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Upgrading the Problem-Solving Experiences of the Primary Students Using an Online Singapore Mathematics Platform

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ABSTRACT

This convergent parallel mixed-methods study examined the effectiveness of a self-directed online platform that promotes the use of the Singapore model method in solving mathematics problems among primary students in a private school in the Philippines. There were 275 students and 4 mathematics teachers that were involved in the study using stratified sampling method. Mathematics achievement test, survey, and interviews were utilized in gathering data. Findings show significant learning gains among the primary students on their pretest and posttest scores. Both the quantitative and qualitative data reveal that students' problem solving experiences improved because they can visualize the abstraction of the problems using pictorial and bar modeling methods. The respondents enjoyed the self-directed nature of the platform, where they could solve problems in the comfort of their own homes. However, the respondents shared that unstable internet connection and the overwhelming number of lessons in the integrated curriculum were some areas for improvement. Overall, the initial assessment shows promising results on the integration of the online self-directed platform that promotes an innovative and creative way of solving mathematical problems among primary students. Further assessments in the future should be made to ensure that integration can bring positive learning outcomes in the long run.

INTRODUCTION

Problem solving is the core of mathematics teaching and learning. The National Council of Teachers of Mathematics (NCTM) emphasizes that problem solving is a fundamental part of mathematics. It underscores the interdependence between problem solving and successful conceptualization of mathematics across content and grade levels (Cai & Lester, as cited in Morin et al., 2017). Although it is the heart of mathematics teaching and learning, many students struggle to solve word problems. Past research exploring the problem-solving skills, experiences, and achievements of learners gave further attention to the procedural and conceptual skills of learners in mathematics. Procedural skills use computational fluency or fact retrieval. Conceptual skills, however, involve number sense or problem-solving skills (Seethaler & Fuchs, 2010).

Among the two, conceptual skills or number sense is a better predictor of mathematics achievement (Jordan, Glutting, and Ramineni, as cited in Morin et al., 2017). Because of this, learners should harness conceptual skills for it is their key to successful problem solving. In the Philippines, where this study was conducted, the challenges of the students in learning and mastering this 21st-century skill lingers despite the constant efforts of mathematics educators to improve the curriculum, instruction, and assessment. The Philippines had a dismal academic showing based on PISA in 2018, where the country scored the lowest among the 79 participating countries in major areas such as mathematics (Villegas, 2021).

Based on the analysis by the mathematics educators, learners successfully learned concepts and algorithms

but fell short in applying these in solving word problems. It is for this reason that enrichment and intervention programs have been planned and implemented by different schools to hone the mathematics problem-solving skills of the students.

Meanwhile, Singapore mathematics is considered by many as an effective teaching approach that is highly research-based. The fact that the performance of students who learn Singaporean mathematics in various international testing display consistent showing inspired different educational institutions to adopt it in their local curriculum (Ashley, 2019). Singapore mathematics adheres to the CPA approach to problem solving, where math concepts were introduced in this progression: concrete (C), pictorial (P), and abstract (A) (Morin, 2021). It promotes deep mastery, a growth mindset culture, and visual learning. Since the school where the study was conducted envisioned a remarkable improvement in students' mathematics performance, a self-directed online platform was incorporated into the curriculum. The Singapore Mathematics Enrichment Program (SMEP) is an addition to the existing local curriculum, which is basically based on the Department of Education curriculum and teaching guide.

The SMEP is scheduled at least once a week, and it uses an online learning platform that aims to increase and improve learners' mastery of mathematical skills using abundant engagement activities, including unlimited quality mathematics questions, heuristics teaching videos, and math games. As the name suggests, this enrichment program was benchmarked in Singapore, just like other local and international schools adopting their heuristics in problem solving. The integration of SMEP intends

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to give explicit emphasis on the concrete-to-visual progression of lessons, conceptual understanding of algorithms, strategic repetition of previous knowledge, and mental and bar modeling strategies in solving word problems. Since the implementation of SMEP is in its immature development period, an initial assessment is deemed needed to describe the learning outcomes and learning satisfaction of the students and identify challenges and opportunities for further improvement of the said program.

General Purpose and Research Questions of the Study

This study aims to examine the effectiveness of an online self-directed platform that promotes the use of the Singapore model method in mathematics problem solving among primary students. Specifically, it sought answers to the following research questions:

- To what extent do the mathematics problem-solving learning outcomes of the primary learners improve as a result of their exposure to the online self-directed Singapore math platform?
- How do the learners and teachers assess their experiences in using the online self-directed platform?
- What are the prevailing challenges faced by the learners and teachers as part of their experiences in the laboratory?
- What action plan can be recommended to improve the incorporation of the online self-directed platform in the mathematics class?

LITERATURE REVIEW

Understanding Singapore Mathematics

Singapore Mathematics education has problem solving at its core. Its curriculum employs the Model Method, a diagramming technique developed in Singapore for computational word problems. The Model Method joins two problem-solving strategies by asking students to categorize word problems by type and draw schematic diagrams of the mathematical relationships depicted in the problem (Foong, 2009).

There are empirical pieces of evidence showing that Singapore math is an effective teaching approach. The effect of Singaporean Mathematics problem solving in the education of United States of America was found to be impressive in one quasi-experimental study conducted by the Educational Research Institute of America (2010), wherein second and fourth graders enrolled in Old Bridge Township School District, a large New Jersey school district used the Singapore math program, “Math in Focus” which showed a significant increase in math achievement over one academic year. Also, students from Singapore consistently outperform American students, and students from most other nations, on international tests in Mathematics, such as the Trends in International Math and Science Study (TIMSS), which shows Singapore as a top-performing nation for the past 15 years. (Provasnik et al., 2009).

The superior math achievement among Singaporean students in mathematics could be the result of the nation’s unique approach to teaching the subject using a pedagogy that is quite distinct from the typical programs used in the United States (Ginsburg, Leinwand, & Decker, 2009, as cited in Bisk, 2010).

Indeed, Singapore’s math curriculum has received much international acclaim over the past 20 years, as educators and researchers worldwide are attracted by that nation’s consistent placement at the top of most international comparisons of mathematics achievement, even at the elementary levels (Bhattacharjee, 2004).

Use of Technology in Teaching and Assessing Problem-Solving Skills in Mathematics

The teaching and learning process has been revolutionized in the same way technology does. New technologies have the capacity to innovate the way teachers teach, and learners learn (DeNeui & Dodge, 2006).

The use of technologies in the classroom has removed various boundaries and maximized learning opportunities that promote achievement. One of the many recent developments in incorporating technology in the classroom is using online platforms and learning management systems (LMS). There is an increase in online course involvement by students and faculty, and that underscores the importance of using an effective LMS (Borup as cited in Ippakayala & El-Ocla, 2017).

Such learning and social media needs are reasonably combined in some existing LMS applications, but they still provide marginally satisfactory performance. Online testing helps verify students’ mastery of the subject; it has the advantage of timely and immediate feedback, and students can practice solving problems by themselves anytime and anywhere they want. Furthermore, if questions are designed to be automatically and randomly generated for students, they can repeatedly practice different questions with varying levels of complexity, which is suitable for drill practice. In the area of mathematics, teachers and students have access to valuable resources via the Internet that includes software, simulations, spreadsheet, and graphing calculators (Roblyer & Edwards, 2000).

Students can learn mathematics using comprehensive math tutorials. Drill and practice programs offer instant feedback for skill building. Higher learning skills can be acquired through geometric exploration programs where learners create shapes, experiment with mathematical formulas, and visualize data in graphic formats. For effective mathematical e-learning, one needs appropriate software and practical learning principles and theories to create mathematics content that fits the learners’ needs and the teachers’ overall intentions. In developed countries, high internet connectivity has enabled most universities and other teaching institutions to embrace e-learning fully. Nevertheless, e-learning practices are yet to attain their full potential in developing countries, partly due to the high initial costs of designing and setting up

the platforms and low internet connectivity in developing countries. To overcome the hurdles that impede successful and effective mathematical e-learning intervention in developing countries, e-learning implementers need to focus on three e-learning aspects: cost, usability, and impact on learning (Jeong Yong & Akugizibwe, 2018). The primary platform used in this study optimally used the power of technology to improve problem-solving skills among primary students.

Singapore Mathematics Online Self-Directed Platform

At present, there are different providers of Singapore Mathematics e-learning platforms in the country. The setting of the study purchased individual accounts for the students annually. The enrichment program is held once a week, where the model method and other Singapore math principles are taught to the learners. Since the platform has online and self-directed features, most learning activities are completed by the students in the comfort of their homes. Students essentially progress on their own regardless of the academic pacing of their peers. They watch video lectures, participate in different games, and answer various problems online. Teachers integrate the Singapore math methods with the learning activities in the local curriculum.

Scope and Delimitations of the Study

This research study is focused on assessing the effectiveness of the Singapore mathematics online platform among primary K4-6 learners in a private school. The effectiveness of the program is measured based on the pretest and posttest achievement tests, the survey conducted with the respondents, and interviews and focus group discussions facilitated by the researcher. There was no control group in the study as the online platform assessed in this paper is required among all enrolled students. The assessment data were also collected during the first two years of implementation of the program.

MATERIALS AND METHODS

This study employed a convergent parallel mixed-methods design. The purpose of a convergent (parallel or concurrent) mixed-methods design is to simultaneously collect both quantitative and qualitative data, merge the data, and use the results to understand a research problem. This design is mainly used for both data collection forms to supplement one another for a more complete understanding of a research problem results from collecting both quantitative and qualitative data (Creswell, 2012). More specifically, this convergent parallel mixed method design used experimental and non-experimental approaches. A one-shot pretest, posttest experimental design, and survey methods were employed. Moreover, survey research provides quantitative or numeric descriptions of trends, attitudes, or opinions of a population by studying a sample of that population. This

design is appropriate to the objectives of this study which is to describe the attitude and opinions of the students and teachers concerning the effectiveness and efficiency of the online learning platform. The opinions, attitudes, and perceptions of the learners are described through the responses of the respondents to the survey questions. The qualitative data were collected, analyzed, and presented concurrently to stress the strength of this mixed-methods design. It combines the advantages of each form of data; that is, quantitative data facilitate the generalizability of the results, whereas qualitative data provides contextual information and enriches the discussion. This design enables the researcher to gather information that uses the best features of both quantitative and qualitative data collection.

Sampling Distribution

The researchers used a simple random sampling technique and involved 275 learners from primary K4- 6. All the mathematics teachers handling the classes were also involved in the study.

Table 1: Sampling Distribution

Level	Population	Sampling	Percentage
K 4	136	97	71.32%
K 5	166	92	55.42%
K 6	171	86	50.29%
Total	474	275	56.96%

Research Instruments

The researcher used achievement tests to measure the learning gains of the respondents. Equivalent sets of tests were used as pretest and posttest. These tests were prepared by the level teacher and underwent content validity and internal consistency measures. Moreover, a survey instrument was prepared and used to investigate the other research focus of this study. The survey questionnaire consists of three parts. The first part is a Likert scale intended to solicit the level of agreement of the learners and teachers regarding the areas of the program, namely curriculum, instruction, laboratory, and the online platform. The second part consists of open-ended questions to identify the problems and possible recommendations and improvements to the program. Also, the interview schedule was prepared and validated, and a database regarding the utilization of the online platform by students was requested from the e-learning provider.

Data Gathering and Analysis Procedures

The survey questionnaire was distributed to the respondents through their subject facilitators. The collection of data was done for a period of one week. Interviews and focus group discussions were conducted concurrently. Descriptive measures were used, such as frequency, mean, and standard deviation, in order to analyze and summarize the data from the responses of the learners and teachers. An arbitrary scale was used in

order to measure their agreement and satisfaction with the implementation of the Singapore Mathematics Enrichment Program. Moreover, paired t-test was used to determine if there was a significant learning gain in the achievement of the students before and after their exposure to the Singapore Math online platform. Content and thematic

analyses were carried out for the qualitative data.

RESULTS AND DISCUSSION

This section presents all the analyzed responses and results of the gathered data to answer the specific research questions presented in the earlier section of this paper.

Table 2: Active Users of the Singapore Mathematics Online Self-Directed Platform

Month	Year 1		Year 2	
	Frequency of Users	Percentage	Frequency of Users	Percentage
August	474	100.0	449	100.0
September	465	98.1	420	93.5
October	470	99.2	411	91.5
November	345	72.7	425	94.7
December	187	39.5	367	81.7
January	467	98.5	389	86.7
February	463	97.7	398	88.6
March	451	95.1	403	89.8
April	445	93.9	402	89.5
May	398	84.0	285	85.6
Average User:	417	88.0	405	90.2

Based on the data retrieved and delivered by the e-learning provider for the first year, August (100 %), October (99.2%), and January (98.5%) were the three months with the highest number of active users of the online platform. On average, 417 out of 474 students (88%) were active online platform users. In the second year, August (100 %), November (94.7%), and September (93.5%) were the three months with the highest number of active users of the online platform. On average, 405 out of 449 students (90.2)% were active users of the e-learning platform in mathematics. It can be inferred from the data for the period of two years that the learners were active users of the online platform. This is due to the fact that the Mathematics facilitators adhered religiously to the once-a-week schedule. Moreover, it can also be observed that the learners accessed their personal accounts at the convenience of their respective homes, where their family members could give them the necessary assistance.

Table 3: Profile of Usage of the Online Self-Directed Singapore Mathematics Platform Among the Primary Students in the 1st Year

E-Learning	Frequency
Total number of questions done	364 486
Total number of questions done correctly	265109
Average number of questions done	769
Total number of skills mastered	12 280
Average number of skills mastered per student	26

The data shows that for the last 10 months of the first academic year, there were 365 486 questions that the students answered. Among these questions, 265 109, or 72.74%, were answered correctly. Also, it can be taken from the data that each student was able to answer 769

questions for the last academic year. Furthermore, 12 280 skills were mastered by the learners, and each learner has an average number of 26 skills mastered during the academic year.

Table 4: Profile of Usage of the Online Self-Directed Singapore Mathematics Platform Among Primary Students in the 2nd Year

E-Learning	Frequency
Total number of questions done	321093
Total number of questions done correctly	254094
Average number of questions done	565
Total number of skills mastered	10 051
Average number of skills mastered per student	19

The data show that for the last 10 months of the second academic year, there were 321 093 questions that the students answered. Among these questions, 254 094 or 79.13% were answered correctly. Also, it can be taken from the data that each student was able to answer 565 questions for the last academic year. Furthermore, 10 051 skills were mastered by the learners, and each student had an average number of 19 skills mastered during the academic year. It can be inferred from the data at least 70% of the questions in the online platform were answered correctly by the K4-6 learners. However, it can be observed that there was a decline in terms of the average number of questions done and average number of skills mastered by each student. This is because the online platform changed during the middle of academic year were the skills were compressed and reduced. According to the one of the Mathematics teachers during the interview phase of data collection, the use of the

Singapore Math Online platform was maximized, and the decision to revise the curriculum and list of skills across levels allows the learners to cover all the prescribed lessons of the curriculum. The learners had difficulty covering the lessons during the first year of the implementation of the bulk of the lessons there are in each of the level.

Learning Gains in the Mathematics Problem Solving Skills Among Students

The table below shows the mean achievement of the students before and after their exposure to the Singapore Mathematics Online Learning System. As presented in the table, it can be observed that while both mean

Table 5: The Learning Gains of the Students in Mathematics Problem Solving Before and After their Exposure to the Singapore Mathematics Online Platform

Level	Mean Achievement in Math (Pretest)	Mean Achievement in Math (Posttest)	Mean Difference	p-value	Interpretation
K4	19.32	27.50	8.18	0.002	Reject H_0
K5	22.20	28.36	6.16	0.023	Reject H_0
K6	16.70	24.20	7.50	0.039	Reject H_0

achievement results in the pretest and posttest are fairly on the average level, the learning gains are very noticeable, with the K4 students having the largest mean difference (8.18). Furthermore, all the p-values are less than 0.05 which puts forward the rejection of the null hypothesis. This implies that there is a significant difference on the mean achievement of the respondents before and after their exposure to the Singapore Mathematics Online Learning System. The results of the present study can be compared to the study of Blalock (2011) where Singapore Math has a positive impact on students' knowledge and enjoyment and in the anecdote of Wright (2020) where students were found to have a deeper understanding of

mathematical relationships and were able to apply their problem-solving skills in new situations.

Experiences of Students and Teachers in the Online Singapore Mathematics Program

The table above shows that the students strongly perceived that exposure to the online self-directed platform helped them feel more confident in solving problems (4.21). Also, the students agree that the curriculum helped them to visualize abstract concepts and problems (4.18); improve their accuracy in problem-solving skills (4.11); offer engaging problems (4.02), and the problems in the online platform are related to real-life

Table 6: The Assessment of the Students on the Online Singapore Mathematics Curriculum

Statements	Mean	SD	Interpretation
The curriculum of Singapore Mathematics Online Program			
1. Helps me improved my accuracy in problem solving	4.11	0.45	Agree
2. Offers engaging problems	4.02	0.79	Agree
3. Helps me solved problems that are practically related to real-life situations	3.95	1.02	Agree
4. Makes me visualize complicated and abstract math problems	4.18	0.87	Agree
5. Helps me feel more confident to solve problems	4.21	0.67	Strongly Agree
Over-all Mean	4.09	0.76	Satisfied

scenarios (3.95). The overall mean (4.09) implies that, in general, the respondents are satisfied with the curriculum of the online enrichment program. According to one of the students during the interview phase of the data collection, their exposure to the online platform has provided them with new learning opportunities that they did not experience in their regular math curriculum. While there are opportunities to develop their problem-solving skills in the regular curriculum, these are very limiting and need more emphasis. The Singapore Math online platform has exposed them to engaging problem-solving activities using games and technology.

In addition to this, the interview data reveals that the respondents appreciate that they learn how to create bar and pictorial representations of the problems given to them. This aids them in understanding what is being asked in the problem and what they should need to do. They become more independent students who are confident

to solve problems even if they are not completely sure if what they are doing is right.

Moreover, the Mathematics teachers also shared during the focus group discussion that they observed that the students always anticipate their Singapore math sessions every week. This is probably because the students are so used to their routinary activities like answering their modular activities and taking pen and paper assessments in the regular curriculum. There is also an increased appreciation of the mathematics lesson because of this innovation in the curriculum, as evident in their participation and behavior during classes.

Based on the results of the assessment, the respondents strongly agree that their mathematics teachers have mastery of the concepts and techniques of Singapore Mathematics (4.37) provide sufficient discussion during the enrichment period (4.30), and use various teaching strategies to address the needs of the learners with

Table 7: The Assessment of the Students on the Facilitation Skills of their Teachers in the Online Singapore Mathematics Enrichment Program

Statements My Teacher...	Mean	SD	Interpretation
1. Has mastery of the concepts and techniques of Singapore Mathematics	4.37	0.87	Strongly Agree
2. Provides sufficient discussion during the online enrichment period	4.30	0.81	Strongly Agree
3. Uses various teaching strategies to address my needs in solving problems in the Singaporean curriculum	4.23	0.56	Strongly Agree
4. Keeps me engaged in the activities during the enrichment period	4.13	1.01	Agree
5. Systematically delivers the lessons in the Singapore curriculum	4.20	1.32	Agree
Over-all Mean:	4.25	0.92	Highly Satisfied

regards to problem solving (4.23). Moreover, the learners agree that the facilitators deliver the lessons systematically (4.20) and keep the learners engaged in the activities (4.13). It. As a whole, the respondents strongly perceived that the facilitators provided effective instruction during the enrichment program, with an overall mean of 4.25. While Singapore mathematics came into the curriculum of the school late and has been implemented for two years already, the mathematics teachers handling the enrichment classes shared that they are not completely confident that they have learned all the skills in teaching and facilitating Singapore mathematics lessons. According to the facilitators, the training being given by the online platform provider is not enough, and they need more training and exposure in how to effectively and efficiently

teach Singapore Mathematics problem-solving lessons to primary learners.

This is in contrast to the assessment made by the students with regard to the instructional skills of the teachers. It is amusing to note that the learners feel that their facilitators have mastery of Singapore mathematics lessons and uses various teaching strategies to address their needs in learning problem solving. Moreover, the students think that their teachers are keeping them engaged in the discussion despite the confession of the teachers about their hesitation and lack of experience in facilitating Singapore math learning activities. Therefore, it shows that the teachers can still manage to deliver the lessons despite their personal disposition about their roles as facilitators of this enrichment program.

Table 8: The Assessment of the Students on the Singapore Mathematics Enrichment Program Laboratory

Statements The laboratory...	Mean	SD	Interpretation
1. Has enough functional computer units for all the learners	3.78	0.56	Agree
2. Has computer units with stable internet connection	3.26	1.45	More or Less Agree
3. Has well-maintained equipment	3.77	1.02	Agree
4. Has enough working space and area	4.00	0.75	Agree
Over-all Mean:	3.70	1.11	Satisfied

While the students agree that the laboratory has enough working space (4.00), has enough functional computer units for all the learners (3.78), and has well-maintained equipment (3.77), the respondents seem not to agree that the internet connection of the computers is stable (3.26). This factor is very crucial since the platform is made available online and affects the productivity of the students. In general, the respondents agree that the program has a good laboratory despite the raised concern about internet connection.

As shared by both students and teachers during the focus group discussion, the most prevailing problem that they encounter is the internet connection. The quality of the internet connection is most affected whenever a class consisting of almost 40 students simultaneously access their accounts. While technical requirements were considered and prepared before the implementation of the program, it has become a major hindrance in maximizing the learning opportunities of the students

during the first academic year. This is supported by the claims of the teachers regarding the problem with the internet connection. The teachers even shared that they elevated this concern to the concerned school administrator.

"We struggled a lot during the first year of implementation because we did not anticipate this problem. We felt apologetic to our students and we made sure that this concern reached the concerned authority." (K5 Math Teacher)

"We were very excited during enrichment period but much to our disappointment, we experience unstable internet connection which caused to us extend overtime and do our tasks at home." (K6 Student)

There was an observed significant improvement in the quality of internet connection during the second academic year.

The computer units in the laboratory were also replaced by more updated models through the initiative of computer head. According to both teachers and students,

the connection improved very well. The students have minimal concerns regarding the internet connection since the replacement of computer units and installation of additional servers. However, it is interesting to note that the respondents continue to experience internet

connection problems even at home.

The last part of the assessment is focused on the online platform which provides the materials and content of the enrichment program. Based on the figures, the respondents strongly agree that the online platform is

Table 9: The Assessment of the Students on the Online Singapore Mathematics Enrichment Platform

Statements	Mean	SD	Interpretation
The online platform...			
1. Is personalized and aids self-paced learning in Mathematics	4.46	1.23	Strongly Agree
2. Has abundant discussion, questions, and activities	4.36	1.22	Strongly Agree
3. Is user friendly to Filipino learners	4.34	0.86	Strongly Agree
4. Provides accurate information and concepts	4.14	0.75	Strongly Agree
5. Motivates us to learn and appreciate Math better	4.21	1.56	Strongly Agree
6. Effectively caters our needs in learning mathematics	4.19	1.12	Agree
Over-all Mean	4.29	0.87	Highly Satisfied

very personalized and aids them in self-paced learning in Mathematics (4.46); has abundant discussion, questions, and activities; is user-friendly to Filipino users (4.34) and motivates them to learn and appreciate Math better (4.21). Moreover, the learners agree that it effectively caters to their needs (4.19) and provides accurate information and concepts (4.14). The overall mean suggests that the learners strongly agree that an online platform is an effective tool for learning mathematics problem solving. The assessment of the students in terms of the online platform was overwhelmingly positive. This is due to the fact that the online platform facilitates independent and self-paced learning, which is very similar to the system of the school, which is non-graded, self-paced, and modular. According to one of the K6 students, it blends well with the system, and they did not need to make any adjustments. Moreover, it offers new learning experiences, making them more motivated and engaged in learning Mathematics and appreciating its practical values.

"We love the online platform because we don't need to draft questions and we can personalize assessment materials per students. Its monitoring measures are also commendable as we keep track of the progress made by each learner." (K4 Math Teacher)

In addition to the assessment made by the students, the mathematics teachers generally have positive feedback regarding the utilization of the online platform. According to one of the teachers, facilitating discussion and activities is very convenient as there are various instructional videos, questions, games, and math stories that the learners can access.

Challenges Experienced by Students and Teachers

Unstable Internet Connection

This issue was more significantly felt by both students and teachers during the first year of the implementation of the program. While computer units were replaced by (not brand new) a more updated set of computer units, there were still observed incidents of malfunctioned computer units that hindered learners' accomplishment

of the assigned tasks. Internet connection issues were raised and are considered worse during the first year of implementation. Students experienced slow internet connection in school and their respective homes. As with the use of technology, there are occasions where connections were poor despite the improvements made in the school laboratory. This causes minor problems as these situations are usually isolated cases only.

Overwhelming Number of Lessons in the Curriculum

During the first year of implementation, one main conflict which confronted the department and the teachers is the task of designing the curriculum for the enrichment program. Since the lessons and competencies in the regular curriculum had to be considered and maximizing the lessons to be included in the Singapore Math Enrichment Program, covering the lessons for both curricula was very challenging. According to the teachers, even though they reduced the number of lessons to be included in the Singapore Mathematics Enrichment Program, they still had difficulty covering all the lessons. This is due to the fact that the regular Math curriculum in each level contains many lessons already, not to mention the extra-curricular activities and other events that disrupt classes. With the response of the e-learning platform provider to this concern, the set of competencies in the online platform was further refined and streamlined, resulting in fewer competencies per level. However, the change in the interface happened in the middle of the academic year, which confused the implementors and learners.

CONCLUSIONS

The self-directed online platform has been an important integration made by the school to address the need of the learners to augment their problem-solving skills in Mathematics. The significant learning gains show promising results where students learn to appreciate their problem-solving tasks because they can understand, represent, and visualize the given mathematical situations

better. While the Singapore model method is not the traditional means of approaching problems learned by young Filipino students, the present study has proven that students are capable of learning new techniques and realize that they can flexibly choose an appropriate and practical approach to solving problems. The new problem-solving methods they have learned made them more empowered young mathematicians.

In terms of the program implementation, this research has proven that it has satisfied most learners in different areas like the curriculum, instruction, and the online platform itself in the first two years. Also, the program implementors have identified the problems and challenges of the program during its initial implementation, particularly the slow internet connection and the overwhelming number of lessons in the curriculum. Thus, the respondents suggested examining and evaluating the computer units and internet connection by the concerned department. The teachers also recommended streamlining the mathematics curriculum and making the integration of the Filipino and Singapore curricula seamless and connected. This will help the students understand better the end goal of the subject and foster a more positive engagement and improved mathematics learning outcomes among primary students.

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