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Lived Experiences Of The International Mathematics Competition Winners: A Phenomenographic Study

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Abstract

This phenomenographic research aimed to describe, the lived experiences of the winners of International Mathematics Competitions (IMC). Specifically, it aimed to determine the lessons learned during competitions, the preparations of IMC winners to improve their mathematical skills before joining competitions, and the implication of the experiences of IMC winners to improve Mathematics Education. It has three phases – data collection and sampling, principles of phenomenographic data analysis, and effective communication of the phenomenographic results. The five informants chosen purposively were considered the primary informants and their parents and coaches were considered the secondary informants. The study has the following themes: As to the lesson learned (1) A life-changing experience, and (2) Difficult yet Beautiful. For preparations of IMC winners, (1) Support from Parents, (2) Good Study Habits, and (3) Exposure to Mathematics through Consistent Training. As to its implication to mathematics education (1) Know the Learners, Listen to them, (2)Awaken the love for Math through Fun and Challenging Activities or Games, and (3) Child Support. The result of the study implies everyone has some Mathematics ability, but some children have potential far beyond others. With proper training, support, and encouragement, this ability can be activated. Moreover, the results may be used as a guide by both parents and teachers especially in joining mathematics competitions.

Keywords: Lived Experiences, Mathematics Education, International Mathematics Competition (IMC) winners, Phenomenographic Research.

I. INTRODUCTION

Roger Bacon (1214-1294), an English Franciscan friar, philosopher, scientist, and scholar of the 13th century, once stated: *"Neglect of mathematics works injury to all knowledge since he who is ignorant of it cannot know the other sciences or the things of the world"*.

Everyone must have heard that mathematics and science education in the Philippines is deteriorating. This is because of the Trends in International Mathematics and Science Survey (TIMSS) 2019, the Philippines ranked last among 58 countries in grade 4 mathematics and science. Also, in 2018, the Philippines ranked last among 79 countries in reading comprehension, and second lowest in both mathematical and scientific literacy in the Programme for International Student Assessment (PISA) (Bernardo 2020).

Based on history, the Philippines enjoyed being on top of Asian countries 50 years back. Moreover, the Philippines ranked second from the top but now it is a total upside-down picture (Villaceran, 2011). The statements above entail a big difference in the performance of the country's education from being on top and now at the bottom. Nine years have passed and the Philippines did a lot of interventions in its educational system to address this problem. Various organizations were put up to help

students excel in mathematics. Two of which are the Mathematics Teachers Association of the Philippines (MTAP) and Mathematics Trainers' Guild – Philippines (MTG). MTAP together with Metrobank focused on hosting a competition to showcase students' skills and ability and while MTG focused on training students to compete in international competitions.

The fruit of labor is indeed sweet. This is because after several years the efforts of the Department of Education as well as of the different organizations had been fulfilled when recently the Philippines emerged as the most bemedaled country at the 12th International Mathematics Contest (IMC) held from July 29 to August 1, 2016, in Singapore. Filipino students bagged 208 medals and 120 merit awards to top the said competition. The Philippines was followed in the medal tally by China with 196 Singapore, 123; Vietnam, 82; and Taiwan, 71. Other participants are from South Korea, Iran, Malaysia, Indonesia, Thailand, India, Laos, and Hong Kong (Rappler.com, 2016).

Moreover, the Philippines pulled another feat by placing second overall at the 2014 IMC in Singapore. The Philippine team brought home a total of 155 medals putting it behind China, which topped the competition with 193 medals. Malaysia was third with a total of 92 medals, followed by Indonesia with 75, host country Singapore with 67, South Korea with 59, Thailand with 30, Iran with 8, Myanmar with 3, and India with 1 (Esplanada, 2015).

Furthermore, young Filipino students emerged as overall champions in their last international math competition for 2014 in Bogor, Indonesia, and also as overall champions in a math competition for India, continuing their winning streak in international contests (Rappler.com, 2014).

All these medals and honors garnered by students in international competitions are shreds of evidence that slowly, the Philippines is regaining its position to be on top among Asian countries. How did these students manage to emerge to be on top among other contestants? What made these students win? To whom do they attribute their success? How did they do it? A lot of questions run in the researchers' minds because it is not just one or two students who earned gold medals but a lot. To describe the experiences behind the success of these children, a phenomenographic study is the most appropriate design to be conducted (Bacio, et al. 2022).

EPISTEMOLOGICAL AND THEORETICAL RESEARCH PERSPECTIVES

This qualitative study rested on the premise that meanings were constructed from the interpretation of the patterns and symbols during our interactions with the informants. This study was anchored on the epistemological stance of constructionism. The theoretical perspective in which this study was grounded is symbolic interactionism, a specific type of interpretivism (Crotty, 1998).

From the epistemology of constructionism, truth or meaning is formed by the subject's interaction with the world and it is constructed not discovered (Gay, 2004). Also, this epistemological perspective, as stated by Crotty (1998), deals with the construction of meanings as one interacts with other people and objects around them and not just by being passive receivers. It is the interpretation of concepts, ideas, and formulated knowledge as one experiences or interacts with something or probably events or phenomenon. It can be dealt with that we can learn and get meaningful meanings from our own lived experiences that might help us in all other aspects of life.

As this study aims to identify and analyze the lived experiences of International Mathematics Competition (IMC) Winners, with the parents and coaches or trainers as secondary participants, we can develop stories and themes about how these students excel in math, how they prepare for competitions, and how they enhance their skills since they are the ones who experienced the phenomenon firsthand. They are the ones who have lived the experience and are living testaments of how they became math wizards. In the case of parents, we can also

develop ideas on what interventions they can provide for their children to be math achievers for they are the ones who guided them and provided them with the need for quality education.

The stance of symbolic interactionism rests on the assumption that " people transmit and receive symbolic communication when they social interact" (Neuman, 2007). People interpret these symbols transmitted during social interactions and in situations that confront them in their everyday lives (Athen in Tracy 2013). Moreover, how people think about themselves and others is based on their interactions.

The knowledge people have about the world and the things around them originate from the process of social interactions (Gray, 2004). The people involved in these social interactions interpret the things around them as well as each other's actions and behaviors that later become the basis of how they act and make meaning in the world. McClelland (2009) said that for interactionists, "humans are pragmatic actors who continually must adjust their behavior to the actions of the actors". People refer to these actions and those who perform them as symbolic objects. Individuals interpret these symbolic objects and then create meanings out of the events and the participants of those events.

The results generated from the IMC winners will always be the result of their interaction with their environment as they experienced the reality of joining international mathematics competitions. These tales are unique, varied, and genuine for they came from the ones who are present and fully participated in the phenomenon. In this study, stories of triumph were heard from our IMC winners. Their experiences upon competing in international competitions, their preparations, and lessons learned were written and these were analyzed on to how these could be implied to mathematics education. These tales were generated through interviews, written responses, and on any platform where they can express their views, experiences, and opinions. Parents and trainers provided different perspectives, and points of view, which compared and generalized collective and varied ideas from the informants.

The methods, methodology, theoretical perspectives, and questions posed in this study are all aligned with the epistemology of constructionism. The epistemology and theoretical research perspective as the underlying theoretical frameworks, methodology, and methods used in this study are shown below in Figure 1. The figure also shows the relationship between the four. In the largest rectangle, constructionism is seen as the very foundation of this study.

STATEMENT OF THE PROBLEM

This research sought to describe, the experiences of the winners in International Mathematics Competitions and how these ideas can be implied to mathematics education. This undertaking tried to answer the following research questions:

1. What are the lessons learned by the *IMC winners* upon joining international competitions?
2. What are the preparations of *IMC winners* to improve their mathematical skills before joining competitions?
3. In what ways can the experience of *IMC winners* be implied to improve Mathematics Education?

II. RESEARCH DESIGN AND METHODOLOGY

2.1. RESEARCH DESIGN

To attain the objectives of this study, the researchers utilized the phenomenography research approach. According to Orgill (2012), phenomenography is an empirical research tradition that was designed to answer questions about teaching and learning, particularly in the context of educational research. A phenomenographic study aims to identify the different ways in which a group of people experiences, interpret, understand, perceive or conceptualize a certain phenomenon or aspect of

reality – and to do so from the perspectives of the members of the group.

Throughout the slow process of collecting data and analyzing themes, we were able to explicate the meaning, structure, and essence of the lived experiences of the informants. In-depth interviews and written responses were the basis for collecting data. This methodology enabled this undertaking to better understand the lived experiences of IMC winners in participating and winning in international competitions and its implications to mathematics education. Through data triangulation, information was taken from various perspectives; from the IMC winners, their parents, and coaches.

2.2. RESEARCH LOCALE

Since data was collected through an interview, the researchers secured a place wherein informants felt comfortable and safe. The interview was conducted in different ways depending on the availability of the informants and the secondary informants, which were the coaches and parents. Out of five IMC winners, one agreed to have a face-to-face interview with his mother and coach as secondary informants, wherein another coach of two respondents joined. Two respondents agreed to have the interview over the phone with their parents since the informants were on in-house training in Manila under MTG. Furthermore, another two respondents, with their parents, agreed to answer the interview over online questionnaires created with google forms for the reason that one is busy with school activities and examinations and the other one is studying outside the country. In addition, one coach agreed to answer the questions over messenger since she's out of the country and some errors are opening the google form sent to her due to connection issues in the country she's in. A recorder was used during face-to-face and voice interviews. Also, a video recorder was set up to capture moments and record information during the face-to-face interview conducted at a Café in Iloilo City, Philippines.

2.3. INFORMANTS.

Polkinghorne (1989) recommends that researchers interview from 5 to 25 individuals who have all experienced the phenomenon. For validity and reliability, the triangulation approach was implied thus, parents and coaches of these *IMC winners* acted as secondary informants of the study.

This study's informants were chosen through purposive sampling following these inclusion criteria: (1) they should be public or private school learners; (2) they should also be living and studying in the province or city of Iloilo when they won in the international competitions; (3) the respondents should have won in any International Mathematics Competition outside the country in the last four years (2015-2018); and (4) these learners should have undergone training under the MTG, Philippines – Iloilo Chapter from 2015-2018.

The five respondents were in their pseudonyms were Ann, a former student of Ateneo de Iloilo- SMCS now studying at Tanjong Katong Girls' School in Singapore, Bea from Iloilo Scholastic Academy, Ziron from Philippine Science High School – Western Visayas Campus, James from Philippine Science High School – Western Visayas Campus, and Sam from Ateneo de Iloilo - SMCS. All of them were chosen with the help of the Iloilo MTG Coordinator. The respondents' parents and coaches in Math were the secondary informants of this study. The parents, Mrs. T, Mrs. D, Mrs. V, Mrs. Y, and Mrs. C, and the coaches, Ms. M for Ann and Sam, Ms. C for Alyssa and Ziron, and Ms. S for James.

2.4. ETHICAL CONSIDERATIONS

Ethics were properly observed in the conduct of the present study based on the standards of the American Psychological Association (APA) (2010). That is, this study must "not harm" participants. Furthermore, ethical guidelines such as privacy and confidentiality in conducting ethical research were observed.

During the interview, sensitivity to the needs and gestures, both verbal and non-verbal, of the informants should be considered. As much as possible, since the undertaking was dealing

with elementary learners, the interview must be comfortable for them and it should ensure that everyone is safe and sound.

An assent form for minors and consent from parents and coaches was provided for those who volunteered to be respondents to the study and were willing to be interviewed at their most convenient time. The respondents were contacted online with the help of the MTG – Iloilo Chapter Secretary and were asked politely if they could participate in the research undertaking. It is made sure that the comfort of respondents was taken into consideration and thus, their time and schedules were considered likewise, as their availability to give their precious time for the research. In the case of video and audio recording, permission from them is prioritized if they wanted to be shown on the video and if the research can make use of their photographs as depicted on the consent form. Through the continuous exchange of messages, the respondents allowed the researchers to use their photos and names throughout the research paper and are enthusiastic to share their experiences.

2.5. PROCEDURES

There are three key procedures for conducting a phenomenographic study according to Han and Ellis (2019). These are described in the following: (1) data collection and sampling, (2) principles of phenomenographic data analysis, and (3) effective communication of the phenomenographic results.

2.5.1. DATA COLLECTION AND SAMPLING METHODS

The most popular phenomenographic data collection method is semi-structured interviews, which are often conducted using a set of pre-defined interview questions as well as the information emerging from participants' responses (Stenfors-Hayes et al., 2013).

In this study, a series of activities were the basis for collecting data to describe, analyze and understand the experiences of the IMC winners with their parents and coaches. The very first stage of the undertaking was obtaining records of purposively chosen IMC winners following the inclusion criteria to identify the informants that were retrieved with the help of the Iloilo MTG Secretary and Guidance from the MTG Coordinator. Next, getting a permit for approval from the MTG Coordinator to conduct a study on the MTG Trainees was secured the same as with the consent form for the parents to use their children as informants and an assent form from the IMC winners to take part in the research undertaking.

To gather data, the researchers made an interview schedule that was made and presented to the panel of experts for validation and to check if the content is fit for the research undertaking. Then, the researchers meet and discussed the comments and suggestions regarding the interview schedule and the progress of the research. Next, the researcher communicated with the informants over messaging applications with the help of the MTG Secretary, all were reached through the Messenger Application and agreed to be a part of the study. Two of the informants with their parents and coach agreed to answer via online response questionnaires, two agreed to have the interview over voice call and one agreed to a personal interview with the parent and coach. Furthermore, the researchers wrote field notes to record the necessary information during the interview. Aside from these, artifacts such as a photocopy of certificates, pictures of medals and trophies, and photographs during competitions, which were deemed beneficial in this study, were collected.

2.5.2. PRINCIPLES AND PROCESSES OF ANALYZING PHENOMENOGRAPHIC DATA

The main aim of phenomenographic data analysis is to identify a set of qualitatively different categories representing variations of individuals' experiences of a phenomenon. The researchers used Marton et al. (1992) process. This process has four steps, which are: (1) identification, (2) sorting, (3) contrasting and categorizing, and (4) reliability checking

2.5.2.1. Identification. Data that are related to the phenom being described are identified. The

researchers listened to the entire tape-recorded interviews several times and read the transcription several times. The narratives began with the key event in the informants' life which refers to the triumphs in international competitions and then works forward with the lessons learned and implications, and backward, including the preparations, from that event.

Moreover, in this step, the researchers checked out every word, phrase, sentence, and paragraph and noted significant nonverbal communication in the transcript to elicit the informants' meanings.

2.5.2.2.Sorting. The identified data are sorted into 'pools of meaning' according to similarities. In this step, the recorded interviews were transcribed, organized, and analyzed. The meanings that were formulated were clustered to form themes as to how it answers the research questions and how the generated theories and ideas from the stories unfolded can be implied to Mathematics Education. Exploration, data collection, and analysis were involved in the study.

2.5.2.3. Contrasting and categorizing. The 'pools of meaning' are contrasted, and categories are generated with descriptions. The themes are now summarized, and crafted, from the preparations, lessons learned, and the implications of the experiences of the *IMC winners* in international mathematics competitions to mathematics education are identified. It was also carefully analyzed and reviewed that no themes were the same and no support statements will duplicate with others.

2.5.2.4. Reliability checking. The reliability is checked by having a portion of data coded by independent researchers and the inter-coded reliability is determined. In this stage, the researchers compared meanings with the original interview. The researchers returned to the informants to determine if the essence of the phenomenographic interviews had been captured correctly. Moreover, the researchers asked the informants to read the exhaustive description to assure that it faithfully represented the experiences of the IMC winners in international mathematics competitions as a measure of the validity of the research findings. Furthermore, the researchers made necessary modifications in some transcripts as a result of the validity check.

2.5.3. COMMUNICATING RESULTS IN PHENOMENOGRAPHIC RESEARCH

The phenomenographic results are presented as themes. The details are shown in the result and discussion.

III. RESULTS AND DISCUSSIONS

3.1. LESSONS LEARNED BY THE IMC WINNERS UPON JOINING INTERNATIONAL COMPETITIONS.

International Mathematics Competitions are *difficult yet beautiful and life-changing for a learner*. Joining these competitions are truly a huge learning experience for informants since they'll understand the value of both victory and failure and will greatly teach various lessons that could help them grow as a learner.

Theme 1.A life-changing experience. Joining math competitions will not just let you measure your potential but there is more to that. It is a life-changing world of opportunities, an avenue for socialization, and a medium to improve for the better.

It may be a bit hard at first for James but as it happens continuously, he has learned

something important upon being in international competitions. He stated:

The most important lesson that I learned is to never give up since it always pays off. That kind of mindset has given me the proper work ethic to achieve my school requirements. Because of those, I became more productive and more efficient and tend to finish all requirements within the deadline. That shows that it has changed me into a better learner.

Mrs. Y added, that when you go out of your comfort zone (home and school), you will discover and experience a whole different world out there. You might be the brightest here, but you eventually come to realize that many others are brighter than you. This realization is the start of their life-changing process. Will they use this

to challenge themselves and do better or will they just accept the hard fact and do nothing? Their attitude toward triumphs and defeats will mold them and train them on how to tackle and survive this interesting life we have.

For Mrs. T, Ann's mother, joining contests has made her child ready to accept and face any challenges that may come her way. She became equipped with experience without fear of losing. She also added that her child, Annika, was able to meet new friends. Her Mathematics skills helped her in her studies and scholarship opportunities." Ann added, "It made me look out for greater achievements and opportunities. In school, I would seldom let a competition or school activities go, for I see them as great opportunities for me to hone my skills.

For Bea, International Competitions have made her more confident and do well in school. She became more advanced than some of her classmates and it truly helped her in her studies.

In the case of Sam, her socialization skills have greatly improved since she is mixed with different individuals from other countries and gained new friends. She said: I want to join an international math competition because, I want to travel to different places outside the Philippines and to socialize with different students from different countries, but the truth is I want to challenge myself.

Moreover, Sam's mother, she has found out that these opportunities have changed her child to be better. As she explained,

Kay si Sam *bal-an sir kang gamay* very shy type *sia nga bata so ang part man sang* training *nya sa* math *indi lang tungod para mag* improve sia sa math *pero para maka* socialize *man sia sa* different kinds of students *diba*? [Sam was shy when she was young, and her training in Mathematics is not just about improvements in the subjects but also improving her socialization skills as well.]

So sang nag start *kami* joining *ah mga* math competition *daw nag* improve *gid si* Sam, *nadula iya huya huya, naga* start *sia maging* vocal, so *na* notice *namon sirnga amo na, nga kadako gid kag ang iya nga* confidence *ya, nag* improve *gid.* [Since we started joining Mathematics competitions, Sam improved a lot, she was not shy anymore, became more vocal, and we noticed that there is an increased self-confidence in her.]

Ziron, on the other hand, revealed that his experiences in international competitions are something that brought about minor changes in him, but he admitted that it increased his self-confidence in his Math classes and in answering difficult Mathematical roblems. It was clear from the transcript above that joining a mathematics competition could be a life-changing experience such as gaining friends through socialization. It can also hone their skills as well as increased their self-confidence and not give up on any challenges in life.

Research supports the fact that extracurricular activities are an important part of finding and developing friends. The idea of socialization should not be dismissed as unimportant in the realm of academic competition (Fredricks & Eccles. 2005). Also, according to the study of Bicknell & Riley (2012), competitions can serve as a way of bringing students of 'like minds' together so that they find friendship, inspiration, and encouragement from working with others. This may be in preparation for the competition, working on problems from previous competitions, or sharing after a competition. Another benefit of joining math competitions was an improvement in a student's confidence level within his or her math class. They will be ahead of their classmates who have not competed (Professor Math, n.d.).

Theme 2. Difficult yet Beautiful. The international competitions had given the *IMC winners* feelings of excitement about the results and anxiety since they need to cope with schedules and various activities but somehow it gave them that light on what it is to be representing the nation in an international math contest. Although they are *IMC winners,* they too also find mathematics first difficult. They also experience failure before joining the competitions. Just like what Ann experienced. According to her

I started learning math to pacify my strong feeling of failure. I believe that many students learn math to prove something to everyone. This makes them stressed about it, which can fuel their hatred towards the subject (which is why most high schoolers start hating the subject). I started greatly improving in math when I started to see its beauty- its art. Rather than studying for a certain test or competition, I would do it out of sheer habit, sometimes even for entertainment. James also shared the same experience. According to him, I just went with the flow at first and followed my parents' words to attend reviews and tutorials. At first, I find it difficult because I am still young, I was in Grade 1, but later I realize I was better, a little bit better than average until I reached Grade 2 when the big contests started, and the offers came. What made me love Math is probably because I was given a great opportunity to join a competition and I kind of appreciate its application in real life. Samantha also finds mathematics hard. When asked what she learned from joining competitions she said, Math is the most challenging mind-blowing, and the creative subject of all. So, I make sure that in every math problem I encounter, I have to understand what I do not understand. So that during the competition, I know how to answer the problems.

Mathematics is difficult. It is a fact and universal. People might find it difficult because they were not able to appreciate its true beauty as the IMC winners do. Yes, it is difficult, but it has lots of applications in real life. Thus, if we apply mathematics in real life and work hard on it, then it might become easier. Also, if we continue to practice solving a math problem and make it our habit, then this can also help mathematics easily.

Despite the many changes to the curriculum, the goals of mathematics education at the basic education level remain more or less the same: "to provide opportunities for individuals to develop skills and attitudes needed for effective participation in everyday living and prepare them for further education and the world of work so that they make worthwhile contributions to the society at large" (Pascua, 1993). Moreover, there is growing evidence in the literature that problem-centered approaches—including mathematical contexts, "real world" contexts, or both—can promote learning of both skills and concepts. In one comparative study, for example, with a high school curriculum that included rich applied problem situations, students scored somewhat better than comparison students on algebraic procedures and significantly better on conceptual and problem-solving tasks (Schoen & Ziebarth, 2008). This finding was further verified through task-based interviews. Studies that show the superior performance of students in problem-centered classrooms are not limited to high schools. Wood and Sellers (1996), for example, found similar results with second and third graders.

3.2. PREPARATIONS OF IMC WINNERS TO IMPROVE THEIR MATHEMATICAL SKILLS BEFORE JOINING COMPETITIONS.

Support and investment from parents, good study habits, and exposure to mathematics through consistent training are the most important things to consider when joining competitions. Child support be it in guiding them in their studies or letting them join in training at an early age will boost the confidence of your child since seeing you as a parent being there for him or her always will give them that feeling of security and thus, they can think and work efficiently in any endeavor.

Theme 1. Support from Parents. As stated by James, the important factors that helped me win are the research of past questions or the kind of test from my mom, the advice and new techniques from my brothers, the continuous tutoring of a personal teacher, and the urge to impress my family and friends.With that, there is huge transparency that parents and family members play an

an important role in preparing their children in math competitions be it locally or internationally. Mrs. D added that when you see potential in your child, let him/her be exposed to such, especially in learning Mathematics. On the

other hand,from a teacher's perspective, Ms. G stated that: do not force the child to join thecompetition. The student must have an interest in Math. Give him/her time to learn. It takes a long process to achieve whatever remarkable skills they need to possess to learn the subject.

Considering a child's capability to learn and comprehend is also a consideration when identifying the gaps in learning. In a diverse classroom, teachers need to look into how a child learn and develop activities that will provide them opportunities to learn better at their own pace. With those perspectives, we can say that knowing the capabilities of our children is a factor to consider and support follows thereafter. It was observed that parents who continuously provide support and assistance to their children are those whose children achieve in school. Therefore, the value of Education depends on how a learner values it with the support of the parents.

Studies revealed that major contextual influences such as students' environment, family, and historical and cultural contexts influence student learning (Acido, 2010). Moreover, The National Numeracy Review acknowledges the role of parents and reports that connecting families to schools and informing them of the ways they can support the learning of numeracy can be of benefit to students (Commonwealth of Australia, 2008). Thus, supportive parental interventions to learners do have great outcomes and also, and a positive attitude towards the subject will truly have positive effects on Mathematics learning. Furthermore, mathematics learning needs the support of both parents and other community groups. TIMSS studies have shown that parental and home support contributes to students' success in learning mathematics (De Guzman et al., 2007; Cajilig et al., 2007). Families should project positive attitudes and beliefs towards mathematics and the learning of it.

Theme 2. Good Study Habits. Another consideration in joining competitions is the kind of study habits we have. There is no need to force yourself to study, you just have to find the right time on when and how you can do well. Ann stated:

Normally, I would review one topic a day, depending on my stamina to do practice questions. When the competition is about a week or two away, I would start doing past papers to test my speed and planning.James added, that even if it's an easy or hard contest, I always try to do my best but of course never overwork myself. Some people say working harder gives better results. It may be true, but it doesn't work for me. There will always be a limit for me in reviews. But if I feel the need to review, I or my mom usually research the type of test.

In the case of Sam, she said: My preparations before competing outside the country are, I do practice mathematical problems, searching the pointers and topics in the contest, and I make a strategy. I make sure I understand what I do not understand.

Learning Mathematics is varied in terms of how a child manages to focus and construct knowledge. A child can learn better in a certain way but another one can learn the other way around. With that, providing children with opportunities to review, read, manipulate, and observe certain activities in Mathematics can develop that sense of responsibility for them for learning and applying it not just in school but also in society as well. In addition, parents should also be responsible for giving time for their children to study in learn at home as follow up as well as giving them time to play and enjoy their childhood.

Many studies have been carried out by researchers like Adeyemo (2005) and Gbore (2006) on effective study habits. They argue that study habits have a strong relationship with the academic performance of students. A student who cultivates certain study habits will perform differently from a student who has another set of study habits. It is believed that a student who lacks effective and efficient means of studying would be building on a shaking foundation and consequently have a weak foundation. This was also supported by the result of the study of Gladys and Alamina (2014) that a significant

positive relationship exists between students' study habits and their performance in mathematics. The study habit has a significant role or influence on the level of performance. This agreed with the findings of Lock (1981 in Gladys and Alamina 2014). Students study habit rather than their inability to comprehend mathematical expressions affect their performance in mathematics. Also, Hussain's (2006) survey report on the effects of Guidance services on study attitudes, study habits, and academic achievement advocated for the inclusion of study habits in the curriculum, for both males and females. The essence of this is indicated by the result of this study that males' and females' performance in mathematics are differentially affected by their study habits. Finally, the study by Odiri (2015) revealed that study habits influence students' achievement in mathematics. It also revealed that good study habits lead to better achievement in mathematics. It was also observed that students with good study habits have better achievement compared to those with poor study habits. From the findings, we discovered that a lack of good study habits results in poor achievement in mathematics.

Theme 3. Exposure to Mathematics through Consistent Training. All five of the informants have been enrolled in MTG and so there is no doubt that Math training had truly one of the most important factors behind their success. Being under the Training programs of MTG means being exposed to mind-straining and mind-provoking problems that require intensive critical thinking and problem-solving skills. These learners have already encountered various problems and are taught different strategies that had truly helped them win in international competitions.

Ann believed that activities and contests such as those related to Math had truly honed her skills. Zirons and Bea's coach added,

Yah trainings *nila oo* just like for Zi *naga kwan si* Zi *mo naga* Kumon *pagid* aside from MTG *naga* Kumon *si* Zi so, *ang* trainings *nia sa* Kumon ang skills *nia* sa Mathematics *naga ano pagid naga dasig* that's why *dasig sia mag* solve its because naga training sia sa kumon *kag* mathematical ability *ya naman naga ka* improve *naman tungod sa* MTG so trainings is, I mean trainings are factors *man* [Zi is enrolled in Kumon tutorial center other than his training in MTG. That is one of the reasons his mathematical skills improved due to his training].

On James's part, he stated, that what made me love Math is probably because Iencounter it continuously via tutorials, especially Kumon and MTG. I think the fact that I started at a very early age made it easier for me. Maybe that is why they find it a little bit harder because they did not get exposed to the subject.

Samantha added, that my preparations before competing outside the country are I practice mathematical problems, and searching the pointers and topics in the contest.

With these ideas from IMC winners, it is can be concluded that exposure to Mathematics competitions at an early age will make the learners embrace the subject and continue exploring. This will provide them with timely, relevant, and meaningful learning opportunities that will lead them far and beyond. Also, through constant reviews, solving problems, numbers, and math-related games can truly be of great help in teaching our learners at an early age.

Study shows that part of the activities that develop students academically is the intervention programs such as coaching, tutorial, or remedial programs; or enhancement programs such as the Mathletes Training Program for the bright and the gifted students. Research evidence showed that these programs elevate students" success (Bonotan & Soroño-Gagani, 2017). Also, Thrasher (2008) in his study revealed that preparation for competitions provides opportunities for students to explore non-routine problems, types of problems not usually encountered as a part of the regular mathematics curriculum. Gagani and Bonotan (2017) also concluded in their study that the Mathletes Training Program has a high positive impact on mathletes. It also significantly improved the academic and self-concept or confidence of the

students. They had learned a lot in the training as well as enjoyed Mathematics. This confirms that even if Math presents an unusual difficulty both to learn and to teach due to its abstract nature, then it is still possible to learn and enjoy the subject if taught creatively and meaningfully.

3.3. THE IMPLICATION OF THE EXPERIENCE OF IMC WINNERS TO IMPROVE MATHEMATICS EDUCATION

Knowing the learners and listening to them and awakening the love for mathematics through fun and challenging activities or games can truly be of great help in teaching our learners. Teachers' initiatives regarding this matter are a big consideration for we can truly help our students by continuously putting the practice in our classrooms where we may start from the basic to a more complex way of teaching and learning.

*Theme 1. Know the Learners and listen to them.*Listening to our learners will provide us opportunities to recognize the flaws not just in ourselves as teachers or mothers, but in the system itself. We can identify what our children need, and what our children want, and that is all through talking and listening to them. Every child has a different personality and so on the way they learn things.

They need to always learn the basics first and not find do teacher hopping. Also, they should never overload and overwork themselves as it ruins the productivity and the number of techniques learned. Some people say working harder gives better results. It may be true, but it doesn't work for me, James Martin stated.

Mrs. Young added that contests are not for the frail-hearted. Discover first what your child is passionate about. Just because his friends join math contests, it doesn't mean he should, too. What if he loves art or music or science? We should support them in what they love. For the learners, it takes time, patience, and passion to fulfill their Math dreams. You might give up a lot for this. For the trainers, know the learner first, and his strength in different topics. He might be good in algebra but is

too weak in geometry. Improve his strengths and build up his weaknesses.

First, you need to know his current condition. Is he in a good mood for review? Does he feel tired from his yesterday's school tasks? Ms. G, James's coach added.

Ann clarified that some learners don't like math because math is naturally difficult. This makes them feel like it is the subject that pulls their grades down. Also, the lack of encouragement from math teachers can lead them to hate the subject more.

That is why Mrs. Tamayo said that we should give full support to our children but do not force them if not interested. Thus, knowing our learners, and their interests, and identifying the kind of support for them will work better. This will all be possible if we talk to them or have some conversations with them as parents, and reflection time with them for the teachers. The learners are of great importance. Knowing their capabilities, identifying their limitations, and providing them with the necessary learning environment and activities will eventually spell success in the world of numbers.

In the country, there is a need for certain improvements but as someone responsible for teaching the learners, teachers must be able to meet the demands of more globalized teaching to cater to each learner's needs better. According to Nye et al. (2004), and Chetty et al. (2014), teachers have a substantial impact on their student's academic and life-long success. Clements et al. (2013) agreed and stated that teacher as an aspect of the mathematics instructional environment is related to student achievement. Wenglinsky (2001) added that teacher quality has a significant effect on student achievement. He particularly stressed that high-quality professional development focusing on higher-order thinking skills and diversity issues does appear to strongly influence classroom practice. Teacher quality and classroom practice have an equal to or exceeding effect on student achievement than socioeconomic status.

Hence, enhancing teachers' quality is vital in improving the students learning outcomes. The teacher's academic advancement and professional upgrading activities contribute to enjoyable and productive teaching (Bayocot 2014). And to realize this, there should be an intensive, ongoing professional development model provided to teachers. A development model that is connected to teaching practices focused on students learning and addresses the teaching of specific curriculum content aligned to school improvement priorities and goals, and which also builds strong working relationships among teachers (Darling-Hammond et al. 2009).

*Theme 2. Awaken the love for Math through Fun and Challenging Activities or Games.*Play and manipulation had been key factors to consider in conditioning and motivating our learners to do well and learn better. In schools, we have books and materials for learning but there is a need to do more, to go beyond what was done before. Being innovative as parents and teachers can be strong child support for our children.

Mrs. C believed that games or any other fun activities in Mathematics can surely help our learners. She stated, *Ma* encourage *man ang mga bata sa* math *siguro may ara sila* skills or ano ni ang mga ma play sila fun Math games. *So basi kun sa umpisa palang kun may mga* games *ma* play *sila sang mga* fun Math games *or mga* board games *guro pwede man para ma* realize *nila sa umpisa sa* basic *palang nga kanami sang* math *para maka* build *man ni sang* confidence *nila sa ulihi para maka* encourage *man sang ano e sang* questions and then *maka*share *sang* positive attitude. [Playing fun math games can encourage learners to hasten their skills. Maybe in early years, if they are exposed to fun Math games or board games, they'll improve. Through that, in an early age, learners will relize that math is beautiful, self confidence will be improved, and there will be sharing of positive attitudes.]

Ms. T added, *Arang indi lang pirme puros lang kami* lecture lecture some times *hatagi manang bata ka pwede sia ka* play, manipulate, *yah* games *pwede man* or anything *nga ara kuno bala nga indi lang mamati ang bata*." [It shouldn't be all about lectures, sometimes, provide learners with something to play with and manipulate. It can be games or anything so that learners will not just be listeners in the classrooms.]

As added by Ms. G, the students, develop their interest in learning Math. You could start with playing games that require you to think, then start working with puzzles, logical reasoning, and simple processes with numbers and keep on working onmore complicated problems.

The use of games to teach math concepts and skills and to give children practice in applying them were long been proven to improve students' mathematics performance. Also, another method to improve math performance was creating a math-rich environment where children can recognize and meaningfully apply math.

According to the study by Frye et.al. (2013), games can provide an engaging opportunity for children to practice and extend skills, and the practice guide supplies several examples of games teachers can use to encourage children to apply their math knowledge. Teachers can use games that are included in math curricula, purchase games, make games themselves, or use games that come up during natural play, like hopscotch or jump rope, to reinforce math concepts. Teachers can get involved with the game-playing to ensure educational play or to challenge children to extend their skills. Moreover, teachers can provide opportunities for children to see and use math concepts regularly by creating a math-rich classroom environment. This enrichment can be done by making math-related objects and tools readily available, labeling and organizing them so they are easy to find and use, and organizing activities and routines with numeric systems. Teachers can also explicitly teach children how to use math tools by modeling their use during small- or large-group time.

Theme 2. Child Support. Strengthening the bond between families had been a very important factor in our schools nowadays. It was observed

that it was not poverty, but the lack of child support that hinders their dreams. Aside from listening to them, do something to provide them with their needs as learners to learn better and grow as a person. Support may it be financially, morally, or spiritually is important. Be there for your children, be there for your students. Your presence as they go along their journey toward an educational quest is a big help.

James stated that factors that helped him win are the research of past questions or the kind of test from his mom, the advice and new techniques from his brothers, the continuous tutoring of a personal teacher, and the urge to impress his family and friends.

Mrs. Y added that strong support from parents and school, a good review teacher, time management, and readiness to give up free time for review had truly helped her child. She added: Being there to support, console or celebrate can be challenging. Losing has made him learn humility and graceful acceptance. He has changed his outlook on contests. He is not afraid to lose and if he does, he knows how to handle it emotionally.

Sam believed that training, her study habits, support from family, and prayers are indeed big factors to achieve something.

Mrs. T added that schools should also provide financial assistance, and recognize the students' achievements to encourage others to develop their skills. And they as an institution should also organize math-related activities. With this, the math abilities of the learners will be allowed to be sharpened.

In the eyes of the coaches, parents need to follow up with their children at home and there is a need for them not to rely too much on the teachers. The lack of child support can truly hinder a child's performance in school that is why we need to develop a caring, loving, and supportive avenue for our learners from which they can call home.

The study of Qudsyi (2013) showed that parental involvement and Mathematics ability in elementary students are significantly correlated. The same result was seen in the study of Lamprea (2019) that parents supporting their children will yield the best results since their children became more active in school and continued improving their performances in school. Also, child support can be possible with enough resources and patience since learning takes time. Also, according to NCTM (2004), young children are naturally curious and eager to explore their world. Even before they enter school, children have acquired a substantial amount of mathematical knowledge and understanding. As they move through the elementary years, students can begin to lose interest in mathematics when they see it as simply memorizing procedures. You can foster interest and development by encouraging your child to think about and use mathematics in everyday situations.

In general, taking steps towards the improvisation of mathematics education is a process, and there is a need for everyone in the system to look for gaps to be filled in along the way. Collectively, as lifelong collaborators, these initiatives can eventually bring about changes in the curriculum to cater to more of the needs of the learners and provide them with a more comprehensive and intensified quality of education.

IV. RECOMMENDATIONS

Based on the findings of the study, the following recommendations are advanced:

It is really important that at an early age, learners must learn to love mathematics since it can help them in many ways. They need to find motivation from their fellow learners who enjoy mathematics. If there is an opportunity to learn or to join certain activities, grab it since exposure to a certain thing will eventually bring you to a mastery level, and with that, no one can get that burning enthusiasm to learn within you. Embrace learning for the rewards that will truly amaze you in the end. Never give up on mathematics same as how you wanted to never give up on your dreams. Never force yourself for learning certain subjects like Mathematics is a slow process, that will gradually change your perspective.

Parents, on the other hand, can be the support systems. Both success and failure in learning Mathematics are of the same value. Success means keeping up the good work and sharing, whereas failure means more exciting discoveries and learning. At an early age, be there to support your children, and expose them to the realms of Mathematics slowly in an enjoyable way since learning the subjects requires effort and creativity. It is really important to discover the potential in your child. Be their motivation whatever happens, as long as you don't rush them to live up to your expectations. Rather, as simple as it is, send them to school and inculcate in them the value of education. If opportunities come along the way and if you think your child can do it, be there for them and make sure that they will feel comfortable, and as long as you see the change in them, for the better.

Teachers, as second parents, and as part of their profession can continue giving quality Mathematics education to their learners since the subject can be very beneficial for them in any way. Continuing education in mathematics specifically for teachers teaching the subject could be a great help since as time goes by, new approaches and techniques in teaching mathematics are formulated and it requires a modern and innovative teacher to do such and to cater to the needs of his or her learners.

Organizations such as the Mathematics Trainers Guild, Philippines or the MTG can continue promoting Mathematics Education and be dedicated to helping young Filipinos progress in Mathematics as its programs provide opportunities for learners, parents, and teachers to better themselves and invest in a worthwhile program that will help their children in the future, specifically in their careers.

The Department of Education, on the other hand, can look down to the roots of the problems existing in schools and organize and develop projects and programs to know its learners better and strengthen the connection with its stakeholders to provide basic quality Mathematics Education in the country.

Curriculum designers might also consider revisiting the Mathematics programs in our schools to provide a more amicable avenue for learning math as well as to fill in the gaps and issues that may arise along the way.

These recommendations might also inspire researchers to be lifelong collaborators and find out or formulate new solutions to the ever-changing problems in Mathematics education.

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