

USTP-BSEd. MAJOR IN MATHEMATICS CURRICULUM: DOES IT ADDRESS K-12 GRADE 9 MATHEMATICS?

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ABSTRACT: *The new trend in basic education demands a new breed of teachers that are equipped with competence to address the needs in the field of teaching. Academic institutions offering education programs must tailor their curriculum to align with the required competencies of graduates needed in the new system of education. The study aimed to determine whether the curriculum of the Bachelor of Secondary Education Major in Mathematics Program of the University of Science and Technology of Southern Philippines meets the demands of Grade 9 Mathematics in junior high school under the K–12 curriculum in terms of skills and content standards. The syllabi of BSEd Mathematics were compared with the list of competencies for grade 9 mathematics in the Department of Education. The analysis revealed that, in terms of 21st century skills, the BSEd major in Mathematics curriculum will be able to equip the education students with a skill relevant to teaching. With regard to mathematics content knowledge, the analysis also revealed a very sufficient coverage of all the content standards mandated by the Department of Education. It is highly recommended that the university continue to offer a BSEd major in mathematics program as it adequately prepares pre-service teachers in the field of teaching. However, continuing curriculum review is recommended to address the demands of education in this rapidly changing world.*

Keywords: BSEd major in Mathematics, k -12 grade 9 Mathematics, curriculum, 21st century skills, content knowledge standard.

1. INTRODUCTION

One of the sustainable development goals in the country is to provide quality education for all [1]. Quality education may be provided by addressing the demands of a rapidly changing world. In the field of education, the system of delivering instruction is greatly affected by the new system of education. The situation calls for a new breed of teachers that will be able to efficiently deliver learning instruction for 21st-century learners under the new normal educational system. The teaching-learning process in the new normal demands updated skills needed in teaching and mastery of knowledge. Teachers must be equipped with content knowledge and skills relevant to teaching face-to-face and remote learners. They played an important role in the students' academic achievements. The expectations to develop students' ability to solve mathematical problems [2] are highly needed. However, despite all teachers' initiatives to improve students' mathematics performance, results in international comparative assessments were still poor. Filipino students ranked 77 out of 78 participating countries in the 2018 Program for International Student Assessment (PISA), ranked lowest among 58 countries in the 2019 Trends in International Mathematics and Science Study (TIMSS) [3], and ranked 34.82% in the 2018 National Achievement Test (NAT) [4]. Capuno et al. [5] pointed out that the standardized national examination results revealed that student's performance did not conform to what is expected at a particular grade level. Achievement in mathematics is not just a problem in a few countries but has become every nation's concern. The examination results can be attributed to poor engineering of the curriculum in a teacher education program. As we know, curriculum is vital to producing competent graduates that can handle and address the demands of the changing educational system. On the other hand, Schmidt [6] argued that content standards are not sufficient to guarantee curricula that lead to high-quality instruction and achievement. He explores the data from the third International Mathematics and Science Study and finds out that high-achieving countries introduce a new topic in

mathematics gradually to a few grades. We may say that high-achieving countries place more

emphasis on the mastery and deepening of mathematical concepts than discussing many topics. Hunter, R. [7] revealed that in the teacher education program, it is necessary to develop pre-service teachers' foundation skills both in content and pedagogy as well as communication ability. They need to be taught how to articulate sound mathematical explanations and how to justify their solutions. Musset, P. [8] suggested that pre-service teachers must learn fundamental communication skills to ensure that they can guide students into mathematical fluency and flexibility. Pedagogical knowledge has a greater impact on student achievement than content knowledge [9]. However, a study by Schwillie and Dembele [8] stated that some scholars preferred content-specific pedagogy. Teacher education programs that deliver are those that "put emphasis on subject matter," especially how it is learned by students. As analyzed by Musset [8], there is importance in having teacher education programs based on the needs of schools. Darling-Hammond [10] noted that one of the many ways to configure what knowledge teachers need is through a framework intersecting three areas of knowledge: (1) knowledge of learners and how they learn; (2) understanding of curriculum content and goals; and (3) understanding of and skills for teaching. One particular study [11] about exemplary teacher education programs highlighted the feature of a "strong curriculum taught in the context of practice and grounded in knowledge of child and adolescent development and learning, an understanding of social and cultural contexts, curriculum, assessment, and subject matter pedagogy.

Further, the present education situation calls for pre-service teachers to be trained to teach learners in the new normal conditions and new learning environments. Skills for using digital technologies to support remote learning are very important. The need to strengthen the pre-service teachers' curriculum to meet the demands of the K–12 curriculum and the new normal is vital. Hence, this study was conducted.

2. METHODOLOGY

2.1 Research Design

The study is a comparative analysis of the curriculum of the Department of Education in Grade 9 Mathematics under the K–12 program and the curriculum of the Bachelor of Secondary Education majoring in Mathematics at the University of Science and Technology of the Southern Philippines. The data for the study were gathered by evaluating the mathematics topics in all the syllabi and comparing them with the list of topics in grade 9 mathematics learning competencies. Also, the skills introduced in the teaching and learning process for both curriculums were evaluated.

The Instruments

The instruments used in the study were all recent syllabi of the BSEd-Mathematics program curriculum and the list of learning competencies in Grade 9 mathematics under the K–12 program. There were twenty-seven (27) syllabi for mathematics major courses and twelve (12) for professional education courses, which were compared to the Department of Education K–12 mathematics curriculum at the junior level, particularly grade 9.

The Respondents

The respondents consisted of all professors/instructors handling the subjects of the BS Mathematics Education Program in the Department of Mathematics Education.

2.2 Data-Gathering Procedure

The Syllabi of BSEd- Mathematics Program and the mathematics competencies in the K-to- 12 curriculum for grade 9 level were compared and evaluated. Extent of coverage in every topic in grade 9 mathematics is verified. It was verified wither all topics were captured in the curriculum of Bachelor of Secondary Education major in Mathematics program offered by the University. Rubrics were used to determine the extent of coverage. Guide for interpreting the result is shown below.

Table 1: Guide in interpreting of the k-to-12 curriculum content standards and 21st century skills

Guide in interpreting the coverage of the K-to-12 curriculum content standards and 21st century skills

Extent of Coverage	Description of Coverage	
	K-to-12 Content Standard	Teaching-Learning Approaches and 21st Century Skills
Very Sufficient	There are at least three major courses in the BSEd-Mathematics program that has a topic or learning outcome that addresses the K-to-12 Curriculum content standard.	88% to 100% of the courses have content that: - Address the K-to-12 teaching and learning approaches - Develop the 21 st century skills
Sufficient	There are two major courses in the BSEd- Mathematics program with a topic or learning outcome that addresses the K-to-12 Curriculum content standard.	75% to 87% of the courses have content that: - Address the K-to-12 teaching and learning approaches - Develop the 21 st Century skills
Partially Sufficient	There is one major course that has a topic or learning outcome that addresses the K-to-12 Curriculum content standard.	38% to 74% of the courses have content that: - address the K-to-12 teaching and learning approaches - develop the 21 st Century skills
Insufficient	There is no course that has a topic matching the K-to-12 Curriculum content standard.	37% and below of the courses have content that: - Address the K-to-12 teaching and learning approaches

The data of the study, particularly on the evaluation of mathematics contents, was gathered using the syllabuses of the major courses, while the data on the evaluation of 21st century skills was gathered using the syllabuses of the professional education courses of the BSEd-Mathematics Program. The topics of the syllabi of major courses and the mathematics content standards in the K–12 curriculum for grade 9 were compared and evaluated. With regard to 21st century skills, the data were gathered by using both the syllabi of major and professional education courses and compared to the curriculum of the Department of Education. The extent of coverage in every topic in grade 9 mathematics is verified. It was verified that all topics were captured in the curriculum of the Bachelor of Secondary Education major in Mathematics program offered by the university. With regard to mathematics content, the coverage was sufficient if there were two (2) courses covered the topics. More than two major courses covered is labeled as very sufficient. For the skills, at least 24 courses covered the skills were declared to have sufficient coverage. Evaluation of coverage was made by the researchers and the instructor handling the course. For further clarification, criteria to determine the extent of coverage is shown in the table below.

The table shows the comparative analysis of the mathematics K–12 and BSEd–Mathematics curricula. The list of mathematics content standards for grade 9 junior high school was written in the first column as compared to the topics found in the syllabi of major courses in the BSEd-Mathematics curriculum. The analysis revealed that out of 27 major courses in the BSEd-Mathematics Program curriculum, 15 courses clearly covered the topics listed as evaluated by the researchers. The extent of coverage is claimed to be very sufficient. The result of the evaluation was supported by the instructors who were actually handling the courses. The instructors’ evaluation showed that 100% of the courses in the based-math curriculum covered the topics of grade 9 mathematics under the K–12 program. In fact, there were topics that were repeatedly discussed in three or more courses.

2. RESULTS AND DISCUSSIONS

Table 2. Evaluation result of Grade 9 Mathematics Content Standards vis a vis with BSEd-Mathematics Syllabi

Content Standard	Researcher Evaluation (Courses = 27)	Coverage	Instructor Evaluation (Courses = 27)	Coverage
Demonstrates understanding of key concepts of quadratic equations, inequalities and functions, and rational algebraic equations.	4	V. S.	10	V. S.
Demonstrates understanding of key concepts of variation and radicals.	3	V. S.	7	V. S.
Demonstrates understanding of key concepts of parallelograms and triangle similarity.	4	V. S.	8	V. S.
Demonstrates understanding of the basic concepts of trigonometry	4	V. S.	6	V. S.

As we can see, the majority of the topics in grade 9 mathematics are fundamentals in the discussions of higher mathematics in the BSEd-Mathematics curriculum. The results of the comparison of the two curricula as done by both parties are enough evidence to claim that the BSEd-Mathematics curriculum enables the BSEd students to acquire mathematics knowledge relevant to teaching grade 9 junior high school mathematics.

Table 3. Result of Syllabi valuation on 21st century skills

Content Standard	Researcher Evaluation (Courses = 27)	Coverage	Instructor Evaluation (Courses = 27)	Coverage
Demonstrates understanding of key concepts of quadratic equations, inequalities and functions, and rational algebraic equations.	4	V.S.	10	V.S.
Demonstrates understanding of key concepts of variation and radicals.	3	V.S.	7	V.S.
Demonstrates understanding of key concepts of parallelograms and triangle similarity.	4	V.S.	8	V.S.
Demonstrates understanding of the basic concepts of trigonometry	4	V.S.	6	V.S.

The table showed a comparative analysis of the 21st century skills shown in K–12 and the syllabi of BSEd-Mathematics curricula. The list of skills mandated to be developed among junior high school students was listed in the first column and compared with the BSEd-Math syllabi to determine whether it will be able to capacitate the education students on the required skills. The result of the analysis revealed that collaboration has very sufficient coverage. Collaboration is a very important skill in the workplace. Furthermore, analysis revealed that communication, social skills, creativity, and critical thinking have sufficient coverage, while the rest of the skills have partially sufficient coverage, with the least percentage of 59% for information and media literacy. The result of the analysis is enough evidence to claim that the curriculum of the BSEd-Mathematics program will be able to produce a new breed of teachers who can respond to the demands of the new educational system for 21st century learners.

4. CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis of the data gathered, the researchers concluded that the curriculum of the Bachelor of Secondary Education major in Mathematics at the University of Science and Technology of the Southern Philippines will enable the education students with content knowledge in mathematics to higher than what is required by the Department of Education in the Philippines. In addition, 21st century skills needed for teaching techno-savvy learners were also captured in the curriculum. However, it is recommended that information and median literacy skills be incorporated into all professional courses to have a balance of coverage with the other skills. It is also recommended to have a constant re-visit of the curriculum to properly address the demands of the rapidly changing world.

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