Teaching Preparedness, ICT Integration Readiness, and Motivation as Predictors to Student Teaching Performance in Science

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***Abstract*—** The focus of this research was to determine which among students' teaching preparedness, ICT integration readiness, and motivation most significantly predicts student teaching performance in science. A descriptive and predictive correlational research design was used in the study to determine the association between teaching preparedness, ICT integration readiness, motivation, and teaching performance of students in science. Only teaching preparedness has a significant relationship on student teaching performance in Science while the ICT integration readiness and motivation were both insignificant. Using Pearson's Product-Moment Correlation and linear regression analysis, the study found out that pre-service teachers' teaching preparedness and motivation to learn the subject is low, whereas their readiness to ICT integration was high. However, when considered as a whole, teaching preparedness, ICT integration readiness and motivation predict pre-service teachers' performance in teaching science courses.

***Keywords*—** MAED-Teaching Science, teaching preparedness, ICT integration readiness, motivation, teaching performance, Philippines.

I. INTRODUCTION

In a state college of Davao de Oro, blended online learning is the practice of the college as means to continue providing quality education to teacher education students. This means that they will no longer have to practice teaching in the usual residential face-to-face but will be done through online and/or virtual classes. However, upon evaluating students' performance in teaching Science, the institution finds it very poor, and students are under-prepared. Interestingly, decreasing performance rate of pre-service teachers in science-related teaching courses as well as science gap among college students is not a secluded case in the Philippines. Teaching performance is the most important indicator of pre-service teacher preparedness in all institutions offering programs for teaching where students' ability to conduct learning and assessment tasks successfully in the classroom were demonstrated [1]. It is believed that pre-service teachers' readiness to teach is theoretically related self-efficacy development which was strengthened by Bandura [5] who defined self – efficacy or confidence as an "individual's evaluation of their ability to execute successfully a behavior" [34]. In the study of Kiamba and Mutua [15] on quality and teacher training and student accomplishment, they cited that teacher preparedness makes a difference, and that teacher qualification, experience, and amount of education and knowledge were positively conveyed to students who are assigned to multiple ineffective or underprepared teachers do worse than those who are assigned to efficient and effective teachers ([27] cited by [15]). In Davao De Oro State College, BEED pre-service teachers were having hard times in coping with the new normal especially in teaching science in the intermediate grades. For them or for every educational practitioners wish to practice profession the way it should be done physically in a face-to-face interaction leaving them unprepared and demotivated to complete the task and with the substantial upsurge in the use of ICT in the teaching-learning [6] and the current obvious discussion of ICT proficiency in the National Professional Standards for Teachers [4], the incorporation, selection of ICT model ICT used, and integration into teaching and learning within pre-service teacher education programs is deemed necessary. However, the researcher has not come across a study investigating on the relationship between pre-service teacher's preparedness to teach, readiness to ICT integration and pre-service teachers' motivation in science learning to their teaching science performance, thus, generating the research gap of this endeavour. centred on the above-mentioned literature, the researcher desired to conduct a study exploring the said variables, hence the urgency to conduct the study.

Teaching Preparedness. Teaching preparedness for teaching is defined as "the state of preparedness of student teachers for the teaching profession" ([22], p. 153). Furthermore, a more specific definition of teaching readiness might well refer to a maximum level

of professional expertise that allows future teachers to effectively assume professional responsibilities [20]. Straková [30] also claimed that teaching readiness can be recognized as the sense of being prepared for the job, considering all aspects and elements that made a significant contribution to the pre-service teachers' training experiences. To clearly understand the pre-service teachers' readiness to teach, Manasia, Ianos and Chicioreanu [20] considered professional knowledge (PK), professional practice, engagement (PE), and self-management (SM) the central dimensions of teachers' job readiness, each of them encompassing a set of components or vectors and are vectors of teaching efficacy.

ICT Integration readiness. Integrating technology into teaching and learning is a rising area that has piqued the interest of many educators in recent years especially in lieu of the new normal education in response to the global pandemic. According to Qasem and Viswanathappa [25], teachers must be involved in collaborative projects and the development of intervention switch tactics, including the utilization of ICT collaborations as a strategy, demonstrating a considerable difference in terms of teacher opinions in the integration of ICT, particularly in the blended learning approach to learning.

To address the current issue, the educational research sector established Technological, Pedagogical and Content Knowledge (TPACK) as a theoretical framework for understanding teacher knowledge essential for effective technology integration [28] which was reflected within the reviewed research.

Technological pedagogical knowledge is the understanding of how various technologies can be used in teaching and how using technology may transform the way teachers teach ([28], cited by [7]). The knowledge required by teachers to integrate technology into their teaching in any content area is referred to as technological pedagogical content knowledge. By teaching content using suitable pedagogical methods and technologies, teachers acquire an intuitive awareness of the intricate interplay between the three basic components of knowledge (CK, PK, TK ([28], cited by [7]).

Motivation to learn Science. Learners' motivation has long been recognized as a critical component influencing the rate and success of learning. Motivation is an essential component for students' performance in any learning setting ([9], cited by [31]). At all stages of education, students' motivation was regarded as a critical aspect in the teaching and learning processes ([17]; cited [31]). However, motivation is a multifaceted concept that connects with cognitive aspect to promote learning ([33], cited by [23]). Learners who are interested in learning the subject are willing to try and devote the necessary time to learning, focusing, and devoting on the subjects, not giving up doing required behaviour in difficult circumstances, insisting on seeing it through to the end, and resolution is then observed (Montajes, 2021). Furthermore, examining motivation in learning science entails combining constructivist learning theory with motivation theory as mentioned by Hsiao-Lian Tuan et al. [14] who identified five descriptive measures of motivation to learn science: self-efficacy (SE), active learning (AL), Science learning value (SLV), goal and performance attainment (G/PA), and learning environment (LE).

The learning environment is the last component of motivation to learn science. The word "learning environment" most commonly refers to the social, psychological, or psychosocial setting in which learning, or teaching occurs ([10]; cited by [26]). Most of the study has concentrated on the many factors of classroom context. Bronfenbrenner [8], as cited by Radovan and Makovec [26], defines the classroom context as a microsystem, "a pattern of activities, roles, and interpersonal relations experienced by the developing person in a given setting with particular physical and material characteristics" ([8], p. 22) which contains elements that contribute to an understanding of what is going on in the classroom.

Pre-service Teachers' Teaching Performance. Before entering the classroom, pre-service teachers should have a thorough understanding of all these concepts. According to Freeman and Johnson [11], as cited by Mufidah [24], preservice teachers' expertise effects their classroom teaching, which in turn influences students' learning. Further, this study considers Shulman's [29] domains of teacher knowledge when examining sources of professional knowledge for instructors. In the belief that one of the most important teacher education curricula is pre-service teacher training, this prerequisite should be met by pre-service teachers since it prepares them to become effective and efficient teachers [35]. Microteaching has long been recognized as a tool for improving pre-service teachers' pedagogical ability and performance ([19]; [13]).

Several research has shown that microteaching improves teaching skills significantly. For instance, Sumani and Arifin [32] investigated the pedagogical competency of English pre-service teachers in terms of their instructional strategy used in teaching. According to the findings of their study, pre-service teachers are

competent in introductory and closing explanation, group and individual teaching, teaching variation, classroom management, and assessment. They lacked, however, questioning and reinforcement.

In Davao De Oro State College, the institution is currently offering teacher education programs which includes of teaching elementary and secondary courses. Specifically, the elementary teaching courses are expected to be equipped with different practical teaching courses in different fields which precisely involve teaching sciences in the primary and intermediate grade levels.

Teaching science involves investigation, problem solving and the critical thinking skills that pre-service teacher's needs to be more efficient and effective to deliver the lessons effectively and efficiently.

Thus, re-evaluating the effectiveness of the implementation of the teacher education program and identifying the association of the factors, which this study is focused to, should be prioritized to provide adequate intervention, and plans for maximizing the effectiveness of the training programs. The re-evaluation will open information in explaining the current situation the educational adversities in the local where the study is conducted.

II. METHODOLOGY

This study will utilize a predictive correlational research design. This study will be conducted in a state colleges and private higher education institutions (TEIs) in Davao de Oro, Philippines, specifically in Compostela, New Bataan, Maragusan and Montevista. Currently, there are only two TEIs in the selected municipalities.

The Davao de Oro State College with branches in the selected municipalities and Legacy College of Compostela. The population is composed of two hundred fifty-three (253) second year Bachelor of Elementary Education students which are shown in the distribution table below. However, all first year, third year and fourth year college students are excluded as respondents of this study.

Moreover, second year students who are not enrolled in education program are also not included. In this study, there will be three test questionnaires to be adapted: questionnaire for teaching preparedness [20], pre-service teachers' readiness on ICT integration questionnaire [28] and The Students' Motivation Towards Science Learning (SMTSL) Questionnaire [14].

III. RESULTS AND ANALYSIS

Descriptive Analysis on Teaching Preparedness, ICT Integration Readiness, Motivation and Performance of PST in teaching Science Courses

Table 1 displays the mean scientific teaching preparedness scores, with an overall mean of 2.41 indicating a poor level of preparedness and a standard deviation of 0.54 which can be described as low. The respondents' poor scores in all attributes of teaching preparedness in science, including PK, PP, PE, and SM, might explain the low level of scientific teaching preparedness. The garnered mean score was 2.38(low) for professional knowledge, 2.37(low) for professional practice, 2.41(low) for professional engagement, and 2.50(low) for self-management, based on the computed mean scores from highest to lowest indications.

Table 2 displays the mean scientific readiness of ICT integration scores, with an overall mean of 3.43 indicating a high level of readiness and a 0.43 standard deviation, which is considered high. The high level of scientific readiness in ICT integration may be explained by the respondents' high scores in all at-tributes of ICT integration readiness in science, including TK, TPCK, TCK, and TPK. The garnered mean score was 2.44 (low) for technology knowledge, 2.23 (moderate) for technology pedagogical content knowledge, 4.22 (very high) for technological content knowledge, and 3.83 (high) for technological pedagogical knowledge, based on the computed mean scores from highest to lowest indications.

The mean scientific motivation scores are shown in Table 3, with an overall mean of 2.44 indicating a low degree of motivation and SD of 0.31 suggesting a low level of motivation. The respondents' high scores in all attributes of motivation to learn in science, including SE, ALS, SLV, A/PGl, and LE might ex-plain a low level of scientific motivation to learn Science. The garnered mean score was 2.38 (low) for SE, 2.29 (low) for ALS, 2.42 (low) for SLV, 2.17 (low) for P/AG and 2.93 (moderate) for learning environment, based on the computed mean scores from highest to lowest indications.

The level of science achievement of students is displayed in Table 4. One of the objectives of the research is to evaluate students' teaching performance using their Grade Point Average (GPA) in their teaching Science subject. Students in EED 10 (Teaching Science in Intermediate Grade) is 87.36 (2.3) with a SD of 5.50, which is considered is high.

Correlation Analysis among Teaching Preparedness and Science Teaching Performance of Pre-Service Teachers

Table 5 shows that there is significant relationship between all dimensions of teaching preparedness and student teaching performance in science using Pearson-r correlation test. Further, the table shows that there is significant relationship between PK (r=-0.234, p=0.0010), PP (r= -0.198, p= 0.005), PE (r= -0.268, p= -0.001), SM (-0.288, p=0.001) and student teaching performance on Science. With the given r-value showing a negative correlation indicating that as the level of each indicators increase, their performance in teaching science decreases and vice-versa. These support the claim of Yuan et al. [36] that professional knowledge and competence as well as teaching belief and professional development can affect teaching efficacy of the faculty.

Correlational Analysis among ICT Integration Readiness and Science Teaching Performance of Pre-Service Teachers

Table 6 shows the importance of TK, TCK, TPK and TPCK as factors to PSTs' science teaching performance. The p-values for all indicators in the table are less than 0.05, indicating that the dimensions have a meaningful link of ICT integration readiness and PSTs' teaching performance in science. Also, based on the r-value in the table, it determined that there is a negative correlation variable of the study in TK and TCK, implying that when the levels of each indicator rise, their performance in teaching Science decreases and vice-versa. While the study's positive association factors were PK, and TPCK, indicating that as the level of indicators increases, their performance in teaching Science increases as well and vice-versa. This is in tandem with the findings of Ghavifekr and Rosdy [12] who indicated that ICT integration has a great effectiveness for both teachers and the students.

Correlational Analysis among Motivation and Science Teaching Performance of Pre-Service Teachers

As the Table 7 presented, the p-values for science learning value in the table is less than 0.05, indicating that there is a link between the aspect of motivation and the science performance of PSTs. Also, based on the r-values in the table, it can be determined that there is a negative correlation variable of the study in self-efficacy and performance/achievement goal, indicating that as the level of the indicator increases, their performance in teaching science decreases and vice-versa. While ALS, SLV and LE determined as positive correlation variables of the study, indicating that as the level of indicators increases, their performance in teaching science increases as well and vice-versa. A positive correlation between PSTs' motivation and performance is also evident in the study of Libao et al. [18] who also found out that motivation did not vary across their sex, age, and curriculum year and good performance in science subjects.

Table 1: *Level of Pre-Service Teachers' Teaching Preparedness*

Indicator	Mean	SD	Description
Professional Knowledge	2.38	0.52	Low
Professional Practice	2.37	0.54	Low
Professional Engagement	2.41	0.74	Low
Self-Management	2.50	0.79	Low
Overall	2.41	0.54	Low

Table 2: *Level of Pre-Service Teachers' ICT Integration Readiness*

Indicator	Mean	SD	Description
Technology Knowledge	2.44	0.98	Low
Technology Pedagogical Content Knowledge	3.23	0.68	Moderate
Technological Content Knowledge	4.22	0.64	Very High
Technological Pedagogical Knowledge	3.83	0.54	High
Overall	3.43	0.43	High

Table 3: *Level of Pre-Service Teachers' Motivation*

Indicator	Mean	SD	Description
Self- Efficacy	2.38	0.70	Low
Active Learning Strategies	2.29	0.58	Low

Science Learning Value	2.42	0.60	Low
Achievement/ Performance Goal	2.17	0.67	Low
Learning Environment	2.93	0.78	Moderate
Overall	2.44	0.31	Low

Table 4: *Level of Student Performance in Teaching Science*

Indicator	Mean	SD	Description
Grade Point Average in EED 10 (Teaching Science in Intermediate Grade)	87.36	5.50	Very good

Table 5. Correlation Analysis among Teaching Preparedness and Science Teaching Performance of Pre-Service Teachers

Independent Variables	Dependent Variable	r-value	r2	p-value	Decision
Professional Knowledge	GPA	-0.234*	0.0548	0.001	Reject H0
Professional Practice		-0.198*	0.0392	0.005	Reject H0
Professional Engagement		-0.268*	0.0823	0.001	Reject H0
Self-Management		-0.288*		0.001	Reject H0
***p< 0.05**					
Dependent Variable: Teaching Performance					

Table 6: *Correlational Analysis among ICT Integration Readiness and Science Teaching Performance of Pre-Service Teachers*

Independent Variables	Dependent Variable	r-value	r2	p-value	Decision
Technology Knowledge	GPA	-0.234*	0.0864	0.001	Reject H0
Technological Content Knowledge		-0.171*	0.0292	0.015	Reject H0
Technological Pedagogical Knowledge		0.322*	0.1037	0.001	Reject H0
Technological Pedagogical Content Knowledge		0.271*	0.0734	0.001	Reject H0
***p< 0.05**					
Dependent Variable: Teaching Performance					

Table 7: *Correlational Analysis among Motivation and Science Teaching Performance of Pre-Service Teachers*

Independent Variables	Dependent Variable	r-value	r2	p-value	Decision
Self-Efficacy	GPA	-0.078	0.0061	0.270	Failed to reject H0
Active Learning Strategies		0.106	0.0112	0.135	Failed to reject H0
Science Learning Value		0.216*	0.0467	0.002	Reject H0
Performance or Achievement Goal		-0.110	0.0121	0.122	Failed to reject
Learning Environment		0.132	0.0174	0.063	Failed to reject
***p< 0.05**					
Dependent Variable: Teaching Performance					

Regression Analysis on Teaching Preparedness, ICT Integration and Motivation as Predictors of Teaching Performance in Science

As presented on the table 8, the regression analysis on teaching preparedness, ICT integration and motivation as predictors of teaching performance in science. With the F-ratio of 8.124 and a p-value of 0.001 on the table, when independent variables are taken as a whole, predicts student performance in teaching Science. Given an R-value of 0.333, this indicates a favourable association between teaching preparedness, ICT integration and motivation as predictors of teaching performance in science. As to the overall R value of 0.333, indicating that the independent variables usefulness account for 33.3% of student competency in the subject. Among the independent variables, only teaching preparedness is strongly predicting student

performance in science. The study's goal was to figure out which of the independent variables strongly predicted teaching performance in science among PSTs.

To obtain an adequate conclusion based just on the standardized coefficient (B) provided in the table, linear regression is required. The beta of teaching preparation is -0.325, with a p-value<0.05. As a result, pre-service teachers' performance is significantly predicted by teaching preparedness.

ICT integration and motivation on the other hand, does not predict the pre-service teacher's performance. The result of the study is also supported with the findings of Mar et al. [21] when they found out that science learning motivations of pre-service elementary grade teachers predict their employment of authentic assessment practices in science in PSTs hold pedagogical and andragogical standpoints which are coined from their pre-service education and training.

IV. CONCLUSION

The study concluded that PSTs' teaching preparedness and motivation to learn Science are both low and recorded their readiness in ICT integration as high. The study also recorded high pre-service teachers' teaching performance in science as observed from their mean grades in science teaching courses.

Moreover, the study also found out that some indicators of teaching preparedness, readiness on ICT integration and motivation to learn have a major connection to PSTs' science teaching performance; however, only teaching preparedness predict teaching performance.

The study also showed an insignificant relationship among readiness on ICT integration and motivation to learn to pre-service teachers' performance in teaching.

However, when taken as a whole, teaching preparedness, ICT integration readiness and motivation can predict student performance in teaching science.

After considering the probable ramifications of the study's results and after conducting research, the researcher came up with several ideas for how PSTs might improve their teaching ability.

Firstly, since preparedness in teaching, readiness on ICT integration, and motivation in learning predict teaching performance when taken as a whole, school administrators may reconsider curriculum revision and incorporate their use in learning through employment of appropriate teaching strategies, establishing sound learning outcomes, and utilizing concrete and authentic assessments.

Secondly, since teaching preparedness most significantly predicts learners' performance, school administrators may consider raising the level of student preparation in teaching through considering teachers, learners, and the environment in planning the teaching-learning processes and may encourage them to enhance the use of self-assessment to carefully examine their readiness in teaching.

Also, teachers may introduce to students its various use and how they can use them in teaching-learning activities and tasks.

Thirdly, since teaching preparedness significantly predicts student performance, teachers may strengthen pre-service teachers' view on teaching preparation as an empirical component of providing effective and efficient instruction to future educators.

When teachers will carefully understand the needs of the learners on the level of their preparation to teaching, this might narrow down important things to be done to increase their level of teaching performance, which help learners identify their strengths and weaknesses in teaching. Through this, students can be more responsible and diligent, making them more focused on learning the subject.

Fourthly, to raise the level of students' teaching performance in science, teachers may provide a more practical rather than theoretical based learning by providing them authentic experience to teaching. By maintaining consistent teaching experiences and using various online platforms, PSTs may be able to improve their teaching abilities in this subject.

Lastly, the researcher recommends teaching the value of a sense of responsibility to the students by understanding the importance of performance and maintaining a positive attitude towards the subject.

Teachers could do this by conducting orientations and seminars on the expectations in the subject. Further, the researcher recommended looking for other indicators/components of ICT integration readiness and motivation that would significantly predict student performance in teaching science.

Table 8: *Regression Analysis on Teaching Preparedness, ICT Integration and Motivation as Predictors of Teaching Performance in Science*

Independent Variables	**Unstandardized Coefficient**		**Standardized Coefficient Beta**	**t-value**	**p-value**	**Decision**
	B	SE(B)				
(constant)	88.078	3.853				
Teaching Preparedness	-3.293	0.713	-0.325*	-4.616	0.001	Reject Ho
ICT Integration	0.467	0.914	0.037	0.512	0.609	Fail to reject Ho
Motivation	2.305	1.215	0.131	1.896	0.059	Fail to reject Ho
Dependent Variable: Teaching Science Performance						
R= 0.333* F-ratio= 8.124		R2=0.111 p-value=0.001				
***p< 0.05**						

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