CONTENT AND PEDAGOGICAL COMPETENCE OF MATHEMATICS TEACHERS IN THE SECONDARY SCHOOLS OF LA UNION, PHILIPPINES

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ABSTRACT

The descriptive research looked into the competence of mathematics teachers in the secondary schools in San Fernando City, La Union, Philippines. It looked into the profile of the teachers; their competence along content and pedagogy; the significant relationship between and among teacher's profile, content and pedagogical competence. It used validated questionnaires and covered 13 schools with heads, faculty, and students as respondents. It found out that the teachers are licensed, pursuing graduate studies, new in teaching and had inadequate seminars. Their level of content competence was average. They scored highest in conceptual and computational but lowest in problem-solving. Conversely, their level of pedagogical competence was very good. They were rated highest in management but lowest in teaching. Moreover, highest educational attainment and number of years of teaching correlate to content competence. Highest educational attainment and number of seminars correlate to pedagogical competence. Also, content correlates to pedagogical competence. The teachers' conceptual and computational skills were strengths. Equally, reasoning and problem-solving were weaknesses. All the other skills under pedagogical competence were strengths except on the quality of utilization of information and communications technology.

Keywords: Pedagogy, Content Competence, Mathematics Teaching, Teacher Quality.

INTRODUCTION

The tremendous task of education today, under the enormous influx of technological advances and innovations, is still the development of a learner into a whole person, a complete human being capable of understanding his own complexity and his intricate society. The teacher, who is in charge of this global task, needs to cope with the challenges of the modern times. He has to be equipped with the resources vital in arousing and sustaining students' interest, in facilitating the learning process, and in evaluating the learning outcomes. He should be a master of his craft and should be genuinely concerned with the total growth and development of his students (Clemente-Reyes, 2002). Quality education is first and foremost a function of instruction. Thus, for education to attain and sustain its quality, it should be coupled with the best preparation for excellent instruction. It is then emphasized that to be an excellent high school teacher, one should both have full command of the subject and full knowledge of the teaching-learning process. The teacher, therefore, should not only have mastery of the subject matter but also an in-depth understanding of the mind set and standards of students within the class (http://www.dooyoo.co.uk/discussion/what-qualities-make-an-excellent-teacher/1039890/).

The Philippines' vision for quality education with focus on Mathematics Proficiency is undoubted. But, the Philippines is not exempt from troublesome scenarios of lowering performance. In fact, Dr. Milagros Ibe of the University of the Philippines said that the result of a survey on the competence of Science and Mathematics teachers showed that majority of the teachers are not qualified to teach the subjects. In April 2010, the passing rate for secondary teachers was only 23.32% and in September, 2010 the passing rate was 25.86%. These rates reveal that teachers, though possess the needed degree/s are not yet qualified to teach; thus, they are not competent. With this reality, it is not surprising why students performed poorly in Mathematics Achievement Test. This is stressed by Roldan (2004) in her assertion that students' mathematics low performance is reflective of the weak mathematics teachers' influence. She revealed that secondary teachers in Region I were proficient only in concepts and computations but they were deficient in their skills in problem-solving and the use of teaching strategies. Thus, mathematics teachers frequently find themselves focusing on mechanics, the answer-resulting procedures without really teaching what mathematics is all about-where it came from, how it was labored on, how ideals were perceived, refined, and developed into useful theories - in brief, its social and human relevance (Cayabyab,2010).

It is with these situationers that the researcher embarked on the idea to appraise and evaluate the competence of mathematics teachers in the City of San Fernando, La Union, Philippines along content and pedagogy.

LITERATURE REVIEW

According to the Executive Summary on Teachers and Institution, teacher qualifications matter (www.sec.dost.gov.ph). It is with this idea that the areas on teacher's profile are established. The areas include Highest Educational Attainment, Years in teaching Mathematics and Numbers of Trainings and Seminars Attended. Republic Act 9293, an act amending section 26 of RA 7836 states that no person shall engage in teaching or act as a professional teacher whether in preschool, elementary or secondary level unless the person is duly registered. Fianza (2009) revealed in her study that majority of the respondents possessed the required eligibility to teach secondary mathematics since most of the teachers were LET/PBET passers and degree holders of mathematics. She further stressed that 40 out of 56 respondents were bachelor's degree holders, 15 had master's degree and 1 had doctorate degree. In addition, Eslava (2001) found out that out of the 40 teacher-respondents in the secondary schools in La Union, only 12 or 30% were AB/BS graduates, 19 or 47.5% were AB/BS with MA/MS units, or 8 or 20% were MA/MS graduates and 1 or 2.5 was a PhD/EdD graduate. It was pointed out that the mathematics teachers value continuing education to further equip themselves in the issues and concerns about teaching.

In the revised guidelines of the appointment and promotions of teaching and related teaching group (DepEd order No.66, s 2007) teaching experience is one of the criteria. Thus, the more experienced a faculty member is the more confident and effective he is in teaching. This was confirmed and affirmed by the study of Aware-Achwarin (2005). She stressed that most of the teachers (71.07%) had teaching experience of more than 10 years. However, several local studies ran nonparallel to these international findings. Oyanda (2003) revealed that 136 high school Mathematics teachers taught for 5-9 years, 132 taught for 0-4 years and only a few had 20 years or more teaching experience. This implied that majority of the teacher-respondents were quite young in the service.

Further, as teachers become the 21st century teachers, they need to continually update and upgrade themselves to serve the needs of the so-called digital learners. One way of doing this is through attending mathematics seminars or trainings. Oyanda (2003) revealed that 6 (six) had attended international trainings and 45 had national trainings. However, 4 revealed that they had not attended any training. It was pointed out that only a few went to international seminars/in-service trainings due to financial reasons including lack of sponsorship from the government and private sectors.

Over and above the profile of the teacher, it is widely accepted that the significant factor in achieving quality Secondary Mathematics Education is the teachers' competence along content and instruction. Diaz (2002) supports this by expressing that to be a successful mathematics teacher, one must be competent in math and in mathematics instruction. Thus, the levels of competence along the two dimensions show teachers' strengths and weaknesses that serve as basis to develop and actualize activities that will further improve and enhance competence. Mathematics teachers can therefore improve the ability of their learners when they have very good content knowledge of their subject area and at the same time sound instructional skills. Cabusora (2004) stressed that the first essential of effective teaching is teacher's thorough grasp of the subject matter he teaches. According to Toledo (1992) and Bagaforo (1998), as cited by Diaz (2000), teachers, in general, felt moderately competent in their knowledge and ability in mathematics. It was disclosed that the teachers still lack the knowledge of mathematics subjects, particularly the higher mathematics. Thus, it was concluded that teachers did not possess math competence at level adequate for teaching secondary mathematics. Diaz (2000) also found out in her study that teachers were moderately competent in their knowledge in mathematics.

As a common concept in teaching, a teacher cannot share what he does not have. He has to be a subject matter expert when he intends to instill lasting thoughts in the minds of his learners. Several articles posted on the World Wide Web implicitly and explicitly cite the relationship between profile variables along highest educational attainment, teaching experiences and number of seminars attended and subject matter competence. One article contends that subject matter/ content knowledge is rooted from teaching experiences and the number of degrees a teacher holds. (http://doconnor.edublogs.org/finding-e-learning-and-online-teaching-jobs/). Another supports this thought by mentioning that subject matter competence can be attained and maintained through continuing professional education. It also extended that teachers who are subject matter expert are the ones who have stayed in service for quite some time. (jobs.stanlake.co.uk/recruiter/users/ jobs.php?id=22).

METHODOLOGY

There were two research tools used in the study: a validated content competence test covering the Mathematics content of the Secondary Curriculum and a validated questionnaire on pedagogical competence covering teaching/facilitating, guidance, evaluation and management skills. The tools were administered among 357 randomly selected teachers, their heads and their students.

RESULTS AND DISCUSSIONS

Highest Educational Attainment

Table 1 shows the highest educational attainment of Mathematics Teachers. Out of the 26 teacher-respondents, 11 or 42.31% are licensed teachers, 14 or 50.00% are pursuing graduate studies and 2 or 7.69% are Master's degree holders. This means that the Mathematics teachers are qualified to teach in the Secondary schools since they have met the necessary requirements stipulated in the Magna Carta for Public School Teachers and Republic Act 9293, which both require secondary teachers to be duly registered before engaging themselves in the teaching profession. It is also noticeable that majority of the teachers value continuing education since half of the total population are currently enrolled in their Master's program. This finding runs parallel to the studies of Fianza (2009), Eslava (2001) and Rulloda (2000) stressing that generally, the teachers meet the basic requirements for teaching and do not want to be stagnant because they want to elevate their professional outlook to make them effective and worthy members of the profession.

Number of Years in Teaching Mathematics

As seen in Table 1, 18 or 65.38% have been teaching from 0-5 years, 2 or 7.69% from 6-10 years, 1 or 3. 85% from 11-15 years, 4 or 15.39% from 16-20 years, 1 or 3.85% from 21-25 years, and 1 or 3.85% has been teaching for more than 25 years. These data indicate that the teachers are very young in the profession. It means that the general turn-over of teachers in the private schools is high, especially in small schools where teachers stay only up to 1-2 years since they desire to be employed in the public schools or work abroad, where higher compensation, more incentives and other benefits abound. This finding runs parallel to Fianza (2009) revealing that the teachers are generally quite young in the service.

Table 1 Profile of the Mathematics Teachers

Profile Variables	Frequency	Rate
A. Highest Educational Attainment		
BSEd/AB/BS Graduate	11	42.31%
BSEd/AB/BS Graduate w/ MS/MA units	13	50.00%
MS/MA graduate	2	7.69%
Total	26	100%
B. No. of Years in Teaching Mathematics 0-5 years	17	65.38%
6-10 years	2	7.47%
11-15 years	1	3.85%
16-20 years	4	15.39%
21-25 years	1	3.85%
26 years and above	1	3.85%
Total	26	100%
C. No. of Seminars Attended (0-10) Very Inadequate	22	84.62%
(11-20) Slightly Inadequate	4	15.39%
Total	26	100%

Number of Seminar/Trainings Attended (for the last two years)

Table 1 also presents that out of the 26 respondents, 22 or 84.62% have "very inadequate" attendance or participation in trainings and seminars while the remaining 4 or 15.39% have "slightly adequate" attendance to seminars and trainings. This implies that the teachers have not been sent to seminars and trainings where their participation was highly expected. This is caused by financial constraints, non-availability of teachers due to school commitments and the distance of the venue of the seminar.

The finding of the current study is supported by the finding of Oredina (2006), which disclosed that majority of the teacher-respondents have "very inadequate" participation in seminars and training workshops. This was due to financial constraints. However, it does not jibe with the finding of Fianza (2009), which revealed that more than 50% of her respondents have attended trainings on curriculum, teaching strategies, management and assessment methods.

Content Competence of the Mathematics Teachers

Table 2 reveals that the teachers have above average competence in Elementary Algebra, average competence in Intermediate Algebra, above average competence in Geometry; and average competence in Advanced Algebra, Trigonometry and Statistics. Generally, the teachers have "average subject matter competence" in Mathematics. This means that the teachers know what to teach since they have "good" proficiency in the Mathematics subjects offered in the Secondary schools. Since they have average competence in Mathematics, it can be inferred that they are qualified to teach secondary mathematics.

Table 2 Content Competence of the Mathematics Teachers

Area of Mathematics	Concep-tual Skills	Analytical Skills	Computa-tional Skills	Problem-Solving Skills	Mean	Rating	Remark
Elementary Algebra	24	12	19	11	17	Above Average	S
Intermediate Algebra	18	16	19	10	16	Average	W
Geometry	14	19	21	13	17	Average	W
Advanced Algebra, Trigonometry, and Statistics	17	14	11	12	14	Average	W
Grand Mean	18	15	18	12	16		
Rating	Above Average	Average	Above Average	Average		Average	W
Remark	S	W	S	W			

Legend: S – strength; W - weakness

Moreover, they have above average competence in conceptual skills but average competence in reasoning/ analytical, computational and problem solving. They are competent in the facts,

properties and terms in mathematics but they are not so competent in the application of concepts to word problems. The finding of this study is supported by the findings of Toledo and Bagaforo, as cited by Diaz (2000), which asserted that the teachers have average competence in their knowledge and ability in mathematics. They emphasized that the teachers needed updating and upgrading of subject matter competence to possess the needed competence situated at a level very adequate for teaching secondary mathematics. As to strengths and weaknesses, the teachers are strong in conceptual and computational skills but are weak in analytical and problem-solving. This indicates that the teachers are really good with facts and computations but are hard up in segmenting a problem into its interrelated parts and applying computations in solving word problems.

Pedagogical Competence

Table 3 reflects the summary of pedagogical competence of mathematics teachers. It is gleaned from the table that the competence of the teachers obtained a grand mean of 4.24, interpreted as very good. All the levels of skills were rated very good with management skills as the highest and teaching skills as the lowest. Along teaching skills, one indicator was rated good only, that is on the quality of communication and information technology used. This implies that the teachers are not very familiar and unskillful in utilizing instructional technology; thus, they are not very competent along this area. This is also rooted to the access to such technologies. In the researcher's observation during the proctoring of tests, teachers, especially the ones in the big schools, own laptops. This gives an idea that the math teachers have limited access to projectors since other math teachers and teachers of other subjects also desire to use information and communication technology in facilitating the teaching-learning process.

Preparation of instructional technology is also a cause of this. Creating interactive slides, researching up-to-date clips including the setting up of the gadgets is also a complex task. Reinhardt, as cited by Oredina (2006), emphasizes that using ICT in teaching develops the proficiency desired among the students since features of computers such as video presentations; animations and the like are better instructional objects than chalkboards and transparencies. The very good evaluation given by the respondent groups to almost all the skills is pinpointing to a laudable instructional competence of the mathematics teachers in the Private schools in the City Division of San Fernando. This means that the mandate of the Department of Education (DepEd) to provide Quality Education for All (EFA) is present such that the realization of the goals and objectives of Mathematics teaching is achievable, especially in the Secondary schools.

The studies of Acantilado (2002), Subala, as cited by Roldan (2004) and Oredina (2006) support the finding of the study. Their studies emphasized that their teacher-respondents were highly competent. Subala explained that since the teachers were competent, they can be proper sources of assistance and guidance to their students in analyzing different mathematical concepts. As to strengths and weaknesses, the teachers are strong in their pedagogy but have been found weak in one area only, that is, on the utilization of educational gadgets and tools. More trainings are desired for this purpose.

Table 3 Pedagogical Competence of Mathematics Teachers

Level of Instructional Competence	Mean	Rating	Remark
A. Teaching/ Facilitating Skills 1. Substantiality of Teaching	4.21	Very Good	S
2. Quality of Teachers' Explanation	4.31	Very Good	S
3. Receptivity to students' ideas and contributions	4.13	Very Good	S
4. Quality of questioning procedure	4.24	Very Good	S
5. Selection of teaching methods	4.07	Very Good	S
6.Quality of information and communication technology used	3.49	Good	W
Sub-Mean	4.07	Very Good	S
B. Guidance Skills 1. Quality of interaction with students	4.26	Very Good	S
2. Quality of students' activity	4.22	Very Good	S
Sub-Mean	4.24	Very Good	S
C. Management Skills			
1.Atmosphere in the Classroom	4.30	Very Good	S
2.Conduct and return of evaluation materials	4.43	Very Good	S
Sub-Mean	4.37	Very Good	S
D. Evaluation Skills 1. Quality of appraisal questions	4.23	Very Good	S
2.Quality of assignment/enrichment activities	4.32	Very Good	S
3.Quality of appraising students' performance	4.4	Very Good	S
Sub-Mean	4.32	Very Good	S
Grand Mean	4.24	Very Good	S

Legend: S – strength; W - weakness

Relationship Between and Among Profile Variables, Content and Pedagogical Competence

Table 4 summarizes the relationship existing between profile and content competence, profile and instructional competence, and competence along content and instruction. It reveals that the t-value of the computed correlation coefficients between the profile variables and content competence are all (except for number of seminars attended) greater than the t-critcial value of 1.711; thus highest educational attainment, number of years of teaching are significantly related to content competence. This means that the higher the educational attainment and the number of years of teaching, the higher is the content competence of the teachers. It is true that when teachers get the needed educational exposure and get the needed experience, their mathematical foundations get stronger. Moreover, it divulges that highest educational attainment and number of seminars attended are significantly correlated to instructional competence. This is evidenced by the t-values of 4.08 and 1.83, respectively, which are higher than the t-critical of 1.711. However, the number of teaching experience attended does not correlate with instructional competence. This means that the higher are the educational attainment and the number of seminars attended to, the more pedagogically competent a teacher is.

It is also revealed in Table 4 that the content and pedagogical competence of the teachers are significantly correlated. This is indicated by the t-value of 2.01 which is greater that the t-critical

1.711. This means that the higher the content competence, the higher is the pedagogical competence. This is supported by the popular claim that "Teachers cannot give what they do not have". Thus, if teachers know what to teach, they likely know how to teach them.

Table 4 Relationship existing Between and Among Profile, Content and Pedagogical Competence

	Highest Educational Attainment	Number of Years of Teaching	Number of Seminars Attended	Pedagogical Competence
Content Competence	0.40 low t = 3.10*	0.38 low t = 2.01*	0.31 low t = 1.60	0.38 low t = 2.01*
Pedagogical Competence	0.64* Marked t = 4.08*	0.28 low t = 1.43	0.35 low t = 1.83*	
Legend: * Significant df=n-2=24; t critical value = 1.711				

CONCLUSIONS

The mathematics teachers become better equipped in teaching when they possess the needed content and pedagogical competence. This competence is enhanced by educational attainment, trainings and years of service.

ACKNOWLEDGEMENTS

The Saint Louis College and the Department of Education are acknowledge for bringing out the passion for research and for igniting the drive to publish.

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