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SECONDARY PRE-SERVICE SCIENCE TEACHERS' COMPETENCE: THEORY TO PRACTICE

Research article

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SECONDARY PRE-SERVICE SCIENCE TEACHERS COMPETENCE: THEORY TO PRACTICE

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Abstract

The study assessed the teaching competence of the secondary pre-service science teachers in terms of teaching knowledge, teaching skills, and attitude. The study made use of quantitative research approach (descriptive comparative research design). The validated instruments (Scale) was distributed to the respondents (n=45; Secondary Pre-service Science Student Intern) and a purposive sampling was utilized on selected Tertiary Education Institutions. Weighted means and Two-tailed T- test of dependent means at the level of significance $\alpha = 0.05$ were applied. The assessment of the teaching competence has shown that the pre-service teachers were competent. Results revealed that the level of knowledge was very good, level of teaching skills was high and attitude was very positive. Results also revealed that there was no significant difference before and after practice teaching in terms of knowledge and attitude. Yet, for teaching skills, there is a significant difference before and after practice teaching.

Keywords: preservice teachers, knowledge, attitude, teaching skills

1. Introduction

It is essential that pre-service teachers ought to be equipped with solid understanding of theory and develop this in their own classroom when they become teachers. Just as teacher education institutions have a mission of high responsibility to coach competitive educators for modification and future faculties. The authentic experiences, arguably is that the most powerful influence in teacher education institutions (Bullough et al., 2012). Teacher education programs have been regularly looking for the simplest potential ways in developing future instructors. It is progressively urged to specialize in ways in which of developing quality education through teacher preparation programs. The thought of student internship acknowledges pre-service teachers as key components in their own skilled growth, role of model, information constructors and distributors, and agents of improvement in students learning behavior.

Achievement in the teaching profession is gotten from three principles: knowledge, competencies, and attitude. Most educationists, be that as it may, give over the top consideration to the learning part while disregarding the improvement of the other two. (Scocco, 2006). Chances to feature the centrality of connection among theory and practice can be uncovered during the practice teaching, where pre-service teachers can encounter reasonable exercises, get proficient capabilities, and create inspirational demeanour towards teaching.

Then again, teacher factor, class exercises and general study hall environment can altogether rouse them to accomplish scholastic achievement (Falsario et al., 2014). Comparable discoveries likewise uncovered in the study directed by (Latifah, 2014) where there is a need to fortify instructor readiness. Darling (2014) calls it well-regulated actual practice as a basic component of effective preparation. It was additionally laid out that

difficulties makes beneficial actual encounters for prospective educators and distinguishes procedures that have been discovered effective in overcoming these difficulties.

The scholastic part of teacher training is typically held in a school or university setting, where instructive theory is formed. Conversely, abilities can be created alongside their skill in the authentic practice yet, much as could reasonably be expected, these optional pre-service teachers should as of now be school-prepared when they will be risen in the work environment. In any case, the useful ramifications of that theory are not constantly apparent. For the most part, pre-service teachers regularly neglect to perceive the significance of their coursework to the everyday substances of classroom teaching.

Most science pre-service teachers have been known to have difficulty involving the needs of the mechanisms they are arranged to play and the reality of the real job environment. These pre-service teachers did not well discovered from the real classroom setting in order to define real classroom management; thus, making it difficult for them to sort out the order of their class in relation to actual experiences. This could influence their dispositions towards the teaching profession. Classroom administration has been observed as a widely recognized concern of pre-service and expert teachers (West-white, 2007) and the majority of them credit it to the absence of readiness by teacher education programs. The pre-service teachers usually not distinguish learners conduct as their most troublesome parts of their practicum.

Preparing a lesson plan can viably achieve objectives and a significant advancement in any educating learning process, and pre-service teachers are no exemption. But then, it has been observed that it is where pre-service teachers need more improvement. Lesson plans should be well developed as these are used to communicate with students on what they need to learn and how they will be assessed. Planning empowers pre-service teachers in order to thoroughly consider what they instruct, how they instruct, and how to assess their instruction (Ruys et al., 2012). Be that as it may, student teachers need involvement in arranging and sorting out teaching exercises (Ramirez, 2019).

For this purpose, this study was done to assess the preparedness and competence of the secondary pre-service science teachers in terms of knowledge, skills, and attitude. As it may have great impacts on their professional growth, possible benefits, and challenges to develop and guarantee more efficient and comprehensive teaching-learning practices for all.

1.1 Statement of the Problem

The purpose of this study was to assess the teaching competence of the secondary pre-service science teachers among selected laboratory schools of state universities.

Specifically, the study attempted to:

1. determine the pre-service science teachers' level of knowledge before and after practice teaching in terms of:
    1.1. subject matter knowledge, and
    1.2. pedagogical knowledge;
2. determine their level of teaching skills before and after practice teaching in terms of:
    2.1. lesson planning,
    2.2. pedagogical skills,
    2.3. communication skills, and
    2.4. classroom management;
3. determine their attitude before and after practice teaching in terms of:
    3.1. personal attribute, and
    3.2. professional attribute; and

4. determine the significant difference before and after practice teaching in terms of:
    4.1. level of knowledge;
    4.2. level of teaching skills; and
    4.3. attitude.

1.2 Null Hypothesis

There is no significant difference before and after practice teaching in terms of:
    1.1. level of knowledge;
    1.2. level of teaching skills; and
    1.3. attitude.

2. RESEARCH METHODOLOGY

2.1. Research Design

The study made use of quantitative research approach. To determine the level of teaching competency, a descriptive comparative research design was used. The design was appropriate because the intention is to describe the teaching competence of the pre-service science teachers before and after practice teaching. The purpose of descriptive studies is to describe, and interpret the current status of individuals, settings, conditions, or events (Mertler, 2014). In descriptive research, the researcher is simply studying the phenomenon of interest as it exist naturally, and no attempt is made to manipulate the individuals, conditions, or events.

2.2. Participants

The participants of the study were the Secondary Pre-service Science Student Intern. A purposive sampling was utilized in choosing the respondents in selected three (3) State Universities. A total of 45 pre-service science teachers were chosen from State Universities. This group of pre-service science teachers took up Bachelor of Secondary Education major in Science during the 2nd semester of school year 2018-2019. They were consist of the senior undergraduate who were on final term and had their student internship. These pre-service teachers reported to the respective school and rendered eight (8) working hours each day similar to a regular instructor's working hours at the school.

2.3. Research Instruments

There were three instruments used in this research. In particular, The Subject Matter Knowledge and Pedagogical Knowledge, The Teaching Scale of Pre-Service Science Teachers, and The Attitude Scale of Pre-Service Science Teachers. The instruments were developed by the researcher in order to determine the teaching competence of the pre-service teachers before and after practice teaching. A validation was also done by panel of experts to ensure that the instrument was dependable and consistent. A try out was done to test the validity and reliability of the academic performance test.

2.3.1. The Subject Matter Knowledge and Pedagogical Knowledge

To determine the level of teaching competence in terms of subject matter and pedagogical knowledge, their general point average in all professional education subject and their major subjects was used as well as their teaching demo results. It was requested from their respective Deans.

The general average of the subject matter knowledge and pedagogical knowledge would be interpreted using the table:

Table 1
Mean Grade and Description of Level of Knowledge

Rating	Mean Grade	Competence
1	1.00 – 1.65	Very Good
2	1.66 – 2.29	Good
3	2.30 – 3.00	Fair

2.3.2. The Teaching Scale of Pre-service Science Teachers

To determine the level of teaching competence of the pre-service science teachers in terms of teaching skills, the study adopted and modified a scale according to the needs of the study and validated by experts. The teaching skill was subdivided into four parts. Each subdivision was composed of 15 statements that determine the level of teaching competence of the PST in terms of teaching skills, specifically on Lesson Planning, Pedagogical Skills, Communication Skills, and Classroom Management, respectively. It is using a five-point Likert scale – very high (5), high (4), average (3), poor (2), and very poor (1).

Lesson planning was composed of five components: overall plan, preliminary material, objectives, lesson presentation, and content. It was adopted from Teacher Checklist for lesson plan. Pedagogical skills was composed of three components: planning, development, result. Adopted from the study of Murcia et al. (2015). For communication skills, it was composed of four components: articulation, voice, speech fluency, and language. It was adopted from Communication Skills Teacher Checklist of Louisiana Department of Education. And lastly, the classroom management composed of the following: learning environment, instructional strategies and programs, rules and procedures, and student communication. It was adopted from Key Elements for Effective Classroom Management Checklist of University of Oregon.

Table 2
Mean Intervals and Description of Level of Teaching Skills

Rating	Mean Range	Performance	Level of Competence
5	4.20 – 5.00	Very High	Very High
4	3.40 – 4.19	High	High
3	2.60 – 3.39	Average	Moderate
2	1.80 – 2.59	Poor	Low
1	1.0 – 1.79	Very Poor	Very Low

2.3.3. The Attitude Scale of Pre-service Science Teachers

To determine the teaching competence of the pre-service science teachers in terms of attitude, the study adopted The Teacher Skills Checklist of kdp.org and was modified according to the needs of the study and validated by experts. It has two parts; the personal attribute and professional attribute. Each part was composed of 15 statements and used a five-point Likert scale – very positive (5), positive (4), neutral (3), negative (2), and very negative (1).

Personal attribute was composed of the following: caring, fair and respect, enthusiasm, and reflective practice. While the professional attribute was composed of interaction with students, motivation, and dedication to work.

The level of teaching competence of the secondary pre-service science teachers in terms of teaching skills and attitude was measured using weighted mean. The weighted means of the different features was interpreted using the table:

Table 3
Mean Intervals and Description of Attitude

Rating	Mean Range	Attitude	Competence
5	4.20 – 5.00	Very Positive	Very Positive
4	3.40 – 4.19	Positive	Positive
3	2.60 – 3.39	Neutral	Neutral
2	1.80 – 2.59	Negative	Negative
1	1.0 – 1.79	Very Negative	Very Negative

2.4. Data Gathering Procedure

Before data gathering, the validation of instrument was done by three experts from three different universities of Cebu City. Once the clearance from the Research Ethics Committee was received, the researcher followed the proper protocol during the data gathering. The researcher then gathered all the secondary pre-service science teachers for a short briefing stating the purpose of the said research. Also, the consent of these PSTs were asked before gathering the raw data. In the same way, the professional education and major subject grades of the PSTs was requested. These were utilized in determining the level of teaching competence in terms of knowledge. After the short briefing: informing the respondents of the purpose of the study, source of data collection, participation risks and benefits, voluntary participation and withdrawal, as well as its confidentiality, the researcher agreed on a schedule with the respondents on where and when to conduct the survey.

2.5 Data Analysis

The level of knowledge, teaching skills, and attitude of the secondary pre-service science teachers in the different aspects were measured using weighted means. Two-tailed T-test of dependent means at the level of significance $\alpha = 0.05$ was also used to test the significant difference before and after practice teaching in terms of knowledge, teaching skills, and attitude.

3. PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

3.1. Level of Knowledge of Pre-service Science Teachers Before and After Practice Teaching

Table 4 shows the overall level of knowledge of pre-service science teachers on theory and practice. From Table 1, it shows that there was an improvement of knowledge between the theory and practice of pre-service science teachers in terms of subject matter knowledge and pedagogical knowledge. Further, both grand weighted means (1.75 and 1.28) before and after practice teaching were interpreted as Very Good. Results may imply that pre-service science teachers were able to convey the relevant constructs of content and

pedagogical knowledge in a manner that they appeared in their classes well-prepared and with well-organized lesson as rated by their mentors.

Table 4.
Overall Level of Knowledge of Pre-service Science Teachers Before and After Practice Teaching

Parameters	Before	Description	After	Description
Subject Matter Knowledge	1.88	G	1.29	VG
Pedagogical Knowledge	1.62	VG	1.26	VG
Grand Weighted Mean	1.75	VG	1.28	VG

Legend: 1.00-1.65 – Very Good - VG
1.66-2.29 – Good - G
2.30-3.00 – Fair - F

Generally, schools may be producing competent pre-service science teachers, thus making them become globally competitive and ready to face the modern and complex world of teaching. Opposing researchers exist with respect to the legitimacy of evaluation guide normal and its relationship toward pedagogical competence. The study of Baumert et al. (2010) guaranteed that the two sorts of knowledge have appeared to influence teachers' instructional practice as well as student learning. There are additionally different studies declaring that grades are one-sided and untrustworthy markers of showing competency in teaching yet there are findings that show ideal relationship between grade point average and competency in teaching (Davy et al., 2007).

In the study of Pagaduan (2009), the expert discovered that academic excellence and teaching internship competence are essentially intertwined with each other. Hall and West (2011) confirm this by referring to that the higher is the academic grade of the pre-service teacher is directly intertwined with the teaching competency. The ideal is the teaching competency of the pre-service teachers, the greater is the scholastic meaning of inner interest, responsibility, and time management and study atmosphere. Conversely, Kunter et al. (2013) uphold that the pre-service teachers' general scholastic ability is not directly related their teaching effectiveness. This was upheld by Zumwalt and Craig (2015) revealing that there is no relationship between scholastic ability and teaching competence.

Unmistakably, existing literary works demonstrated the hazy areas that require a top to bottom research to investigate the irregularity of the said variable. Thus, innovative programs may be developed with the use of intentional and purposeful research to sustain and guarantee that pre-service teachers have the subject matter knowledge as well as the pedagogical knowledge needed in becoming capable teachers of science.

3.2. Level of Teaching Skills of Pre-service Science Teachers Before and After Practice Teaching

The overall level of teaching skills of pre-service teachers before and after practice teaching is shown in Table 5 below:

Table 5.
Overall PSTs Perceived Level of Teaching Skills Before and After Practice Teaching

Parameters	Before	Description	After	Description
Lesson Planning	3.87	H	4.23	VH
Pedagogical Skills	3.83	H	4.15	H
Communication Skills	3.54	H	4.12	H
Classroom Management	3.71	H	4.13	H
Grand Weighted Mean	3.74	H	4.16	H

Legend:
4.20-5.00 – Very High - VH
3.40-4.19 – High - H
2.60-3.39 – Moderate - M
1.80-2.59 – Low - L
1.00-1.79 – Very Low - VL

Table 2 presents the data on the level of teaching skills of pre-service science teachers before and after practice. It can be gleaned that among the teaching skills, only lesson planning has its unique result from High to Very High. This result may indicate that teaching internship have substantial impact in developing pre-service teachers lesson planning skills. The result is supported by the study of Ayres (2014), lesson planning is a central pre-requisite expected to preparedness in classroom teaching. It is an innovative procedure which gives a system to deliberate learning.

A lesson plan encourages pre-service teachers to thoroughly consider what they are going to educate and how they are going to educate the students. Educators concede to the significance of its utilization (Nesari and Heidari, 2014) and for novice instructors, knowing the "what" and the "how" of teaching gives them the beginning stage from which they can start their exercise for the appointed course (Villagran, 2014). Thus, maximizing their application through teaching internship may improve their realization towards an effective and efficient lesson planning outcomes.

Also, from the table, the level of teaching skills of pre-service science teachers before and after practice teaching is High. It may imply that pre-service teachers' level of teaching skills determines the performance of every pre-service teacher in their teaching career and the number of skills they used in the classroom; It is independent on how these competencies are intertwined, modified and remodelled to make teaching an effective tool in molding learners, explorers and thinkers.

Teachers must dominate number of competencies to manage their everyday scholastic activities (Darling-Hammond, 2006). However, some competencies seem to be more imperative compared to others in bringing out good teaching ability. Therefore, updated pre-service teacher development activities may be an effective means to achieve the desired skills and competencies among the future teachers in their own field of specialization.

3.3. Attitude of Pre-service Science Teachers Before and After Practice Teaching

Table 6 presents the data on the attitude of pre-service science teachers before and after practice. From the table, the attitude of pre-service science teachers before and after practice teaching is Very Positive.

Table 6.
Overall PSTs Perceived Attitude Before and After Practice Teaching

Parameters	Before	Description	After	Description
Personal Attribute	4.32	VP	4.50	VP
Professional Attribute	4.26	VP	4.50	VP
Grand Weighted Mean	4.29	VP	4.50	VP

Legend:

4.20-5.00 – Very Positive	-	VP
3.40-4.19 – Positive	-	P
2.60-3.39 – Neutral	-	NE
1.80-2.59 – Negative	-	N
1.00-1.79 – Very Negative	-	VN

It may imply that pre-service teachers have a Very Positive attitude towards teaching. Also, pre-service teachers practiced professionalism and its interdependencies between personal and professional attribute. It has been said that, teachers essential personal attributes within a professional situation help to enable effective learning (Vallance, 2010).

Moreover, the study of Oliva et al. (2009) show that pre-service teacher training should deal comprehensively with the competencies related to the organization and administration of teaching-learning, this can be supported through the of new technology in the classroom, the participation of families, teaching of values, social cognitive skills and skills for professionalism. This also agrees on the impression of Lumpkin (2008) that when pre-service teachers model reliance, equality, uprightness, reverence and accountability, they may help learners absorb moral upbringing. As a role model, the teacher must display good conduct and inculcate proper manners (Acero et al., 2007).

Therefore, teacher educators may be accustomed to the distinctive qualities of the individuals they prepare for the teaching and learning process. Additionally, human resources may be established in a unified manner through preparation, progressions, sessions or programs to ensure that every individual can progress to their potential to the prime level, especially pre-service teachers.

3.4 The Significant Difference Before and After Practice Teaching

Tables 4 to 6 present the significance of the difference between before and after practice teaching of pre-service science teachers in terms of knowledge, teaching skills, and attitude. The t-test on paired observations was employed to determine this significance at an $\alpha = 0.05$ level of significance.

3.4.1. Knowledge

Table 7 presents the significance of the difference before and after practice teaching of pre-service science teachers in terms of knowledge.

Table 7.
The Significance of the Difference Before and After Practice Teaching in terms of Knowledge

Domain	Variable	Mean	p-value	Decision	Significance
Knowledge	Before	1.750	0.151*	Accept the Null Hypothesis	Not significant
	After	1.275			

*Significant at α= 0.05

Table 4 presents the significance of the difference before and after practice teaching in term of knowledge. The p-value obtained (0.151) is more than the level of significance α = 0.05, which accepts the null hypothesis. Hence, there is no significant difference between the before and after practice teaching in terms of knowledge. Based from the assessment of the pre-service teachers, it implies that the theory and practice in terms of knowledge are comparable. Thus, the level of knowledge of the pre-service teachers on theory is as the same with practice.

This affirms the findings of Kunter et al. (2013) that scholastic record is not directly related to teaching competence. Zumwalt and Craig (2005) also cited that no apparent connection on grades with instructors performance. Likewise, the result is supported by Burns and Richards (2009), that teacher learning should not be viewed as interpreting specific topics into application but instead generating new information in addition to philosophy through contributing in specified common situations and appealing in particular types of undertakings and developments.

Clear as it is that the pre-service teachers acquired this type of knowledge over active participation in practice teaching in their comprehension. Based from the outcome of the assessment, it is safe to assume that there is no statistical gap between theory and practice in terms of knowledge. Thus, teacher education program may cope-up by means of advancement on the strong foundations of theoretical knowledge of the pre-service teachers.

3.4.2. Teaching Skills

Table 5 displays the significance of the difference before and after practice teaching of pre-service science teachers in terms of teaching skills.

Table 5. *The Significance of the Difference Before and After Practice Teaching in terms of Teaching Skills*

Domain	Variable	Mean	p-value	Decision	Significance
Teaching Skills	Before	3.738	.005*	Reject the null hypothesis	Significant
	After	4.158			

*Significant at α= 0.05

As shown on Table 5, the p-value obtained (0.005) is less than level of significance α = 0.05, which rejects the null hypothesis. Therefore, there is a significant difference before and after practice teaching in terms of teaching skills. It may imply that there was a significant change from theory to practice. Hence, the practice teaching has a positive influence on the pre-service teachers. Therefore, it can be supposed that there is a change from theory and practice in terms of teaching skills.

Furthermore, as stressed by Ramirez (2018), the achievement of pre-service teachers does not solely come from the academic knowledge acquired but also on the authentic

experiences which affords them the competencies and attitude that would enhance their positive teaching practices. This authenticates the outcomes of research done by Somblingo (2014) and Biong (2014) mentioning that pre-service teachers have boundless capabilities of teaching effectiveness.

Corroboratively, this can be credited from the rigid training of the pre-service teachers during the internship which affords a place for the association of theories and practices aiding the pre-service teachers garnered a strong basic features of teaching and to be associated with the authenticity of the real teaching-learning environment (Abao, 2013). Thus, pre-service teachers may be included in designing, implementing, and evaluating the program for them to help in the development and success in the implementation of the program.

3.4.3. Attitude

Table 8 shows the significance of the difference before and after practice teaching of pre-service science teachers in terms of attitude.

Table 8.
The Significance of the Difference Before and After Practice Teaching in terms of Attitude

Domain	Variable	Mean	p-value	Decision	Significance
Attitude	Before	4.290	.090*	Accept the null hypothesis	Not significant
	After	4.500			

*Significant at $\alpha = 0.05$

Table 6 exhibits the significance of the difference before and after practice teaching in terms of attitude. The value of the significance (0.090) is more than the level of significance $\alpha = 0.05$, which accepts the null hypothesis. Therefore, there is no significance of the difference before and after practice teaching in terms of attitude. It implies that there was no change in terms of attitude of pre-service teachers before and after practice teaching. The same attitude was exposed by the pre-service teachers on theory and practice. Thus, it is safe to assume that there is no statistical gap between theory and practice in terms of knowledge. As shown on Zhang et al. (2016) result of the study with pre-service teachers in the phases of teacher education. It presented that pre-service teachers' proficient distinctiveness fortified the teaching performance by influencing their task, worth, assurance and external learning drive.

Quite the reverse, one study settled that the pre-service teachers appreciated teaching as an important line of work, later, would regard their career with pride. Also, the pre-service students gave great significance on being dynamic in their performance where their capabilities are exposed to enhance their sense of achievement whenever a certain task is accomplished. The pre-service teachers had not expected a good working environment and accessibility in the profession. Since the pre-service teachers are already aware that teaching is a challenging job. Attitude in terms of teaching and their ethics are autonomous of each other. Whatever the pre-service teacher experience during the education preparation, their attitudes towards teaching and their work ethics could be similar (Torres and Ballado, 2014). Thus, teaching internship may be extended, as little time and deferment in engaging in an internship delimits pre-service teachers' competencies of the teaching profession.

4. CONCLUSION

The assessment of the teaching competence of the secondary pre-service science teachers among selected state universities has presented that the pre-service teachers are very competent. It is evidently revealed from the findings that the level of knowledge was Very Good, its level of teaching skills was High and the attitude was Very Positive. Results also revealed that a competent pre-service science teacher can translate strong theoretical foundation on the diversity of learners, has acquired competence grounded on authentic experiences and possess a positive attitude towards teaching.

The study, however, has also several limitations. Initially, considering that the sample size was very few per Teacher Education Institution, it did not essentially represent the cluster of pre-service science teachers where the results were generalized. Only three (3) particular state universities were also included, its findings may not generally match the viewpoints of the pre-service teachers about the teacher Education programs in other Tertiary Education Institutions. Also, the study was not able to provide a richer picture of the implementation of the program and the factors affecting the teaching competence, as the instruments used in the study, were perceived to have only composed the superficial facts and not the deeper nuances that have also emerged and have been experienced by the pre-service teachers.

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