Assessment of Science Teacher Competence in Teaching Secondary Science with Spiral Progression Approach

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Abstract. This study aimed to assess the competence of science teacher in teaching secondary science with spiral progression approach in terms of their knowledge on subject matter, teaching strategies, personality traits and teaching approach. Science teachers in both public and private schools within Lanao del Sur and Lanao del Norte served as the respondents of this study. The study used questionnaire as methodology and utilized the frequency distribution, correlation coefficient and regression analysis method. The result showed that the profile of the respondents specifically age, tenure and year in teaching science, and salary grade are correlated with science teacher’s competence in knowledge of subject matter. The result also showed that aside from age and tenure rank or position of the respondents is also correlated with the teaching strategies. Length of service correlates only with the personality traits of the respondents. Civil status, years in teaching, highest educational attainment correlates with the respondents teaching approach.

1. Introduction
Over a century, many policy makers around the world have tried their best to revise and improve the science education by altering the curriculum based on the perception that creating a new curriculum that will influence teachers to shift from their traditional routines in the classrooms, making students learn far better in science [8]. In order to cope with global challenges in science education experienced by many countries around the world especially Philippines, reforms in education is continually occurring [5]. Philippines’ new educational system was implemented starting in 2011. This is the Republic Act 10533 also known as the Enhanced Basic Education Act of 2013 enabled the implementation of the K-12 in the country [13]. The features of the K-12 Enhanced Basic Education Program include the strengthened Science and Math education which follows a spiral progression. The use of spiral progression avoids disjunctions between stages of schooling and allows learners to learn topics and skills appropriate to their developmental and/or cognitive stages [4]. On that teacher are required to develop the essential knowledge skill, attitudes, and values of the student to enable the cope with these changes. It is known that there has been a focus upon the student’s learning performance but there has also been an acknowledgement that students’s learning was not liely improve markedly until teacher were given the opportunity to further support and develop as well ti increase their teaching skills [2]. Teacher competencies is defined as “set of knowledge, skills, attitudes, values, beliefs and experience necessary for future, which manifests in the teachers’
activities [12] Teachers need to improve knowledge and skills to enhance and explore their teaching practices. In fact, teacher’s professional development should be defined for sustainability. Sililarly, teacher are responsible for operating educational system and they need strong and effecient professional competence [6].

Data analysis showed that the profile of the respondents were correlated with there teaching competencie.Therefore, in this work, we first intended to contribute to the search for good and effective curriculum of science subject. Specifically, it seeks to explore that may beneficial to both public and private schools, which all seek to assess science teachers’ competencies teaching science in the spiral progression approach mandated in the K-12 program. Findings in this research may also give rise to the role of progressive schools in educational research and development of alternative, pedagogical systems.

The purposes of this study were to to assess the competence of secondary science teacher teaching science in spiral progression approach Specifically, the study sought to answer the following:

1. What are the competencies of a Science teachers in the spiral progression approach in terms of:
   1.1. Knowledge of Subject Matter
   1.2. Teaching Strategies
   1.3. Personality Traits
   1.4. Teaching Approaches

2. What are problems encountered by the science teacher using spiral progression approach?

3. Is there a significant correlation between the competencies of science teachers and their profile?

Null Hypothesis (H0): There is no significant relationship between the competences of science teachers and their profile.

Alternative Hypothesis (Ha): There is a significant relationship between the competencies of science teachers and their profile.

2. Theoretical Background

According to the principles of Jerome Bruner’s Theory [4] Instruction comes in three ways these are the: readiness which the Instruction must be concerned with the experiences and contexts that make the student willing and able to learn, spiral organization which the Instruction must be structured so that it can be easily grasped by the student and last but not the least is the principle that going beyond the information given in which Instruction should be designed to facilitate extrapolation and or fill in the gaps. The Spiral progression approach has main philosophies behind these are the Constructivism, Progressivism and Behaviorism. A major theme in the theoretical framework of Bruner [4] is that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. As far as instruction is concerned, the instructor should try and encourage students to discover principles by themselves and they should engage in an active dialog. Curriculum should be organized in a spiral manner so that the student continually builds upon what they have already learned. Teachers’ competency in teaching secondary science with spiral progression approach can be achieve through assessment of science teachers’ competence in teaching Secondary Science with Spiral Progression Approach and comparing the relationship of the profile of the teacher to the teachers’ competency by the profile of the teachers and teachers’ pedagogy in teaching science with Spiral Progression Approach.

3. Methods

The study was conducted in selected public and private high schools in Lanao del Sur namely the MSU-Saguiaran, Saguiaran National High School, MSU – University Training Center – Main and Experimental Campus, MSU – Integrated Laboratory School. MSU – Institute of Science Education, Marawi National High School, Ibn Siena Integrated School and one (1) school in Lanao del Norte
namely Pantar National High School. It obtained 55 Science teachers with their profile terms of sex, age, civil status, educational attainment, length of service, rank or position, years in teaching science, tenure, salary grade and which are officially teaching Science subject during the academic year of 2017-2018. It used correlational research design with purposive sampling method to provide description of the correlation between the competencies of science teachers and their profile. used questionnaire which underwent several revision and face validation by the researchers’ panel members and experts in education before it was used as a tool for collecting data. Used survey questionnaire contained the items that referred to assess the competencies of Science teacher in teaching secondary Science with spiral progression approach. The respondents in this study completed three sections of questionnaire, the profile section, the competencies towards knowledge to subject matter, teaching strategies, personality traits and teaching approach section and problems encountered by the Science teachers in teaching secondary Science with spiral progression approach. The data gathered were immediately tabulated, analyzed and interpreted. The collected data were entered in the Statistical package. The results were generated according to the objectives of the study using frequency distribution table, correlation coefficient and regression analysis as a statistical tools.

4. Results and Discussion

Here is the presentation of the various data according to their respective arrangement as what have been mentioned in the statement of the problem. Significant implications then reinformed each tabular finding.

4.1 Profile of the Respondents in Term of:

Sex from the gathered information, female has the highest frequency of 84.78% while male has 15.22%. This implies that there were more number of women gets in educational courses. Age the data tells us none of them has an age of 59 and above since teachers in that age were in their retirement period. Moreover, the data also implies that there are more fresh graduates ranging from age 23-28. In addition, the result of this study is in line with older workers participating in work beyond the statutory retirement age indicated several preconditions and motives for staying in the work force. Civil Status as for the result that shows, out of 55 respondents 35 of them were single and 20 of them were married. There were no respondents answered widow nor separated. This data shows that most of the respondents are single and only few are married. This is because most of the respondents were fresh graduates. Educational Attainment there are more teachers who are currently enrolled in their Master’s Degree than Doctoral Degree. This is because Master’s Degrees are much easier to accomplish within 2 years. However, in PhD this could take longer years such as 4 years. Length of Service this implies that most of the teachers were on their first to fifth year of service with a frequency of 23 compared to 16 years and above length of service. This is because most of the respondents are fresh graduates and least of them approaching on their retirement. Rank or Position there were most number of Teacher I with 30 respondents compared to Master Teacher I. This is because most of the teachers are fresh graduates and they first land on teacher I before they get promoted. Years in Teaching Science please take note that the respondents of this study were all Science teacher and handling Science subject presently this only means that the length of service and the year in teaching science are mostly likely the same. Most of the teachers are in their first to fifth year in teaching science compared to 16 years and above. Tenure stability in teaching profession tells us most of the respondents are permanent in comparison to substitute teachers. This means that the newly hired fresh graduate teachers landed permanent. And this also implies that there were many vacant slots for new teachers. Teacher Salary Grade out of 55 respondents 32 of the have the salary grade of 11 compared to salary grade of 20. This is because most of the respondents are newly hired teachers.
4.2 Competencies of Science teacher in the spiral progression in term

4.2.1 Subject Matter

It described the distributions of respondent's level of competence about the subject matter. It showed that respondents preferred to teach the Subject matter if made applicable to the real world situation and strongly agreed with 75% and had a frequency of 41 out of 55. This implies that most of the teachers agreed and strongly agreed the level of competence of the subject matter. This was supported by the study of Cochran and Jones [9] in which they defined SMK rather than content knowledge as the overarching category which included content knowledge considered as substantive knowledge only together with syntactic knowledge and beliefs about subject matter.

4.2.2 Teaching Strategies

This showed that 76% of them used the teaching strategies that respondents preferred to relate the subject matter to real-life situations; give tests, quizzes, projects, etc. that cover the most important points of the topic or chapter. This implied that most of the teachers' response on competencies in teaching strategies were mostly agreed and strongly agreed. The result was in line with the statements teaching is the opportunity to help others to live their lives fully, which means we help to give to our learners' lives through their physical, emotional, intellectual and social growth [14].

4.2.3 Personality Traits

It shows about personality traits were possessed by the Science teachers and some of the respondents strongly agreed on the following statements that 57% or 29 of them were flexible, and likes new and different ideas. This implied that distributions of competencies on respondents' personality traits were mostly agreed. This result was in line with the Palardy and Rumberger [15] study, in which teacher aspects such as beliefs, attitudes, practices, and personality were the most relevant variables to teacher effectiveness.

4.2.4 Teaching Approaches

It indicates that the teachers used various approaches which they strongly agreed on the statements that the students should work in a group or teams to help each other as well as students who wants only to work themselves. This was supported by Dyer and Osborne [15] in their study entitled "Effects of Teaching Approach on Achievement of Agricultural Education Students with Varying Learning Styles" proposed that "the selection of an appropriate teaching approach is one of the most important processes to have teaching success and student achievement" (p. 260). [15] further stated that “students react differently to different teaching methods, and that the selection of the proper method is critical to the learning style of those being served by the instruction” (p. 260).

1. Problem Encountered by the Science Teachers

As for the problem encountered by the Science teachers, the most perceived problems encountered by the Science teachers were lack of teaching equipment, lack of instructional materials and in-sufficient in-service training. This because of the shifting of curriculum. Teachers are adjusting to the new curriculum hence they need more equipment, sufficient instructional materials and in-service training in order for them to function effectively in the new curriculum. This is supported by GMA News that the unavailability of learning materials is just one of the problems still hounding the country’s new basic education program, K to 12, in the three years of its implementation as well as in-service trainings for teachers.
2. Significant correlation between the competencies of science teachers and their profile

a. Profile of Science Teachers and their Teacher - Knowledge to Subject Matter

There is a significant relationship between the age, years in teaching science, tenure and salary grade of the respondents and their knowledge of the subject matter. This is because the neophyte teachers’ knowledge varies from the veteran teachers. According to Meister and Melnick [16], over the past thirty years, numerous studies confirmed that new teachers do not have the requisite knowledge to understand the complex interrelationships among management, behavior, and academic tasks. This lack of knowledge prevents new teachers from focusing on student learning; instead, they are preoccupied with their own behavior as they try different workable procedures. An important missing piece in the literature is how the concerns of experienced teachers differ from those cited by beginning teachers. Moreover, teachers may vary based on their tenure because the higher the tenure and salary grade the higher the significance of the teachers’ knowledge. It is in line in utdallas.edu that It is important to recognize that the changes in salaries and student demographics reflect both teacher preferences and district hiring and retention decisions. Because some teacher transitions result from involuntary job separations, these figures likely understate teacher preferences for both higher salaries and specific student characteristics.

b. Profile of Science Teachers and their Teacher - Teaching Strategies.

There is a significant relationship between the age, rank or position and tenure of the respondents in terms of teaching strategies. First, this implies that the age of the teachers affects their strategies. For instance, a fresh graduate teacher versus a veteran teacher. Their strategies really differ because fresh graduate teachers are more inclined to what he/she learned in his/her bachelor’s degree while a veteran teacher can become flexible since the number of teaching experience are longer as well as its tenure. According to oecd.org, teachers’ beliefs, practices and attitudes are important for understanding and improving educational processes. They are closely linked to teachers’ strategies for coping with challenges in their daily professional life and to their general well-being, and they shape students’ learning environment and influence student motivation and achievement. Teachers are more inclined to regard students as active participants in the process of acquiring knowledge than to see the teacher’s main role as the transmission of information and demonstration of correct solutions. This is most true in northwest Europe, Scandinavia, Australia and Korea and least true in southern Europe, Brazil and Malaysia where teachers fall between the two views.

c. Profile of Science Teachers and their Teacher - Personality Traits.

Based on the results there is a significant relationship between the length of service and personality traits. This is because as a teacher gain experience through the years, his/her personality also improves. According to Azer [1]. Excellent teachers serve as role models, influence career choices and enable students to reach their potential. Some of the necessary qualities are inherent, others can be acquired through the years of teaching.

d. Profile of Science Teachers and their Teacher - Teaching Approaches

Based on the results there is a significant relationship between the civil status, educational attainment and the number of years in teaching of the respondents in terms of teaching approaches. This implies that teacher’s civil status has an effect on what his/her teaching approaches are. According to Gill [11] every teacher has her or his own style of teaching and as traditional teaching styles evolve with the advent of differentiated instruction, more and more teachers are adjusting their approach depending on their students’ learning needs. Moreover, educational attainment also could influence on how the teacher teach his/her students. As what Gill [11] said that teaching approach could also be improved by continuing study in every aspect. Although it is not the teacher’s job to entertain students, it is vital to engage them in the learning process. Selecting a style that addresses the needs of diverse students at different learning levels begins with a personal inventory—a self-evaluation—of the teacher’s strengths and weaknesses. As they develop their teaching styles and integrate them with effective classroom management skills, teachers will learn what works best for their personalities and curriculum.
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