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

ABSTRACT

Aims: To determine the levels of digital literary, 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-casual research design utilizing the Structural Equation Model
Place and Duration of Study: Southern Mindanao Region, The Philippines during the school year 2022
Methodology: Stratified random sampling technique was used to determine the 400 elementary and secondary Filipino teachers. Only those respondents who agreed to be part in the study were included. However, teachers not handling Filipino subjects; those that were teaching in college; teaching outside Region XI; teaching in the previous school year were not included in this study. The respondents came from different divisions of Davao City, Davao del Norte, Davao Occidental, Davao Oriental, Digos City, Mati City, Panabo City, Island Garden of Samal, and Tagum City.
Results: The respondents had a very high level of digital literacy, pedagogical knowledge, research skill, and professional competence. It also showed a significant relationship between three variables: digital literacy, pedagogical knowledge, and research skill in professional competence of the teachers. Among the five models, model 5 best fits the study.
Conclusion: Model 5 was found to be the most appropriate model for the teachers' professional competency, and the study indicated that Filipino teachers in Southern Mindanao Region had high levels of digital literacy, pedagogical knowledge, research skill, and professional competence. It implies that teachers need to maintain executing substantial and relevant teaching-learning activities in order 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 programmes.

Keywords: Digital literary, pedagogical knowledge, research skill, professional competence, Technologocal Content, Knowledge, Structural Equation Model, Southern Mindanao Region

1. INTRODUCTION

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

According to the US National Education Association, teachers must have knowledge in using pedagogy and strategy in professional competence as they impart knowledge to the learners [5]. In Greece, it is importance to have qualification and knowledge in professional

competence among teachers in order to attain the pedagogical effectiveness and deductive way of teaching [6].

1.1 Research Objectives

This study aimed to determine the best model suited for 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 descipline;
    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 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 skill and professional competence of the teachers;
6. determine the combined and single influence of digital literacy, pedagogical knowledge, research skill, professional competence of the teachers.
7. determine the best fit model of professional competence of the teachers.

The relationship between the digital literacy in the professional competence as dependent variable is the deep and relevant understanding as well as mastery of using technology in processing information, communication and in problem solving. Digital literacy aims to address the challenges in professional competence of the teachers in using technology [7]. It increases knowledge how to utilize technologies as tools in teaching-learning process [8]. It provides interactive and open discussions, searching information, and learners' knowledge

in all fields [9]. Moreover, the conceptualization of professional knowledge is recognizing the effects and contributions of digital literacy which help develop and improve the skills in using innovations of technology that give huge influence and impact among teachers [10].

Furthermore, pedagogical knowledge provides huge influence in the professional competence of teachers [11]. It shows high understanding on the processes, practices and methodologies in teaching and learning of the learners. It includes the overall goal in apprehension how the learners translate, improve classroom management, making suitable lesson plans, and assessment for learning [12]. The relationship of pedagogical knowledge to the professional competence of the teachers is rooted on the ability of imparting knowledge to the learners [13]. A great connection in professional competence pertains to the processes and activities during the teaching-learning engagements. This also includes the learning of the students, planning strategies and implementations, and how to further evaluate the performance of the learners [10].

On the other hand, in the study of Ward et al. (2022) [14], teachers' experiences and being part of research contribute to learning especially in their professional competence. This includes teaching strategies that are suited and that helped improve the culture of research skills [15]. The connection of research skill to the professional competence is by determining the qualities of teachers who are using research in teaching-learning processes. It showed that professional competence was influenced by using research and joining research activities such as making policies, organizing and choosing appropriate steps and strategies for teaching. Through this, research skills of teachers will be improved and surely have big impacts in their professional competence [11].

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

Another theory that can be connected in the study is the Theory of Committee on Information Technology Literacy of National Research Council on Fluency of Information Technology which shows deeper 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 gives influence in the professional competence of the teachers [10].

In this connection, the proposition of American of Teacher Education determines set of standards that develops professional competence of the teachers. This 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 [11].

It is investigated in this study that 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 the 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 the deeper understanding of the processes, practices, methods in teaching and learning of the learners. The indicators are: teacher education; related theories in teaching language; relevant descipline; 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 the teachers [12].

While the research skill has indicators: processing scientific information, managing scientific information, and developing scientific information. This takes into account the contemporary research at information using technology which help improve the skills in decision making of the teachers [18].

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

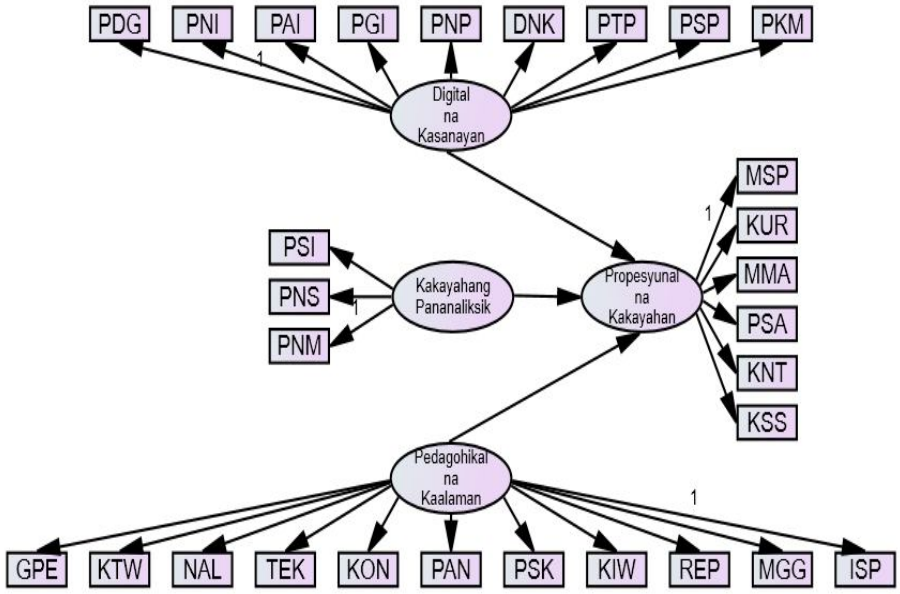

Fig. 1. Conceptual framework of the study

2. MATERIAL AND METHODS

2.1. Respondents

The respondents of the study were the 400 teachers teaching Filipino subjects coming 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 number of population of Filipino teachers. The respondents were selected through stratified random sampling technique 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 in the study were included in this study. However, teachers not handling Filipino subjects; those that are teaching in college; teaching outside Region XI; teaching in the previous school year were not included in this study. 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 Occidental, Davao Oriental, Digos City, Mati City, Panabo City, Island Garden of Samal, and Tagum City. Due to this limitation, San Jose et al. (2022) [19] mentioned that the results may only be applicable to the respondents and location of the study and not to all Filipino teachers. A larger study may be conducted to confirm or challenge the results.

2.2. Research Instrument

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

The first part of the questionnaire was about Digital Literacy, Digital Competence and Research Productivity of Educators of [17] which has 46 items. The following indicators are: 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. 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 descipline; technology; context; research; collegiality; language related issues; reflection; teachers; and socio-political issues. Third was about Design and Validation of a Questionnaire to Measure Research Skills: Experience With Engineering Students of [20] with 20 items and with indicators: processing scientific information, managing scientific information, and developing scientific information. And lastly was about the The Professional Competence of Teachers by [6] with 38 items and with 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 quantitative-casual research design utilizing the Structural Equation Model to determine the best model. In the investigation, it is important to analyze the factors that are hidden in the variables which suggest the cut-off value 0.50 while using the 0.45 in modeling the culture of 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. In order to obtain wider and meaningful interpretation of the data of the study, the researcher made use of *mean* to describe the level of digital literacy, pedagogical knowledge, research skill, and professional competence of the teachers teaching Filipino. *Standard deviation* on the other hand was utilized to measure how far each value in the frequency distribution. While 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 it is the observance of the protocol in analyzing the standardized processes most especially in determining the population of the study. 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, Regional Director and the Chief of Curriculum Implementation. It was then followed by asking permission from each Division Superintendent in Region XI attached 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 permissions were checked and verified by the SVP of the Academic Affairs of University of Mindanao-Professional Schools.

After that, questionnaire was administered for pilot testing to some selected respondents using the google forms. After the results were secured and verified, the questionnaires were administered to the respondents using the google forms. After the actual administration of the questionnaire, collection and tabulation were done by the researcher and followed by the data analysis by the statistician. The interpretation was done by the researcher supported with the related and existing studies. All the results were treated wit utmost confidentiality. Giving of meaning, recommendations and conclusions of the findings of the study were done.

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

Level of Digital Literacy in Teaching among Teachers

As shown in Table 1, results of the study in terms of the digital literacy of the Filipino teachers in Region XI showed overall mean score of 4.37 which means very high level and with standard deviation of 0.39. This means that all the indicators in digital literacy are always observed by the Filipino teachers. The results can be associated in one of the studies about unfolding the increase of understanding in digital practices, finding, using and creating information while utilizing digital technologies at searching information. Having performed the said indicators largely contribute to the improvement of the learners most especially in their quest for education and in the coming opportunities ahead. Digital skills among the respondents in terms of searching information is a need in order to perform the tasks appropriately and successfully. In fact, having skills in gaining information using digital skill is necessary in the society [21]. Moreover, the results unfolded can be related to using information. The European Commission (EC) gave importance on digital skill with a belief and critical use of Information Society Technology (IST) while in the job, entertainment and in communication. The skills are aligned to the Information and Communication Technology (ICT) such of how the respondents use computer in searching, analyzing, putting, making,

presenting and changing information either having communication or in joining collaborative usage of internet [22].

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

On the other hand, creating information using the digital literacy in searching information provides great opportunities to everyone in becoming active. In this aspect, digital literacy of the respondents is seen in creating social moral among individuals who have the ability to undergo the processes of using digital resources anchored to the level of the students [23]. In addition, there is a big role among teacher-respondents inside the class. The result showed that the learning of the learners become meaningful if there are engagements. Having connection to the teacher-respondents is one of the factors in achieving great and enjoyable activities, active participation and appropriate implementation of courses for the learners [24]. In terms of digital resources, it showed that the respondents really need to discover more digital resources that will be utilized in finding content, searching, managing, creating and analyzing as well as in synthesizing data and information. This requires enough knowledge and skills in the field of technology which comprises various disciplines such as: skill in computer, technology, information, media, visual and in communication [25].

Furthermore, the results illustrated that the respondents are seen to be skillful and effective in using technology while doing research, finding information, in writing, have the skill in choosing and making their own decisions. This skill has a connection in choosing and finding what is exact and are important information from the diverse networks. Lastly, the results disclosed that the respondents always practice assessment of learning of the learners as one of the indicators in digital literacy. This refers to the strategies designed in order to determine the learning of the learners, to show the results are attained or if the learning outcomes are achieved in the class. Based on the results, these unveiled very high level in terms of having designs by the respondents as form of evidence in the success of the collaboration of the parents, teachers and co-learners [26].

Level of Pedagogical Knowledge in Teaching among Teachers

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

As presented in the table, indicators teacher education, related theories in teaching language, relevant discipline, context, collegiality, language related issues, reflection, teachers and socio-political issues garnered very high level which means these are always observed among the teachers in teaching, while the technology and research have high level which further means that these are often observed among the respondents.

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
Relevent 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**

The results of the study indicate that the over all pedagogical knowledge of the teachers are always observed in the class. This proves that teacher-respondents have knowledge in teaching pedagogy among diverse types of learners. Learners will have meaningful learning most especially if teachers have very high knowledge in pedagogy. Through the help of pedagogical knowledge, the needs of the learners whatever level they belong will be addressed.

Pedagogical knowledge has higher understanding on the processes, practices, and methodologies in teaching and in the learning of the learners. This consists general objective pertaining to education, goals, and purposes. Significant relationship of this knowledge can be associated to professional competence how the learners learn the lessons, improve skills in classroom management, make suitable and appropriate lesson plans and assessment for learners [12]. In this study, indicator teacher education obtained very high level mainly

because teachers do not just limit their knowledge in curriculum and instructional materials but also immerse themselves in an organization of teachers who run and implement programs in education. Teachers are expected to have adequate knowledge how to present the educational activities in way these are easily understood by those who want to become teachers. Teacher educators must have skills how to assess those aspirant teachers, colleagues, and must have enough knowledge how to evaluate the process and progress of development to determine possibles in the future [11].

Furthermore, indicator relevant discipline which is next to teacher education displayed significant result in pedagogical knowledge of the teachers. This can be associated to the term disciplined inquiry which contributes knowledge about education [11]. This 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 focus of the lesson. The highlights the topics found in the subject being taught among learners [28].

Third indicator which obtained very high level is the related theories in teaching language. It illustrated significant result in the pedagogical knowledge of the teachers because this pertains to the knowledge 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 the pedagogical knowledge. Through related theories, the knowledge and skills will be widened particularly on the emphasis of reading, writing, speaking and listening with the inclusion of pronunciation, spelling, sound recognition and sentence structures [29]. However, results of the study divulged two indicators, the technology and research with high level means teachers often observe these in their teaching. Although the results are not that alarming, this can still be associated to the finding of the one study that unveils that technology needs to be given more focus and attention. With the advent of technology development, there is a huge impact in the field of education yet lack emphasis on this knowledge. There is no doubt why this component gained only high level in this study. On the other note, having knowledge of 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 on how to operate and use technology inside the classes [30].

Similarly, a result in one of the studies revealed that teachers have mastery in finding information, but, they lack the skills in using online methods of research. Even though they are are of the words to be used while doing research online or in social networking sites, they still lack knowledge when and how to strategize doing researches [17]. Also, teachers' knowledge on research still needs focus and attention. Qualitative and quantitative types of researches 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 on how to identify problematic situations of the target study [11]. Through this, knowledge of research is very vital as it involves systematic processes in discovering future information and concepts. Also, it helps solve the problems and contribute innovative ideas in the pedagogical knowledge of the teachers [31].

Level of Research Skill In Teaching among Teachers

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

Table 3. Level of Reseach 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 to the learning and professional competence of the teachers in their teaching practices. It is believed that the learning is anchored in conducting research which is one of the strategies that suits to the development of research skill culture [18].

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

Furthermore, developing scientific information manifested significance in the research skill among teachers. This establishes studies which aims of improving skills necessary to be used in investigations, critical thinking, synthesis, analysis, and others. With the help of the teachers, learners will be able to express and share their knowledge in research as basis of lifetime activity [15]. On the other side, the last indicator based on mean result was the managing scientific information. This skill provides wider and higher understanding in terms of collaboration of strategies and develops skills in sharing and presentation of information in research among learners. This gives freedom and opportunities among learners based on the management of the teachers and teaching competence resulting to the learning of designed activities which further supports in accomplishing the students' researches [33].

Level of Professional Competence in Teaching among Teachers

Table 4 uncovers the results in terms of level of professional competence in teaching among Filipino teachers in Region XI. The results illustrates 4.26 overall mean score and 0.51 standard deviation with very high level. This means that the overall result in professional competence are always observed by the teachers in their teaching practices. The professional competence of the teachers exhibits big contribution in the teaching-learning processes. This is an indication that the respondents give much attention in professional abilities.

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

As observed in the results of the level of professional competence of the teachers, indicator curriculum gained only 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 choices of teaching among teachers. Teachers must have enough knowledge about curriculum, learning resources, have rules in the class, and a systematic implementation of the duties and responsibilities in education. This includes the needs which hoped in having critical methodology or strategy in curriculum in the context of its scope [34]. More so, one of the significant results in professional competence of the teachers is the indicator classroom management. The respondents can be figured out to have always observed managing the class in their teaching. This competence among teachers is very important in achieving successful and creative teaching. A teacher can be identified as having professional competence if he/she possesses knowledge in classroom management. According to Liakopoulou (2011)[6], competence in classroom management is an organization of the classrooms, having motivational appeal, stable learning goals, focused among learners, with enough learning resources, with theories of learning and pedagogical approach. Added to these, knowledge about classroom management ensures that planning in classes served as guides for the teachers.

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

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

Table 5 presents the significant relationship between the digital literacy and professional competence of the teachers with r-value .504 with 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 to the alternative hypothesis with significant relationship between the digital literacy and professional competence of the teachers. This only means that if the digital literacy of the teachers in teaching, 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.

Having significant relations with digital literacy and professional competence shows teaching learners is not done properly if teachers lack knowledge in digital skills most especially in this present time where appropriate strategies are required. This means that, the current school year, digital literacy is very vital among teachers teaching in the 21st century and in the learning of the 21st century learners.

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

Furthermore, digital literacy provides interactive and free collaboration, contributes in finding information and learning of the learners in all fields with the use of technology. Having knowledge in digital literacy gives huge impact among teachers since in gives opportunities among learners to value and apply their acquired knowledge with the help of effective designs, strategies appropriate methods in teaching [35].

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

Table 6 unveils the significant relationship between the pedagogical knowledge and professional competence of teachers in teaching with r-value of .559 with equivalent probability value of .000 which is lower than .05 cut-off level. Based on the results, the hypothesis is rejected and agrees to the alternative hypothesis with significant relationship between pedagogical knowledge and professional competence of the teachers. This means that, if the pedagogical knowledge of the teachers in 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, related issues in language, reflection, teachers, and socio-political issues have significant relationship to 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 of pedagogical knowledge in professional competence showed general perceptions on the knowledge of the teachers in the educational activities anchored in their engagements having power as main source of knowledge to the learners. This knowledge aims to develop teachers who have high value on different programs, have deeper understanding and belief in the society; and showed democratic way of learning. In this context, teachers are honed to become inquisitive and creative individuals, teachers will be able to determine collective needs and related to their pedagogical strategies and goals in teaching [13].

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

Pedagogical Knowledge	Professional Competence						
	MSP	KUR	MMA	PSA	KNT	KSS	Overall
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

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

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

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

Research Skill	Professional Competence						
	MSP	KUR	MMA	PSA	KNT	KSS	Overall
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 processing scientific information, managing scientific information, and developing scientific information showed 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 of the research skill and professional competence is through the process of inquiry and discovery of data which give contributions in providing solutions to the problems encountered. It showed relationship in terms of having systematic use of methods with emphasis of ethical consideration. Research skill aims to analyze and make synthesize the existing knowledge, investigate possible problems in the present, gives solutions to the problems encountered by the teachers in terms the professional competence. This includes the goal in exploring and analyzing issues, make and create new steps or system, determine the phenomena, and develop new knowledge or combination of any of the objectives mentioned that can be used in every day activity and implementation of educational programs [12].

Significant Influence of Digital Literacy, Pedagogical Knowledge, 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 *F-value* of 66.091, *Rvalue* of .578 and *P-value* of .000 which is lower than .05 cut-off level in this study.

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

Professional Competence					
Exogenous Variables		*B*	β	*t*	*Sig.*
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				
∆R	.329				
F	66.091				
ρ	.000				

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 .571 and .429 respectively with 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 significant. This shows that there are indicators from the research skill that have no influence to the professional competence of the teachers, while the indicators under digital literacy and pedagogical knowledge have significant influence in the professional competence of the teachers.

Based on the results, using the *stepwise regression,* it was found out that no all indicators influence the professional competence of the teachers. As shown in the results of this study, the R^2 has .334 which represents only 33.4% influence based on the regression of professional competence. The remaining 66.6% may refer to other factors that are 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 in the professional competence of the teachers. However, this means that all three independent variables in the study still have influence in the professional competence of the teachers.

Based on the results above, this can still be associated in the perspective view how the research skill is presented in the context of utilization in the laboratory. Research skill still can be utilized in providing understanding by means of collaborative way which help improve the skills of the teachers in actual setting. To have influence in the professional competence, it can give array of experiences with the use of designs that support teaching activities (Willison, 8-9). Therefore, there is a need to maintain digital literacy and pedagogical knowledge as well as develop more research skill since the concept discovered in the variables still show influence in the professional competence of the teachers.

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 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, professional competence of the teachers. Results show that all indices did not reached the accepted values Therefore, it is weak and does not fit the model.

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

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

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

The exploration of Hypothesized Model 5 shows the best-fitted model based on the data gathered with P-value of .097; Goodness of Fitness index: Chi-Sqaure 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, Goodness of Fit of model 5 is higly acceptable since all indices reached the acceptable 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 hould be lower than 0.05, with a *p-value* higher than 0.05. Indices like the n*ormed fit index*, T*ucker Lewis index*, and c*omparative fit index* and *goodness of fit index* are said to be higher than 0.95.

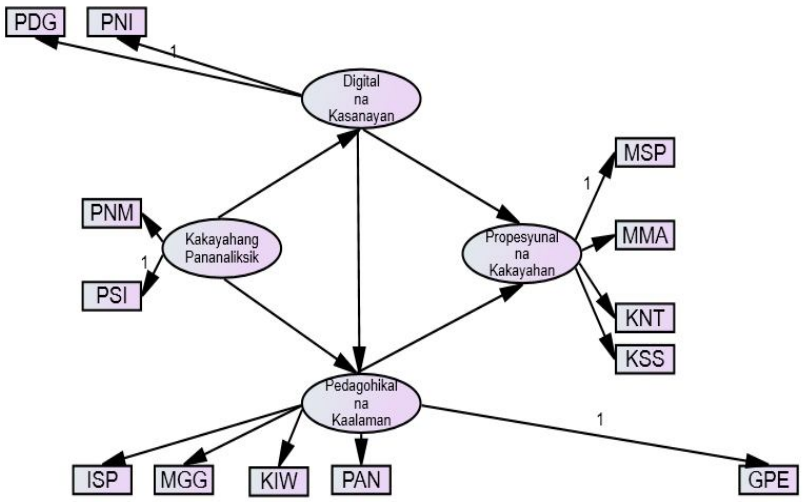

Fig. 2. Best Fit Model for Professional Competence of Teachers

Legend:

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

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

Table 10 displays the latent exogenous variables' direct and indirect effects on the latent endogenous variable, professional competence of teachers in teaching. The 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 beta value of 1.337 which means partly predictor of professional competence. Moreover, the research skill shows negligible direct effect in professional competence yet still gained beta value of 1.212 of indirect effect.

The model developed is based on Technological Pedagogical Content Knowledge Theory that gives emphasis on the terms: technology, pedagogy, content and context. This includes the content of curriculum, specific methods in pedagogy which makes effective discipline in professional competence of the teachers. There are three interconnected components about teachers' knowledge mentioned in this theory: first, is the content knowledge, second, is the pedagogical knowledge, and third, is the technological knowledge which are combined to give huge influence in the contextual knowledge or professional competence [17].

Another theory that can be connected in the study is the Theory of Committee on Information Technology Literacy of National Research Council on Fluency of Information Technology which shows deeper 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 gives influence in the professional competence of the teachers [11].

In this connection, the proposition of American of Teacher Education determines set of standards that develops professional competence of the teachers. This 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 on digital literacy, pedagogical knowledge, research skill, and professional competence among Filipino teachers in Region XI. This means that all items mentioned in all variables were always observed by the teachers. There is significant relationship between the independent variables: digital literacy, pedagogical knowledge, and research skill in the professional competence as 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.

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

Lastly, the researcher suggests that to achieve professional competence among Filipino teachers in Region XI, they should maintain and continue implementing the meaningful and significant teaching-learning activities they have started. In general, it is recommended that

another studies should be conducted focusing those factors not mentioned in this study yet contribute to the professional competence of the teachers. It is also suggested that these three independent variables: digital literacy, pedagogical knowledge, and research skill centered in the in the professional competence of the teachers will be used as bases in the conduct of future studies. These may also be used as reference in developing prospectus for those who will take education courses.

REFERENCES

[1] Seechaliao T. Instructional strategies to support creativity and innovation in education. Journal of education and learning. 2017;6(4):201-8.

[2] Kanchanachaya, N. Development of a blended learning model based on creative problem solving principles using lateral thinking to enhance creative problem solving abilities for instructional media production of pre-service teachers. Bangkok, Thailand: Chulalongkon University, 2012: 202-203.

[3] Saliceti F. Educate for creativity: New educational strategies. Procedia-Social and Behavioral Sciences. 2015 Jul 25;197:1174-8.

[4] Khammani T. Teacher's pedagogy: Knowledge and the teaching profession. Bangkok, Thailand: Chulalongkorn University Press. (2013).

[5] Moradkhani S, Akbari R, Samar RG, Kiany GR. English language teacher educators' pedagogical knowledge base: the macro and micro categories. Australian Journal of Teacher Education. 2013 Jan;38(10):123-41.

[6] Liakopoulou M. The professional competence of teachers: which qualities, attitudes, skills and knowledge contribute to a teacher's effectiveness?(2011): 66-69.

[7] Whattananarong, K. "Innovation ang technical education technology". Bangkok, Thailand: King Mongkut's University of Technology North Bangkok. (2011).

[8] Kowalczyk, N. Perceived barriers to online education by radiologic science educators. Radiological Technology. (2014): 85 (5), 486-493.

[9] Borisova OV, Vasbieva DG, Malykh NI, Vasnev SA, Bírová J. Problem of using innovative teaching methods for distance learning students. International Electronic Journal of Mathematics Education. 2016 Aug 2;11(5):1175-84.

[10] Koehler MJ, Mishra P, Kereluik K, Shin TS, Graham CR. The technological pedagogical content knowledge framework. Handbook of research on educational communications and technology. 2014:101-11.

[11] Moradkhani S. Language teacher educators' pedagogical knowledge: Validating a proposed model. (2017): 92-105 https://files.eric.ed.gov/fulltext/EJ1151063.pdf.

[12] Koehler M, Mishra P. What is technological pedagogical content knowledge (TPACK)?. Contemporary issues in technology and teacher education. 2009 Mar;9(1):60-70.

[13] Kincheloe JL. The Knowledges of Teacher Education: Developing a Critical Complex Epistemology. (2004). 50-60). https://files.eric.ed.gov/fulltext/EJ795234.pdf

[14] Ward C, Bennett J, Bauer K. Content analysis of undergraduate research student evaluations. 2002;2:2008.

[15] Alvarado FC. Design and Validation of a Questionnaire to Measure Research Skills: Experience with Engineering Students. (2016): 220-227. http://dx.doi.org/10.3926/jotse.227.

[16] Harris J, Mishra P, Koehler M. Teachers' technological pedagogical content knowledge and learning activity types: Curriculum-based technology integration reframed. Journal of research on technology in education. 2009 Jun 1;41(4):393-416.

[17] Yazon A, Ang-Manaig K, Buama C, Tesoro J. Digital Literacy, Digital Competence and Research Productivity of Educators. (2019): 1734 - 1741. https://www.hrpub.org/download/20190730/UJER12-19513329.pdf

[18] Cobos-Alvarado F, Peñaherrera-León M, Ortiz-Colon AM. Design and validation of a questionnaire to measure research skills: Experience with engineering students. JOTSE: Journal of Technology and Science Education. 2016;6(3):219-33.
[19] San Jose A, Concepcion MGR, San Jose B. Mothers as Teachers: The New Role of Mothers in the New Normal. *Journal of Learning for Development*, 2022. *9*(2), 351–362. https://doi.org/10.56059/jl4d.v9i2.566
[20] Flavian H. Towards teaching and beyond: Strengthening education by understanding students' self-awareness development. Power and Education. 2016 Jan 4;8(1):88-100.
[21] Ranaweera P. Importance of Information Literacy skills for an Information Literate society., 2008 . In NACLIS 2008, Colombo (Sri Lanka), 24th June 2008. [Conference paper]
[22] Kárpáti A. ICT and the Quality of Teaching: Some Hungarian Results of the OECD ICT Project. InICT and the Teacher of the Future 2003 Sep 30 (pp. 235-245).
[23] Sharkey J. Merging information literacy and technology through instructional and collaborative initiatives. LOEX Quarterly. 2005;32(1):4.
[24] Sakolov CS. Teacher engagement in grades 4-8. (2017): 2. https://core.ac.uk/download/pdf/288854189.pdf
[25] Ozdamar-Keskin N, Ozata FZ, Banar K, Royle K. Examining digital literacy competences and learning habits of open and distance learners. Contemporary Educational Technology. 2015 Mar;6(1):74-90.
[26] Jantke KP, Hume T. Effective learning through meaning construction in digital role playing games. In2015 IEEE International Conference on Consumer Electronics (ICCE) 2015 Jan 9 (pp. 653-656). IEEE.
[27] de Sousa F, Rasmussen I, Pierroux P. Zombies and ethical theories: Exploring transformational play as a framework for teaching with videogames. Learning, culture and social interaction. 2018 Dec 1;19:40-50.
[28] De Kock SM. *Relating teachers' content knowledge to learner performance in probability* (Doctoral dissertation, University of Pretoria).
[29] Rosenberg JM, Koehler MJ. Context and technological pedagogical content knowledge (TPACK): A systematic review. Journal of Research on Technology in Education. 2015 Jul 3;47(3):186-210.
[30] Yilmaz NP. ICT Student Teachers' Pedagogical Content Knowledge: A Case Study. Eurasia Journal of Mathematics, Science & Technology Education. (2016):130-134.https://www.ejmste.com/download/ict-student-teachers-pedagogical-content-knowledge-a-case-study-4463.pdf
[31] Asenahabi BM. Basics of research design: A guide to selecting appropriate research design. International Journal of Contemporary Applied Researches. 2019 May;6(5):76-89.
[32] Maranan V. Basic Process Skills And Attitude Toward Science: Inputs To An Enhanced Students' Cognitive Performance. (2017): 2. https://files.eric.ed.gov/fulltext/ED579181.pd
[33] Willison JW. Research skill development spanning higher education: Critiques curricula and connections. Journal of University Teaching & Learning Practice Volume 15. (2018): 8-9. http://files.eric.ed.gov/fulltext/EJ1195982.pdf
[34] Shulman LS. Knowledge and teaching: foundations of the new reform. Harvard Educational Review, 57, 1, 1987. pp. 1-22.
[35] Sharoff, Leighsa. "Creative and Innovative Online Teaching Strategies: Facilitation for Ative Participation". (2019): 1-2. https://files.eric.ed.gov/fulltext/EJ1223934.pdf