methodology, curriculum, learners, classroom management, context and knowledge of self.

Based on the correlation, the significant relationship between pedagogical knowledge and professional competence showed general perceptions of the teachers' command in the educational activities anchored in their engagements having power as the main source of knowledge to the learners. This knowledge aims to develop teachers who have a high value on different programs, have a more profound understanding and belief in society, and show a democratic way of learning. In this context, teachers are honed to become inquisitive and creative individuals; teachers will be able to determine collective needs related to their pedagogical strategies and goals in teaching [13].

3.7 Significant Relationship between Research Skill and Professional Competence in Teaching among Teachers

Table 7 discloses the significant relationship between research skills and the professional competence of the teachers in teaching with an r-value of .338 with an equivalent probability of .000, which is lower than .05 of the cut-off level in this study. Based on the results, the hypothesis is rejected and agrees with the alternative hypothesis with a significant relationship between research skills and the professional competence of the teachers. It means if the research skill of the teachers is high, the professional competence of the teachers in teaching, as observed, is also high.

Table 6. Significant Relationship between Pedagogical Knowledge and Professional Competence in Teaching among Teachers

Pedagogical Knowledge	Professional Competence						Overall
	MSP	KUR	MMA	PSA	KNT	KSS	
GPE	.135** .007	.110* .028	.090 .073	.103* .039	.077 .126	.056 .261	.105* .036
KTW	.156** .002	.169** .001	.120* .016	.144** .004	.125* .012	.057 .259	.141** .005
NAL	.264** .000	.261** .000	.212** .000	.213** .000	.204** .000	.166** .001	.245** .000
TEK	.539** .000	.578** .000	.462** .000	.438** .000	.423** .000	.338** .000	.515** .000
KON	.525** .000	.504** .000	.401** .000	.413** .000	.404** .000	.366** .000	.486** .000
PAN	.385** .000	.380** .000	.283** .000	.286** .000	.268** .000	.190** .000	.331** .000
PSK	.551** .000	.548** .000	.460** .000	.515** .000	.512** .000	.473** .000	.571** .000
KIW	.389** .000	.431** .000	.335** .000	.334** .000	.355** .000	.264** .000	.391** .000
REP	.422** .000	.448** .000	.397** .000	.406** .000	.360** .000	.273** .000	.428** .000
MGG	.488** .000	.480** .000	.400** .000	.437** .000	.424** .000	.370** .000	.483** .000
ISP	.534** .000	.493** .000	.449** .000	.444** .000	.451** .000	.393** .000	.514** .000
Overall	.584** .000	.587** .000	.481** .000	.496** .000	.478** .000	.390** .000	.559** .000

Table 7. Significant Relationship between Research Skill and Professional Competence in Teaching among Teachers

Research Skill	Professional Competence						Overall
	MSP	KUR	MMA	PSA	KNT	KSS	
PSI	.226** .000	.249** .000	.202** .000	.211** .000	.181** .000	.149** .003	.226** .000
PNS	.294** .000	.287** .000	.190** .000	.205** .000	.213** .000	.156** .002	.249** .000
PNM	.311** .000	.325** .000	.241** .000	.262** .000	.216** .000	.196** .000	.287** .000
Overall	.371** .000	.382** .000	.279** .000	.299** .000	.271** .000	.222** .000	.338** .000

As disclosed in Table 7, the overall results of the research skill in terms of processing scientific Information, managing scientific Information, and developing scientific Information showed a significant relationship to the professional competence of the teachers in terms of teaching methodology, curriculum, learners, classroom management, context and knowledge of self.

Based on the correlation, the significant relationship between research skill and

professional competence is through the inquiry and discovery of data which contribute to solutions to the problems encountered. It showed an association in systematically using methods emphasizing ethical consideration. Research skill aims to analyze and synthesize existing knowledge, investigate possible issues in the present, and give solutions to the difficulties encountered by teachers in terms of professional competence. It includes exploring and analyzing problems, making and creating new steps or

systems, determining the phenomena, and developing new knowledge or combination of any of the objectives mentioned that can be used in everyday activity and implementation of educational programs [12].

3.8 Significant Influence of Digital Literacy, Pedagogical Knowledge, and Research Skill on the Professional Competence of Teachers

Table 8 illustrates the significant influence of digital literacy, pedagogical knowledge, and research skill on the professional competence of the teachers with an *F-value* of 66.091, *R-value* of .578, and *P-value* of .000, which is lower than the .05 cut-off level in this study.

As illustrated in Table 8, digital literacy has standardized and unstandardized coefficients of .238 and 2.217 with a constant *t-value* of 3.473 which is significant; pedagogical has a .571 and .429, respectively, with a constant *t-value* of 6.741 that significant result; while the research skill have standardized and unstandardized coefficients of -.048 and -.030 with *t-value* of -.573 which is not substantial. It shows that there are indicators from the research skill that do not influence the professional competence of the teachers. In contrast, the hands under digital literacy and pedagogical knowledge significantly affect the teachers' professional competence.

Based on the results, using the *stepwise regression*, it was found that not all indicators influence the professional competence of the

teachers. As shown in the results of this study, the R^2 has .334, representing only 33.4% influence based on the regression of professional competence. The remaining 66.6% may refer to other factors not included in this study. One of the objectives of this study is to determine the regression that states the influence of digital literacy, pedagogical knowledge, and research skill on the professional competence of teachers. However, this means that all three independent variables in the study still influence the professional competence of the teachers.

Based on the results above, this can still be associated with the perspective view of how the research skill is presented in the laboratory's utilization context. Research skills can still be utilized in providing understanding using a collaborative way, which helps improve the skills of the teachers in an actual setting. To influence professional competence, it can give various experiences using designs that support teaching activities {33}. Therefore, there is a need to maintain digital literacy and pedagogical knowledge and develop more research skill since the concept discovered in the variables still influence the teachers' professional competence.

3.9 Best Fit Model for Professional Competence of Teachers

This part highlights the analysis of the relationship between digital literacy, pedagogical knowledge, research skill, and professional competence of the teachers. Five alternative models were tested to achieve the best-fit model of professional competence.

Table 8. Significant Influence of Digital Literacy, Pedagogical Knowledge, and Research Skill on the Professional Competence of Teachers

Exogenous Variables	Professional Competence			
	<i>B</i>	β	<i>t</i>	<i>Sig.</i>
Constant	.792		2.534	.012
Digital Literacy	.283	.217	3.473	.001
Pedagogical Knowledge	.571	.419	6.741	.000
Research Skill	-.048	-.030	-.573	.567
R	.578			
R^2	.334			
ΔR	.329			
F	66.091			
ρ	.000			

Table 9. Summary of Goodness of Fit Measures of the Five Generated Models

Model	P-value (>0.05)	CMIN / DF (0<value<2)	GFI (>0.95)	CFI (>0.95)	NFI (>0.95)	TLI (>0.95)	RMSEA (<0.05)	P-close (>0.05)
1	.000	5.075	.746	.795	.758	.778	.101	.000
2	.000	4.593	.772	.821	.783	.804	.095	.000
3	.000	3.885	.789	.856	.816	.843	.085	.000
4	.000	3.847	.791	.858	.818	.845	.084	.000
5	.097	1.259	.974	.994	.973	.992	.025	.993

Legend: CMIN/DF – Chi-Square/Degrees of Freedom, NFI – Normed Fit Index, GFI – Goodness of Fit Index, TLI – Tucker-Lewis Index, RMSEA – Root Mean Square of Error Approximation, CFI – Comparative Fit Index

Table 9 summarizes the goodness of fit measure of the five structural models. Hypothesized Structural Model 1 shows the direct relationship of exogenous variables: digital literacy, pedagogical knowledge, and research skill and its causal effect on the endogenous variable, the professional competence of the teachers. Results show that all indices did not reach the accepted values. Therefore, it is weak and does not fit the model.

On the other hand, Hypothesized Structural Model 2 shows the causal relationship between exogenous variables: digital literacy, pedagogical knowledge, and research skill and its causal effect on the endogenous variable, the professional competence of the teachers. Results show that all indices did not meet the accepted value. Therefore, it is weak and does not fit the model.

Hypothesized Structural Model 3 shows the direct causal relationship between exogenous variables: digital literacy, pedagogical knowledge, and research skill and its causal effect on the endogenous variable, the professional competence of the teachers. Results show that all indices did not meet the acceptability value. Therefore, it is weak, and it is recommended to hypothesize a new model.

Hypothesized Structural Model 4 also shows the direct causal relationship between exogenous variables: digital literacy, pedagogical knowledge, and research skill and its causal effect on the endogenous variable, the professional competence of the teachers. Results show that all indices did not meet the acceptable variance shown in the model. Therefore, it is weak, and it is recommended to hypothesize a new model.

The exploration of Hypothesized Model 5 shows the best-fitted model based on the data gathered

with a P-value of .097; Goodness of Fitness index: Chi-Square, which indicates the CMIN/DF is 1.259; Goodness of Fit Index (GFI) is .974; Comparative Fit Index (CFI) is .994; Normed Fit Index (NFI) is .973; Tucker-Lewis Index (TLI) is .992; Root Means Square of Error Approximation (RMSEA) is .025; and the P-Close Fit is .993. Based on the results, the Goodness of Fit of model 5 is highly acceptable since all indices reached good values, as shown in Table 9. Since Model 5 is the best-fit model of professional competence, it is only an assurance that the hypothesized model is best over some models. Therefore, the hypothesis is rejected.

Determining the best-fit model shows that all indices must be acceptable scores. The *chi-squares/degrees of freedom value* is lower than two, with an equivalent *p-value* greater than 0.05. The root means square approximation values should be lower than 0.05, with a *p-value* higher than 0.05. Indices like the *normed fit index*, *Tucker Lewis index*, *comparative fit index*, and *goodness of fit index* are said to be higher than 0.95.

Table 10 displays the latent exogenous variables' direct and indirect effects on the latent endogenous variable, the professional competence of teachers in teaching. Digital literacy, one of the three latent exogenous variables, exhibits the effect, making it a significant predictor of professional competence, as revealed by a beta value of 1.164. In contrast, pedagogical knowledge shows eligible effects, with a beta value of 1.337 which means a predictor of professional competence partly. Moreover, the research skill shows a negligible direct impact on professional competence yet still gained a beta value of 1.212 of indirect effect.

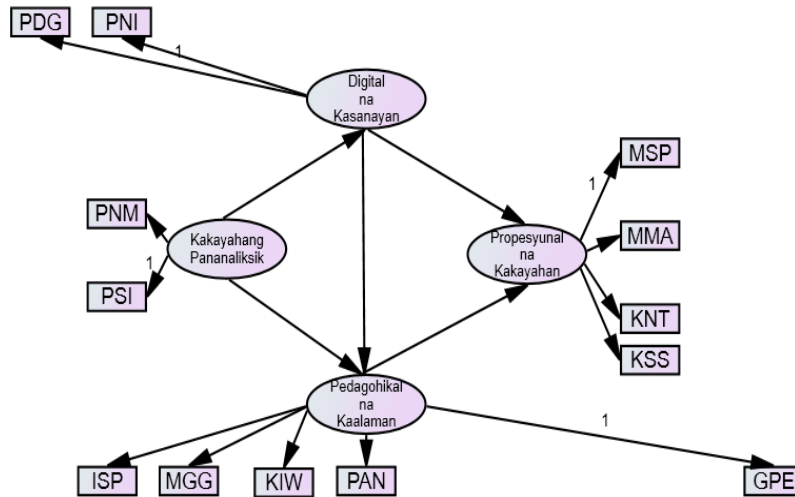


Fig. 2. Best Fit Model for Professional Competence of Teachers

Legend:

<i>PDG- pag-unawa sa digital na gawi</i>	<i>KTW- mga kaugnay na teorya sa pagtuturo ng wika</i>	<i>PSI- proseso ng siyentipikong impormasyon</i>
<i>PNI- pagkalap ng impormasyon</i>	<i>NAL- napapanahong larang</i>	<i>PNS- pamamahala ng siyentipikong impormasyon</i>
<i>PAI- paggamit ng impormasyon</i>	<i>TEK- teknolohiya</i>	<i>PNM- pagpapaunlad ng siyentipikong impormasyon</i>
<i>PGI- pagbuo ng impormasyon</i>	<i>KON- konteksto</i>	<i>MSP- metodo sa pagtuturo</i>
<i>PNP- propesyunal na pakikipag-ugnayan</i>	<i>PAN- pananaliksik</i>	<i>KUR- kurikulum</i>
<i>DNK- digital na kagamitan</i>	<i>PSK- pakikisama sa mga katrabaho</i>	<i>MMA- mga mag-aaral</i>
<i>PTP- paggamit ng teknolohiya sa pagtuturo</i>	<i>KIW- kaugnay na isyu sa wika</i>	<i>PSA- pamamahala sa silid-aralan</i>
<i>PSP- pagtataya sa pagkatuto</i>	<i>REP- repleksiyon</i>	<i>KNT- konteksto</i>
<i>PKM- pagbibigay kapangyarihan sa mga mag-aaral</i>	<i>MGG- guro</i>	<i>KSS- kaalaman sa sarili</i>
<i>GPE-gurong pang-edukasyon</i>	<i>ISP- mga isyu sa sosyo-politikal</i>	

Table. 10. Direct and Indirect Effects of the Independent Variables on Professional Competence of the Teachers in Filipino

Variables	Direct Effect	Indirect Effect	Total Effect
Digital Literacy	.524	.639	1.164
Pedagogical Knowledge	1.337	-	1.337
Research Skill	-	1.212	1.212

The model developed is based on Technological Pedagogical Content Knowledge Theory that emphasizes technology, pedagogy, content, and context. It includes the content of the curriculum and specific methods in pedagogy, which makes effective discipline in the professional competence of the teachers. There are three interconnected components of teachers' knowledge mentioned in this theory: first, is the

content knowledge; second, is the pedagogical knowledge; and third, is the technological knowledge combined to give huge influence the contextual knowledge or professional competence [17].

Another theory that can be connected to the study is the Theory of the Committee on Information Technology Literacy of the National

Research Council on Fluency of Information Technology which shows more profound and higher importance in understanding professional competence using technology for processing Information, communication, and problem-solving. Moreover, this conceptualization recognizes the development and innovations of using technology which influences the teachers' professional competence [11].

In this connection, the American of Teacher Education proposition determines the set of standards that develops the professional competence of the teachers. It includes the standards in various aspects such as instructional competence, research skills, technological skills, and knowledge in assessing programs and professional development of the teachers [12].

4. CONCLUSION

The overall result of the study shows a very high level of digital literacy, pedagogical knowledge, research skill, and professional competence among Filipino teachers in Region XI. It means that the teachers always observed all items mentioned in all variables. There is a significant relationship between the independent variables: digital literacy, pedagogical knowledge, and research skill in the professional competence as the dependent variable. Thus the null hypothesis was rejected. Model 5 was shown to be the best suitable model for the professional competence of the teachers.

Digital literacy contributes to teachers' adequate skills in using technology to have effective teaching-learning processes. On the other hand, pedagogical knowledge contributes to how to get the learners' interests using different strategies at methodologies in teaching the learners. At the same time, the research skill develops awareness of responding to issues and problems encountered by the teachers in teaching Filipino subjects. Technological Pedagogical Content Knowledge Theory emphasizes the importance of technology, pedagogy, content, and context, which are combined to influence the teachers' contextual knowledge or professional competence.

Lastly, the researcher suggests that to achieve professional competence among Filipino teachers in Region XI, they should maintain and continue implementing the meaningful teaching-

learning activities they have started. In general, it is recommended that another study should be conducted focusing on those factors not mentioned in this study yet contribute to the professional competence of the teachers. These three independent variables: digital literacy, pedagogical knowledge, and research skill centered on the professional competence of the teachers, will be used as bases in the conduct of future studies. These may also be used as a reference in developing a prospectus for those taking education courses.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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