# Area of Specialization and Teaching Performance of the Secondary Science Teachers in Negros Oriental, Philippines

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## ABSTRACT

The K to 12 reform and the new Philippine Professional Standard for Teachers have changed the landscape of teacher quality requirements in the Philippines. It is in this context that this study is deemed necessary to determine the area of specialization and the teaching performance of the public secondary school Science teachers in terms of science content knowledge with this new educational schemeThere were 46 respondents in this study from the Department of Education-Guihulngan City Division, Negros Oriental Philippines. Findings reveal that the science teachers' area of specialization can be categorized as Bachelor of Secondary Education (BSED) major in General Science, BS in Scientific Field (Nursing, Biology, and Chemical Engineering) and the Non-Science Field (English, TLE, Social Science). It indicates that majority of them lack the needed educational qualification to teach all science disciplines in the K12 curriculum. Furthermore, it shows that the BSED-General Science teachers with outstanding rating perform better than the B.S. in Scientific Field group and the non-science teachers with very good and good performance ratings respectively. It is an indication of lack of science content knowledge among the non-science teachers. Furthermore, the result discloses that the area of specialization is a determining factor in their teaching performance. It revealed that among the three groups of respondents, the general science teachers appear to be the most efficient. They are followed by those in the B.S. in Scientific field, and the non-science teachers came out to be the lowest. Hence, it clearly suggests

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that the BSED-General Science teachers are the most qualified to teach science since they have the sufficient educational preparations. The B.S.in Scientific Field teachers need to undergo more training and enroll in graduate studies to master all the science areas in the K12 curriculum. While the non-science teachers are discouraged to handle science subjects since they lack the necessary educational preparation to teach science.

## 1. INTRODUCTION

In the Philippines, the new science program of the K to 12 reform policy now has many innovations. One of which is the decongestion of the competencies and arrangement in spiral progression manner. In the old curriculum, a specific discipline is being offered per grade level. First year will take up general science, the second year will deal with biology, the third year will study chemistry, and the seniors will master physics. But in the new science program, the different disciplines in science have been incorporated in every level [1].

Hence, the spiral progression approach was recognized to be difficult not only to students but also to science teachers [2]. Recent studies show that science teachers were still adapting to the new curriculum, they needed more time and trainings to master all the fields and to learn new teaching strategies because it is difficult to teach something, in which one does not have the necessary mastery. They can't teach other branches of science without the in-depth discussion because it is not their specialization [3].

Another challenge in the implementation of the K-12 program is the shortage of science teachers to handle the k12 science subjects in the country [4]. To solve this problem, the K-to-12 law or Republic Act 10533 allows new graduates or new hires to teach in elementary and secondary education in subjects where there is a shortage of qualified teachers provided that they pass the Licensure Examination for Teachers within five years or they will teach on part-time basis [5]. Consequently, the Department of Education (DepEd) opened its doors to hire professionals from other fields to address the challenge of filling more than 30,000 teaching vacancies for senior high school (SHS) in 2017.

The changes brought about by the K to 12 reform policy and the changing character of the 21st century propelled the adoption of the Philippine Professional Standards for Teachers (PPST) in 2017 to further improve teacher quality in the country [6]. The PPST outlines the required skills and competencies that Filipino teachers much have to enable them to cope with the emerging global frameworks [7].

Moreover, the PPST describes the breadth of 7 Domains that are required by teachers to become effective educators in the 21st century such as content knowledge and pedagogy, learning environment, diversity of learners, curriculum and pedagogy, assessment and reporting, community linkages and professional engagement, and personal growth and professional development [8].

However, this present study focuses on the science teacher's teaching performance in terms of content knowledge and its application within and across curriculum areas under the first domain of PPST which is the content knowledge and pedagogy.

Content knowledge is defined as the disciplinary conceptual knowledge of the teacher. Good subject knowledge involves understanding the substance, content, structure and organization of the science subject itself [9]. This is an important characteristic for quality teachers having good subject matter knowledge (Ingressol as cited in [10]. Consequently, when teachers have a good subject matter knowledge, then they are able to help students understand the core ideas of various topics, create useful cognitive maps, as well as enable the students to connect each topic with everyday life examples and facts [11].

Further, Fennena and Franke [12] opined that the perception of teachers for effective teaching of any subject depends to a large extent on the teachers' understanding of the nature of the subject matter and that perception of proper teaching is a consequence of a teacher being able to pass-on the content of the subject matter. Further, Ifiok [13] also opined that a lack of required background and orientation relevant to curriculum, on the part of the teacher, leads to poor attitudes towards the implementation of a new curriculum, on matter how expertly the

pages of the curriculum were designed and put together.

To acquire high level of content knowledge in science is to possess the necessary educational qualification and area of specialization. It is common knowledge that a teacher cannot give what he does not have. Some works like those of Emeh and Enukoha (as cited in [14] provided theoretical support for the importance of area of specialization and teachers effectiveness.In the Philippines, a teacher must be a Bachelor of Science in Secondary Education (BSED) major in General Science to be able to teach all the science areas in the K-12 Science curriculum. However, due to shortage of teachers, graduates from other fields such as Nursing and Pharmacy were hired to teach science subjects.

It is in this context that this study is undertaken to determine how equipped the teachers hurdle the challenges imposed by the new educational scheme. Braskamp and Brandenburg [15] indicated that teachers are in the best position to judge what and how they teach. In this study, the science teachers are the primary sources of data.

Further, this study determines the area of specialization of the science teachers and their teaching performance in terms of content knowledge and its application within and across curriculum areas. It also aims to identify which groups of science teachers based on their area of specialization perform better in their teaching performance. The results of this study can be used as basis in the adoption of new recruitment policy for science teachers in the Philippines.

## 2. METHODOLOGY

This study utilized the descriptive correlational design. The entire population of the public secondary school Science teachers in the Division of Guihulngan City, Negros Oriental were the respondents of this study. There were 46 respondents of this study.

A researcher-made questionnaire was used as the data gathering tool. It was formulated based on the Philippine Professional Standard for Teachers of the Department of Education. It was subjected to validity and reliability testing. The instrument was pre-tested by 20 secondary Science teachers outside the Department of Education- Guihulngan City Division. The data collected were analyzed using Cronbach Alpha.

In order for it to be considered reliable and fit for data collection, its reliability coefficient must reach the least acceptable value of 0.60 (Nunally, 1967). The research instrument was found to be reliable with a reliability coefficient of 0.97.

Aside from the statistical means of determining the reliability of the research instrument, it was also checked and validated by three Department of Education Officials of the Guihulngan City Division namely the   Education Supervisors in Science and English, and the Division Human Resource Officer  for its validity.

The data collected were analyzed using frequency and Percentage, Weighted Mean, and Chi-Square. Percentage was used in presenting the distribution of the respondents' area of specialization. Weighted mean was utilized in determining the respondents' level of performance. The Chi-Square test of independence was employed to calculate the relationship between area of specialization and the teaching performance

This study was conducted in 2019.

## 3. RESULTS ND DISCUSSION

Table 1 on the next page shows the distribution of respondents in terms of area of specialization

The table above manifests that a good number of the respondents (45.65%) holding Bachelor of Secondary Education major in General Science possess the needed educational qualification for a science teacher who can teach all curriculum areas in science. This is beneficial not only to the school and the teachers concerned, but more especially to the students who are the recipients of the teachers' expertise.   It should also be noted that a sheer number of them (43.48%) are holders of Bachelor of Science in various Scientific Fields such as Nursing, Pharmacy, Biology, and Chemical Engineering.   In other words, they are specialists in their respective fields of endeavor.  Although they have both extensive and intensive knowledge in their respective areas, however, this is also a downside in the sense that this limits them in teaching other subjects in the science curriculum considering the spiral approach implemented by DepEd. Moreover, a small percentage (11%) of the science teachers are non-science degree holders whose specializations are English, Social Science, and TLE. In other words, there is mismatch between the expertise held by these

teachers and the curriculum that they are made to teach.  This also defeats the purpose of having additional two years in the basic education which is primarily to make our graduates at par with the graduates in other schools across the globe in the same level of education.

In terms of content knowledge and its application within and across curriculum areas, the respondents have manifested a very good teaching performance.  This is shown in the over-all aggregate mean in table 2 which is 3.80. Further, it shows that the BSED- General Science group exhibited an outstanding teaching performance and the B.S. in Scientific Field group demonstrated a very good teaching performance. While the non-science teachers got only a good rating which is an indication of lack of expertise in this area as it is only at midpoint in the five point scale used in the research instrument.

Another variable which has been explored and associated with teaching performance was the area of specialization. On the entirety, the two variables are associated considering that the computed chi square value is higher than its corresponding tabular value. Concretely, area of specialization has established an association with content knowledge and its application within and across curriculum areas, research based knowledge and principles of teaching and learning, strategies that promote literacy and numeracy skills and strategies that develop critical and creative thinking skills.  Scrutinizing

the distribution on respondents in the context of area of specialization and teaching performance, the contingency table revealed a consistent information that among the three groups of teacher respondents, the general science teachers appear to be the most efficient.  They are followed by those in the specific field the non-science teachers which came out to be the lowest.

This is a point of concern for all the stakeholders. Although the non-science teachers comprise the least number among the respondents, however, considering the number of students each teacher handles every school year and multiplying it with the number of years that these teachers will still be in active service, the outcome will not be negligible.   This conveys the notion that in-service training is indispensable to help both the specific field and non-science teachers get out of the vicious condition of inadequacy of knowledge and skills which at the end boils down to short changing the clientele in entire educational system – the students.  This also gives a heads up on the DepEd personnel in charge in the hiring of teachers.   In selecting among the applicants, alignment of their expertise with the subjects they are going to teach should not be taken lightly.   In agreement with the current finding is of Ezeudu & Utazi [16] whose result indicates that area of specialization influences the teachers' level of competence in teaching in the secondary schools.   The foregoing discussion points to the rejection of the null hypothesis.

**Table 1. Distribution of respondents in terms of area of specialization (N=46)**

| Area of Specialization | Frequency | Percentage |
|---|---|---|
| **BSED-General Science** | 21 | 45.65 |
| **BS in Scientific Field** | | |
| BS Nursing | 17 | 36.97 |
| BS Biology | 1 | 2.17 |
| BS Chemical Engineering | 1 | 2.17 |
| BS Pharmacy | 1 | 2.17 |
| Total | 20 | 43.48 |
| **Non-Science Major** | | |
| BSED TLE | 3 | 6.53 |
| BSED-Social Science | 1 | 2.17 |
| BSED English | 1 | 2.17 |
| Total | 5 | 10.87 |
| **Grand Total** | 46 | 100 |

**Table 2. Content Knowledge and Its Application Within and in Across Curriculum Areas (N=46)**

| Teaching Competencies | B.S. in Scientific Field | | Non-Science | | BSED-General Science | | Overall | |
|---|---|---|---|---|---|---|---|---|
| | WX | VD | WX | VD | WX | VD | WX | VD |
| 1.Engages students through substantive, meaningful and connected activities to deepen their understanding of content knowledge | 4.24 | O | 3.40 | VG | 4.43 | O | 4.02 | VG |
| 2. Shows the connection and coherence between information acquired by students and their daily life applications. | 4.19 | VG | 3.40 | VG | 4.29 | O | 3.96 | VG |
| 3.Traces and uses examples to show how science ideas evolved and change over time to ensure that students understand that science is dynamic | 4.24 | O | 3.00 | G | 4.33 | O | 3.86 | VG |
| 4. Demonstrates links across science disciplines and with other subject areas. | 3.95 | VG | 3.20 | G | 4.33 | O | 3.83 | VG |
| 5.Uses varied viewpoints, explanations, theories, ways of knowing, and methods of inquiry in teaching science concepts; | 3.76 | VG | 3.20 | G | 4.43 | O | 3.80 | VG |
| 6.Articulates science content clearly and avoids incorrect content, inappropriate content, and misinformation | 3.76 | VG | 3.20 | G | 4.19 | VG | 3.72 | VG |
| 7.Develops and delivers logical lesson sequences that reflect curriculum requirements and are constructed to develop understanding of content | 3.81 | VG | 3.00 | G | 4.24 | O | 3.68 | VG |
| 8. Answers accurately content based questions from students | 3.71 | VG | 3.00 | G | 4.23 | O | 3.65 | VG |
| 9. Identifies and addresses science misconceptions of students and in textbooks | 3.81 | VG | 2.80 | G | 4.29 | O | 3.63 | VG |
| Aggregate | 3.94 | VG | 3.13 | G | 4.33 | O | 3.80 | VG |

*VD=Verbal Description WX = Weighted Mean: 1.00-1.79=Poor (P); 1.80-2.59=Fair (F); 2.60-3.39= Good (G); 3.40-4.19=Very Good (VG); 4.20-5.00=Outstanding (O)*

**Table 3. Relationship Between Area of Specialization and Teaching Performance of the Respondents (N=46)**

| Variables | Coefficient of Correlation | df | Tabular Value | Remarks |
|---|---|---|---|---|
| Area of Specialization and Content Knowledge and Its Application Within and in Across Curriculum Areas | $\chi^2$ = 47.7 | 4 | 9.49 | Related |

*$\chi^2$ =Chi Square df=degrees of freedom*

## 4. CONCLUSION

The area of specialization of majority of the Science teachers in Department of Education - Guihulngan City Division, Negros Oriental, Philippines is not General Science but in the related scientific fields such as Nursing and Pharmacy, and some are non-science fields such as English and Social Science. It suggests that most science teachers lack the necessary educational qualifications to teach all science subjects in the K12 curriculum. Further, the BSED- General Science group exhibited an outstanding teaching performance and the B.S. in Scientific Field group demonstrated a very good teaching performance. While the non-science teachers got only a good rating which is an indication of lack of science content

knowledge. Concretely, the area of specialization has established an association with teaching performance of respondents in terms of content knowledge and its application within and across curriculum areas. Scrutinizing the distribution on respondents in the context of area of specialization and teaching performance, the contingency table revealed a consistent information that among the three groups of teacher respondents, the general science teachers appear to be the most efficient. They are followed by those in the specific field the non-science teachers which came out to be the lowest.

## 5. RECOMMENDATION

Science teachers in the Philippines whose area of specialization is not General Science but in the scientific field such as Nursing and Pharmacy may attend seminars and workshops pertinent to science teaching for them to enhance their science content knowledge. They can also enroll in graduate studies so that they can address the students' science misconceptions appropriately. Further, the assignment of science subjects to non-science teachers should be discouraged for they lack the science content knowledge. If possible, they should not be allowed to teach science due to their inefficiencies.

## CONSENT

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

## ETHICAL APPROVAL

Ethical issues are considered to ensure the comfort of the respondents as well as to observe confidentiality of the information they are going to share. To ascertain the respondents' full cooperation in this research endeavor, the researcher asked personally their consent to conduct the interview. The proponent assumed full responsibility of all data gathered that all of those are only be used for the attainment of this study's objectives. At the completion of this research, the materials containing the raw data were shredded.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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