

Development And Validation Of Professional Development Program For High School Teachers Of Science And Mathematics

Ariel Del Mundo Garcia

Centro Escolar University- Manila
garcia1615045.ceu.edu.ph

Abstract: These instructions provide you guidelines for preparing papers for International Journal of Advanced Research and Publications (IJARP). Use this document as a template and as an instruction set. Please submit your manuscript by IJARP Online Submission Tool. Providing quality education among Filipino learners is a constitutional mandate of the Department of Education. The quality of teachers is one of the key indicators which is given focused by the department through its program SULUNG EDUKALIDAD. One of the key components is re-skilling and upskilling of teachers through continuous professional development program. Quality education demands quality teachers. Teachers' academic qualifications, skills and competence in the delivery of content and their dedication to the teaching profession have a considerable impact on the teaching and learning process. The main thrust of the study is to determine the strength and weaknesses of Junior High Teachers of Science and Mathematics particularly of the use of different process skills and their English proficiency which they commonly used in teaching and provide them with a professional development programs. Using both qualitative and quantitative methods of research design to achieve purpose of the study, the 219 Junior High Teachers teaching Science and Mathematics, or both were the chosen teacher participants of the study from the 15 public schools in Schools Division of Lipa City. To gather relevant information, the strength and weaknesses of teachers were identified using an interview questions and focused group discussion. Both were administered through virtual platform. The data were analyzed, processed, consolidated, and analyzed to come up with the development of professional development program based on their identified needs. The developed professional development program had been evaluated using the CIPP Model with the different tools crafted and adapted from the National Educators Academy of the Philippines. One way to provide assistance to teachers is to listen to their voices through interview and focused group discussions. It is truly that their identified weaknesses must be addressed properly thorough the development and validation of professional development program that could help them enhanced their skill using different process skills and develop high proficiency level on using English as medium of instruction in teaching Science and Mathematics.

Keywords: Use about four keywords or phrases in alphabetical order, separated by commas. Keywords should closely reflect the topic and should optimally characterize the paper. proficiency, process skills, professional development program, teachers' quality, performance

1. Introduction

In its unwavering pursuit and commitment to deliver quality basic education in the Philippines, the Department of Education (DepEd) actively establishes various educational reforms, one of which is the implementation of the K to 12 Program. For operationalizing this progress, there are inputs to be factored in: the curriculum, the school head's leadership, teacher quality and school facilities. Teaching in the 21st century encompasses multi-faceted standards. DepEd Order No. 42, s. 2017 vividly reiterates that, "Teachers play a crucial role in nation- building. Through quality teachers, the Philippines can develop holistic learners who are steeped in values, equipped with the 21st century skills, and able to propel the country to develop and progress. This is in consonance with the department's vision of producing: "Filipinos who passionately love their country and whose values and competencies enable them to realize their full potential and contribute meaningfully to building the nation (DepEd Order No. 36, s. 2013). Hence, the quality of teachers affects the quality of performance of the learners. The total quality of the teachers' performance is a basis for the continuous reform that the Department of Education is doing right now. Meanwhile, globalization and ASEAN Integration are indeed two fundamental challenges that the professional teachers are dealing with at present. The adaptability to the changes presses the government, particularly the DepEd to further strengthen its role to maintain a pool of highly qualified teachers in the country. Teaching inside the classroom is a huge challenge, not only

in the mastery of the content and the utilization of appropriate pedagogies, but rather more on the actual skills required to ensure effective and efficient teaching in the 21st century. Since time immemorial, teachers are considered one of the greatest assets of every nation. They are the reformists who play a crucial role in implementing various instructional programs and reforms even to the grass-root level of the educational system of the country-the SCHOOL. Quality education demands quality teachers. Teachers' academic qualifications, their skills, and competence in the delivery of content and their dedication to the teaching profession have a considerable impact on the teaching and learning process. The success of any educational reform depends on the selection of teachers with the highest abilities. Several factors are considered vital in establishing the teachers' quality. These consist of the country's system of education, the theories, practices and pedagogical approaches in teaching and learning. The programs initiated by the Commission on Higher Education (CHED), as well as the Department of Education (DepEd), should further expand to cater to the emerging needs of the country in maintaining a roster of quality teachers who are on the frontline in the delivery of basic education services. The teachers' performance inside the classroom measures the quality of education they provide to the learners. Two subjects that are essential in promoting quality education are Science and Mathematics in the Secondary Level. To prepare the learners for academic success in the two abovementioned subjects, teachers may need to ensure that their instruction adheres to

the standards of quality. Specifically, the way teachers handle Science and Mathematics may necessitate continuing professional development endeavors since education is a never-ending process. Apparently, learning does not stop after earning a degree and starting a career. Through continuing education, career-minded individuals can constantly improve their skills and become more proficient at their jobs. In the field of K-12 education administration, it is particularly important for school administrators to encourage teachers to pursue professional development, not only to ensure the best learning outcomes for their students but also to be more effective and satisfied in various other aspects of their work. This involves the lifelong endeavors of professional teachers. One of the worth mentioning issues in the teaching of Secondary Science and Mathematics, which might be subjected for professional development trainings is the medium of instruction employed by the teachers, specifically the English language. The medium of instruction is the language used by the teacher to teach a subject. Teaching the language, or educational content, through the target language increases the amount of exposure the learner gets to it and the opportunities they have to communicate in it, and therefore develop their control of it (British Council, 2020). Certainly, language is the primary vehicle for learning, instruction, and overall intellectual development (Kersaint et al., 2013). The role that language plays in everyday instruction cannot be underestimated. Teachers teach through language, textbooks convey mathematical knowledge through language, students build understanding through language, and students are assessed through language. In addition, Garet et al. (2001) outlined that teachers are generally supportive of higher expectations with regard to teaching and learning; however, educators are often unprepared to implement the teaching practices required to reach the established expectations. The techniques many educators learned about methods of teaching involved memorization of facts rather than a deep understanding of the content (Darling-Hammond & McLaughlin, 1995). Knowing the status of English as a medium of instruction in High School Science and Mathematics can substantially inform the school authorities in crafting appropriate training programs for the teachers handling the said disciplines. Aside from the medium of instruction employed by the teachers, another significant concern is the process skills of the educators handling Science and Mathematics in the Secondary Level. The ability to use process skills in Science and Mathematics for everyday problems is important for individuals living in a rapidly developing society. Individuals with these skills have the ability to make a major contribution to the improvement of society. Most individuals develop these skills through formal education and interaction with their teachers. Therefore, teachers play an important role in the development of the said skills. However, before investigating the SPS of students, it is useful to study teachers' science process skills. To contribute significantly to the teaching of High School Science and Mathematics, this research aims to develop and validate a professional development program for the teachers based on their specific needs in the following: English as a medium of instruction and their process skills.

II. LITERATURE

The demand to provide quality education among our learners was one of the major challenges among our teachers. It was a challenge, as we were in the 21st century now, to produce quality teachers who have the capability to teach the learners to become logical, creative thinkers and problem solvers. Quality teachers plus quality learners equal quality education. This was supported by the Darling-Hammond (2000), Rice (2003), and Makgato and Mji (2006), that achievements are attributed to quality teachers. This research study summed-up the results of the related literature and studies conducted both locally and internationally that would support to attain the objectives of the research thereby providing the necessary information to derive the possible recommendations. The Science Education Institute, Department of Science and Technology (SEI-DOST) and the University of the Philippines through the National Institute for Science and Mathematics Education Development (UP-NISMED), provided a Framework for Philippine Science and Mathematics Teacher Education. It was clearly stated that teachers teaching Science and Mathematics must be well equipped and well prepared. Ball and Bass (2004), stated that teachers must continue to grow both as teachers and learners. This can only be done if teachers possess an in-depth knowledge on how strategies, methods and techniques was employed in teaching the subjects. Aside from these, Science and Mathematics teachers must know the varied interests, strength and weaknesses of the learners. Science and Mathematics teachers must have extensive knowledge of concepts, application of technology, recent results of researches and other professional development programs that would enhance their knowledge and skills particularly in using English as a medium of instruction and how to use the different process skills in Science and Mathematics. In relation with the statement of Ferrer (2017), that English, Science and Mathematics were foundation subjects necessary for self -development and work and supported by Miles (2010), that teachers with sufficient process skills can teach efficiently. Language was a key factor in the delivery of the lessons. It helped how the students grasp what the teacher was saying and apply what was learned and have mastery of the competencies both in Science and Mathematics. Since English was the medium of instruction used in teaching the subjects, it was important that teachers must be the ones to have mastery in using English in teaching. Lack of mastery in using the English language may lead to low proficiency and poor performance of learners.

III. STATEMENT OF THE PROBLEM

The study aimed to develop and validate a professional development program for high school teachers of Science and Mathematics. Specifically, the study sought to answer the following questions:

1. What were the strengths and weaknesses of the Science and Mathematics teacher-participants in terms of:
 - 1.1 the use of English as a medium of instruction
 - 1.2 process skills in Science and Mathematics?
2. What training program may be designed and developed based on the strengths and weaknesses of the teacher-

participants on the two aforementioned areas?

3. How effective was the program in terms of:
 - 3.1 Context Evaluation
 - 3.2 Input Evaluation
 - 3.3 Process Evaluation

3.4 Product Evaluation?

IV. METHODOLOGY

The researcher utilized the data transformation model (Creswell et al., 2004). This model involved the separate collection and analysis of quantitative and qualitative data sets. However, after the initial analysis, the researcher used procedures to transform one data type into the other data type. This was accomplished by either quantifying qualitative findings or qualifying quantitative results (Tashakkori & Teddlie, 1998). (2002) was an example of this model. In their study, they derived qualitative themes from the qualitative data and then scored those. This transformation allowed the data to be mixed during the analysis stage and facilitates the comparison, interrelation, and further analysis of the two data sets. The study of parental values by Pagano, Hirsch, Deutsch, and McAdams themes dichotomously as present or not present for each participant. These quantified scores were then analyzed with the quantitative data, using correlations and logistical regression to identify relationships between categories, as well as gender and racial differences. Researchers used the validating quantitative data model when they wanted to validate and expand on the quantitative findings from a survey by including a few open-ended qualitative questions. In this model, the researcher collected both types of data within one survey instrument. Because the qualitative items were an add-on to a quantitative survey, the items generally do not result in a rigorous qualitative data set. However, they provided the researcher with interesting quotes that were used to validate and to embellish the quantitative survey findings. For example, Webb, Sweet, and Pretty (2002) included qualitative questions in addition to their quantitative survey measures in their study of the emotional and psychological impact of mass casualty incidents on forensic odontologists. Webb et al. used the qualitative data to validate the quantitative results from the survey items. The fourth variant of the Triangulation Design is what Tashakkori and Teddlie (1998) referred to as "multilevel research" (p. 48). In a multilevel model, different methods (quantitative and qualitative) are used to address different levels within a system. The findings from each level are merged together into one overall interpretation. For example, Elliott and Williams (2002) studied an employee counseling service using qualitative data at the client level, qualitative data at the counselor level, qualitative data with the directors, and quantitative data for the organizational level.

Specifically, this research was subjected to 3 phases:

For Phase 1, the researcher utilized a qualitative research design. In this phase, the researcher conducted an online survey and a Focus Group Discussion (FGD) among the teacher-participants from Junior High School teachers of Science and Mathematics. Questions were asked and FGD

was conducted to determine and validate their strengths and weaknesses in their use of English as a medium of instruction and their Process Skills in the teaching of Science and Mathematics. This led to the design and development of the professional development program for the teachers of Science and Mathematics in Junior High School. The researcher utilized quantitative research designed to craft the professional development program for teachers.

For Phase 2, the researcher crafted the professional development program patterned with the template provided by the National Educators Academy of the Philippines (NEAP).

For Phase 3, the researcher evaluated the professional development program using CIPP model and monitoring and evaluation tools, to determine the effectiveness of the professional development program.

V. SUMMARY OF FINDINGS

Based on the collated data, the following are the results of the study:

1. Strength and weaknesses of Science and Mathematics Teachers.

Based on the data gathered from the teacher respondents. Majority of the age of respondents were ranged between 31-35 years old and 175 or 79.91% of them were female. Most of them served DepEd for 16-20 years. Age and number of years in service are contributing factors on the results of online survey and FGD as to what they really need in teaching Science and Mathematics. As Junior High School teachers of Science and Mathematics, 157 or 71.69% used combination of English and Filipino in teaching and 144 or 75.65% had no experienced to attend trainings, seminars, or workshop in using the different process skills and about English Proficiency. The use of English language in teaching Science and Mathematics was also contributing factors towards the attainment of mastery on content and pedagogy in teaching. Likewise, attendance to trainings and seminars were also factors for familiarization on the use of different process skills and the level of proficiency in teaching Science and Mathematics. As to their strength in process skills, based on online survey on the 13 process skills, they were already at the above average level wherein their scores range from 3.51- 4.51 already, but after the FGD, they mentioned that they need assistance in term of training, seminars or workshop on preparation of lessons in Science and Mathematics using the different process skills as mentioned by 99 or 45.21% and also for the preparation of instructional materials such lesson exemplars, activity or worksheets, video lessons and creation of different interactive Science and Mathematics app as mentioned by 50 or 22.83%. Likewise, out of 291, 39 or 17.81% mentioned that they need laboratory, computer-aided instructional materials and Science and Mathematics equipment in school.

In terms of English Proficiency, among the 25 indicators in English Proficiency, 13 or 52% were given verbal interpretation of average and 12 or 48% were given verbal interpretation of above average based on the results of self-

assessment. During FGD, they encountered challenges in terms of, difficulty in expressing themselves in English both in oral and written form, as mentioned by 116 or 52.97% which led to low students' participation as mentioned by 38 or 17.35% and low mastery of content according to 27 or 12.33% of the teacher participants.

2. In terms of crafted Professional Development Program

A. The crafted PD Program was anchored with the pattern of the NEAP of DepEd Central Office. It was mentioned in the challenges encountered that 99 or 45.21% needed to training, seminars and workshops on process skills, the PD program was designed to address their needs. The PD program for process skills focused on preparation of instructional materials such lesson exemplars, activity or worksheets, video lessons and creation of different interactive Science and Mathematics app as mentioned by 50 or 22.83%.

B. For English Proficiency, the PD Program focused on 13 or 52% English Proficiency Indicators wherein they rated themselves as average.

3. For the evaluation of the developed PD Program, CIPP Model was used. In terms of:

a. Context Evaluation – In terms of context evaluation the developed online and FGD questions were used. It was checked and evaluated by experts as mentioned in this study.

b. Input Evaluation – These refer to developed tool used to evaluate the PD Program. Based on the results of Evaluation 15 or 93.75% rating was given by the Senior Education Program Specialist for Human Resource Training and Development and Education Programs Specialist II – School Management Monitoring and Evaluation of SDO Lipa City.

c. Process Evaluation- NEAP Form 2 for Training and Development was used to determine the rating for process evaluation. In this study it refers to the activities conducted in the in the PD Program. This was the result of responses of the participants in terms of sessions and facilitators, appropriate platform used, accomplishment of objectives and expectation of participant. The over all results showed that over all rating for session was 3.936 and 3.949 for facilitators, with an average score of 3.942 interpreted as strongly agree. For the platform used, the average rating was 3.935, form the attainment of objective, 3.948, and 3.947 was the rating given to expectation from the participants, all of these had an verbal interpretation as strongly agree. An over all rating of 3.944, with verbal interpretation as strongly agree, was the rating given by participant to the professional development program – PROJECT BIGKAS.

d. Product Evaluation- In this study product evaluation refers to PD Program outcomes and output focusing on the objectives of the program. Using the crafted monitoring and evaluation tool, a rating of 3.876 where 4 is the highest score, interpreted as strongly agree. Based on observation, analysis and discussion of the facilitators, the Human Resources Training and Development and School Management Monitoring and Evaluation.

VI. CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. Science and Mathematics teachers had their own strength and weaknesses in terms of Process Skill and English Proficiency. The results from the data gathered through online survey and FGD it was revealed that teachers had their own strength and weaknesses which can be turned into opportunities for improvement through PD Program.

2. The developed PD Program based of needs of teachers can be a used for upskilling and reskilling teachers by providing programs to address the gaps among teachers' performance by aligning all the objectives to the Philippine Standards for Public School Teachers (PPST). This was developed to be able to equip teachers to perform well as K to 12 lifelong learning teachers.

3. Using CIPP Model, monitoring and evaluation of the PD Program on every step such context evaluation, input evaluation process evaluation and product evaluation with M and E tools can be done to address the strength and opportunities for improvement of the develop professional development program specifically designed for Junior High School Teachers of Science and Mathematics. The results based on the CIPP model shall serve as basis for improvement of the PD Program and served as determinant for the evaluation of the outcomes and output towards the attainment of the objectives.

VII. RECOMMENDATIONS

The following recommendations are advanced by the researcher based on the findings and conclusions generated in the study:

1. The strength and weaknesses of the Science and Mathematics teacher varies in different aspects in terms of English Proficiency and Process Skills. This can be determined using self-assessment. Using online survey and FGD enabled them to share what they know, learn and experience and how can the institution help them. Listening to the voice of the customers really matters.

2. Their weaknesses can be turned into their strength by developing and validating professional development program that could help them in the teaching and learning process both by using the English as medium of instruction different process skills. The institutionalization of the professional development program must be done to improve the performance of Science and Mathematics teachers. The same processes stated in this study can also be done to Senior High School Teachers of STEM (Science, Technology Engineering and Mathematics), to have a follow from Junior High School to Senior High School. Attending a professional development program such as training specially for those with average level could develop high self-esteem and can be efficient in their Science and Mathematics process skills.

3. The developed professional development program can be evaluated to assure its effectiveness to teachers in terms of context, input, process, and product evaluation that will be suited for the identified needs of Science and Mathematics in

Junior High School. The progress monitoring and evaluation report using the appropriate tools will serve as basis for continuous improvement of the PD program developed that can lead to teacher effectiveness.

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