PEOPLE: International Journal of Social Sciences
ISSN 2454-5899

Nasayao & Goyena, 2020

Volume 6 Issue 1, pp. 55-68

Date of Publication: 14th March 2020

DOI- https://doi.org/10.20319/pijss.2019.61.5568

This paper can be cited as: Nasayao, M. T. B., & Goyena, J. F. (2020). Mathematics Achievers in Albay: Stories of Success and Challenges, PEOPLE: International Journal of Social Sciences, 6(1), 55-68.

"MATHEMATICS ACHIEVERS IN ALBAY: STORIES OF SUCCESS AND CHALLENGES"

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Abstract

Most students fear Mathematics but still some manage to excel in the subject. This study referred to those students as the Mathematics achievers. Life stories of seven Albayano Mathematics achievers were written. They exemplify "best" in joining competitions regionally, nationally, and internationally. The narratives highlight their personal and socioeconomic background, achievements and success stories, challenges and coping mechanisms, and contributing factors to success: preparation, support system and motivation. The insights drawn from the achievers' narratives may inspire excellence in Mathematics and served as basis for the development of an enrichment program. Class observations and interviews were conducted to answer the sub-problems. The stories were content organized and analyzed to find commonalities and uniqueness in achievers, verbatim quotations were also integrated. Findings showed that opportunities to join competitions were based on the efforts of coach/es, priorities of schools, and the community. Both genders were good in Mathematics and were dominantly visual learners. Their study habits were grounded on their learning styles and multiple intelligences. The type of family they were in, source of living, number of siblings, and the families' average

monthly income were analyzed. Financial problem and anxiety were the mutual challenges they had. The achievers were intrinsically and extrinsically motivated. Greater number of coaches for longer review time assure better competition performance. The schools' motive of maintaining good performance and gaining/regaining trust, and coaches' purpose of showcasing talents for professional growth and satisfaction open opportunities for public high school students with the abilities and confidence to join and win Mathematics competitions.

Keywords

Mathematics Achievers, Personal and Socioeconomic Background, Achievements, Challenges and Coping Mechanisms, Contributing Factors

1. Introduction

Trends in International Mathematical and Science Study (TIMSS) 2013 showed that the Philippines has been the 41st out of the 45 participating countries. Also, the TIMSS-Advanced 2008 revealed that the country has been the 10th placer out of the 10 participating countries (DepEd, 2010). In the Philippines, the quality of math and science education is somewhat better in higher education. The country ranked 67th of 140 countries in quality of math and science education in the 2015-2016 Global Competitiveness Report of the World Economic Forum, and 79th of 138 in the 2016-2017 data. Still, the country is taking its step in firming its education scheme (Dela Cruz, 2017).

Most students encounter excessive pressure to prosper in Mathematics, which is one of the core subjects in the K to 12 curriculum. Local studies showed that Filipinos have poor performance in Mathematics. Mathematics Teachers Association of the Philippines (MTAP) found out that out of 50 questions, secondary students can answer about only 16 questions correctly (Sultura, 2018). In this study, those students who joined and won regional, national and international competitions in the subject are referred to as the Mathematics achievers.

This is a qualitative case study focusing on the Mathematics achievers in the secondary level within the province of Albay. The public secondary schools were chosen since majority of the students from public schools are from low-income and average-income families which make it harder for them, compared to students from private schools, to join competitions which require registration fees, food allowance, travel and other expenses. The study was also delimited to high school students since students from the secondary level obtain higher scores in Mathematics

competitions compared to the elementary level (Sultura, 2018). Therefore, their life stories and excellence could inspire the next generations to do better. Students from this level could also share significant experiences and tips/techniques in problem solving to the younger achievers.

A case study method is an intensive investigation of an individual, institution, community, or any group considered as a unit which includes the development, adjustment, remedial, or corrective procedures that suitably follow diagnosis of the causes of maladjustment or of favorable development (Calmorin, 1994).

The study determined the personal and socioeconomic background of the Albayano Mathematics achievers, their achievements and success stories, challenges faced and coping mechanisms, and the contributing factors along preparation, support system and motivation. Based from the results, a Mathematics enrichment program was developed for proposal to produce more Math achievers in the province.

The study was anchored to the attribution theory. Attribution theory deals with how the social perceiver uses information to arrive at causal explanations for events. It examines what information is gathered and how it is combined to form a causal judgment (Fiske & Taylor, 1991) Moreover, attribution theory is concerned with how and why ordinary people explain events as they do (McLeod, 2012). The study applied the concept of attribution theory by gathering data from the seven Mathematics achievers and utilizing the results to generalize how students grow into young modern mathematicians and why they pursued to achieve those awards in spite of the challenges faced.

Both the internal and external attributions were weighed on how they contributed to the success of the Math achievers. The internal attributions include their personality, attitude, learning styles, multiple intelligences, study habits and personal motivation. On the other hand, the external attributions are the people/institution who played significant roles throughout their journey. These include their preparation, support system and extrinsic motivation. Their coach/es, teachers, school principals, friends and classmates were interviewed to gather sufficient information for the study. The roles played by other people/institution from their municipalities were also carefully considered.

The study investigated on how these attributions caused the challenges or successes that they had before, during and after joining regionwide, nationwide or global wide Mathematics competitions. Information on how the respondents overcame the challenges that they met and how they attained success were solicited.

2. Methodology

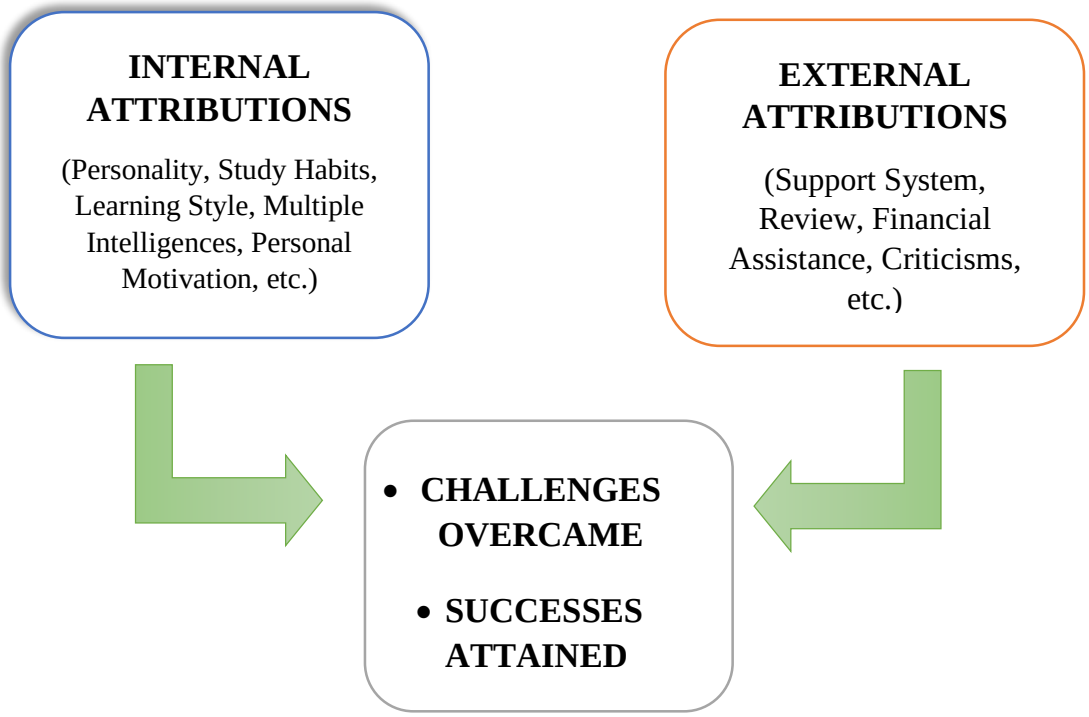

Figure 1: *Theoretical Paradigm*

2.1 Research Design

This qualitative study employed a case-study research on Mathematics achievers from selected public secondary schools in Albay. It involved the search for relevant profiles of the respondents, data analysis, and interpretation of the data gathered. By purposive sampling, seven Mathematics Achievers in the province were chosen. Respondent observation, personal interview, and accessible documents were used to triangulate the results of the study. They were observed during class hours and personally interviewed during their available time by the student

researcher through an interview guide which was prepared and validated. Database and awards received were also presented by the respondents during the interview proper.

The personal and socioeconomic background, achievements and success, challenges and coping mechanisms, and contributing factors to success of the Mathematics achievers were narrated through the "life story" approach. Life stories were written following the presentation of data based on the answers sought to the problems of the study.

2.2 Respondents

Respondents who won recently in the various Math competitions in the regional, national, or international level were chosen. The respondents of the study are Albayano secondary students who topped various Math contests from selected public secondary schools. They are the students, from Grade 7 to Grade 12, of those schools who successfully won selected contests in Math during their stay, as secondary students, in their respective schools. Non-random sampling was utilized in the study, specifically purposive sampling, to identify the desired respondents. Only those Math achievers who received a medal/merit award in the international level, and those who topped in the national or regional level were taken. Data were also collected from the teachers/coaches, friends/classmates, and relatives of the Math achievers.

2.3 Research Instrument

The research utilized a series of class observations and face-to-face interview method in gathering data guided by an evaluated questionnaire. A questionnaire-checklist was prepared and validated as interview guide. The interview proper was comprised of four parts: (Part I) Respondents' Personal, Socioeconomic Background, and Achievements, (Part II) Distinctive Characteristics of Respondents, (Part III) Contributing Factors to the Success of Math Achievers, and (Part IV) Challenges Faced by the Math achievers.

Under their personal background, the type of their learning style/s and the most dominant multiple intelligences that these young Mathematicians possess were included. To identify the learning style/s of the respondents, the study adopted the modality (learning preference) questionnaire by O'brien (1985) and for their multiple intelligences, the Multiple Intelligences (M.I.) Inventory by Walter McKenzie in 1999 was utilized.

The coaches, family members, and friends were also interviewed using separate interview guide questions. Most of the questions were open-ended to encourage the respondents to give as

much information that they can share to assure that all important details will be collected in the study.

2.4 Procedure

Appropriate letters requesting for the conduct of the study were sent to the Department of Education (DepEd), Albay Division and Ligao City Division, and to the respective principals of the schools attended by Mathematics achievers. After the submission and approval of the letters to conduct the study, class observations were scheduled. During their vacant period/s, the interview was conducted. The interview was documented using cellphone recorder, and camera. Important information were noted. Pictures were also taken for additional documentation. They were given the liberty to tell their life stories the way they wanted it to be as long as the essential information were given to answer the research questions.

The math achievers, coach/es, family member/s and principal were separately interviewed. Photos taken during the contest, their medals (if necessary) and certificates earned during the regional, national, or international competitions were also solicited.

During the interview, the tape-to-paper technique was used to record the responses. This technique enabled the author to play back testimonies given by the respondents and include some imperceptible responses. The results were consolidated and interpreted through tables. Pseudo names were used to assure utmost confidentiality and anonymity of the information gathered.

2.5 Data Analysis

Respondent observation, personal interview, and accessible documents were used to triangulate the results of the study. The narratives of the Math Achievers were preserved although revisions were done to conform to the flow of the discussion in the narrative of Mathematics Achievers in Albay: Stories of Challenges and Success. Content analysis of the success stories was done to present similarities and differences on the profiles of the successful contestants.

For analytical framework about profile and undertakings of the Albayano Math achievers, a questionnaire-checklist interview guide was developed to find out personal and socioeconomic background, achievements and success stories, challenges met and coping mechanisms, and contributing factors to success of said Math achievers. The interview guide is composed of open-ended questions to encourage maximum participation from the interviewees. Data collected were

organized in tables. Pseudonyms were used to assure utmost confidentiality and anonymity of the information gathered.

3. Results and Discussion

3.1 Personal and Socioeconomic Background

Table 1: *Mathematics Achievers' Personal and Socioeconomic Background*

CASE	GRADE LEVEL (CURRICULUM)	LEARNING STYLE/S	MULTIPLE INTELLIGENCES (MI)	TYPE OF FAMILY	AVERAGE MONTHLY INCOME
1: Maja	Grade 12 (STEM)	Visual	-Logical-Mathematical (5) -Naturalistic (3) -Musical (3) -Bodily-Kinesthetic (3) -Intrapersonal (3) -Linguistic (2) -Existential (2) -Interpersonal (2)	Extended	P60000
2: Stephen	Grade 12 (STEM)	Visual-Auditory		Grandparent	P50 000
3: Chin	Grade 10 (STE)	Visual		Nuclear	P40 000
4: Catriona	Grade 9 (STE)	Visual-Kinesthetic		Extended	P100 000
5: Sakura	Grade 9 (STE)	Visual		Grandparent	P50 000
6: Thor	Grade 12 (ABM)	Visual		Nuclear	P20 000
7: Patchi	Grade 12 (ABM)	Visual		Nuclear	P30 000

The data gathered revealed that regardless of his/her gender, a student from the top section of their batch could be a Mathematics achiever. Also, the Mathematics achievers were dominantly visual learners. The study habits of the achievers follow their learning styles and dominant multiple intelligences.

Lastly, students can be achievers in Mathematics regardless of the type and socioeconomic status of their families. Joining competitions regionally and internationally was made possible for them due to some contributing factors (discussed on Contributing Factors to Success).

3.2 Achievements and Success Stories

The succeeding pages features some of the remarkable words behind the success of the seven Albayano math achievers.

3.2.1 Case 1: Maja

Maja, a seventeen-year-old half Filipino and half Mauritian, is a Grade 12 STEM student from High School 1. She is a gold medalist (team orals category) and silver medalist (individual written category) in the 2016 Regional Inter Grade 10 Sci-Math Competition. She is also a qualifier in the 2014 Regional Patiribayan.

…Even a mathematics achiever fails at times. Maja lost some of her previous contests. *"Right after the contest, I am in denial of the result. If only I should have done this and that. But still, in the end I accept defeat and made it an inspiration to do better next time."*

3.2.2 Case 2: Stephen

Stephen, a Grade 12 Science, Technology, Engineering and Mathematics (STEM) student of High School 1, was born in Tuburan, Ligao City. He is an eighteen-year-old Filipino student in the third district of Albay. Stephen is a gold medalist in the 2017 AlaMATH (An Albay-wide Mathematics Quiz Contest for High School Students) and a qualifier in the 2016 Regional Patiribayan- Grade 10 Division Team Orals.

"If you believe in yourself, it can surely help with your self-esteem during the contest." . . . *"I motivate myself by thinking of the best outcome that may happen."*

3.2.3 Case 3: Chin

Chin, a sixteen-year-old Filipino-Chinese Grade 10 Science, Technology, Engineering (STE) student from High School 2, has been awarded a gold medal from the 2017 MTG-International Math Open for Young Achievers (IMOYA) and received another gold medal during the 2016 MTG- International Mathematics Wizards Challenge (IMWiC).

...Chin is self-motivated in joining and winning math contests. According to her, "*By being motivated, I am more determined to solve problems no matter how long it would take."* She gets herself motivated by knowing the outcome of what she can achieve once she gives her best and prepares well. Chin knows that there's good in taking risks and said, "*I'll know what the outcome would be if I just try."*

Chin would like to encourage her fellow students, especially the younger ones to love and enjoy the subject. *"At the start of the early age, kids must learn to enjoy the Mathematics. Then,*

they'll find numbers and problems really interesting as they grow old."

3.2.4 Case 4: Catriona

Catriona is fifteen-year-old Grade 9 Science, Technology and Engineering (STE) student of High School 2, Ligao City, Albay. She earned silver medals from the 2018 Asia International Mathematics Olympiad (AIMO) individual written category and the 2017 International Mathematics Open contest for Young Achievers (IMOYA) team written category. She is a former gymnast, a dancer, and a beauty queen. Catriona is the 2018 Miss Kaogmahan of the High School 2.

…When asked about how she motivates herself she had these statements: *"I have lost here, I'll do better next time..."; "I lost here and I accept It."; "I need to be better."* She has a positive view on her failures and uses these to achieve more. Catriona further said*, "Once you lost a fight, never think that it's the end of the line. Know that better things are coming. One must continuously work for success."*

3.2.5 Case 5: Sakura

Sakura is fifteen-year-old Grade 10 Science, Technology, Engineering (STE) student of High School 3. She is a silver medalist in the 2018 Asia International Mathematical Olympiad (AIMO) held in Bangkok, Thailand…

Sakura said, *"For me, students must listen during the class discussion because most Math teachers are good. If they cannot clearly understand, then they can browse the internet or ask for help." "If you really want to learn, there are many ways. Learning originates from one's self."* She also wants to inspire her fellow students, *"Never stop learning", "Do not settle for what you know already, learn and discover more on advanced topics."*

3.2.6 Case 6: Thor

Thor is an eighteen-year-old Filipino 12th grader of High School 4 under the Accountancy, Business and Management (ABM). He is a bronze medalist in the 2017 International Math Open for Young Achievers (IMOYA)…

…When asked about his inspiration and his main source of motivation, Thor replied, *"From my family and the other people who helped me because if not for them, it is impossible for me to join the competition."* And he did it! Thor took home a bronze medal from the IMOYA held in Singapore last September 2017.

…Thor wants to inspire his fellow students. *"For those students, they just need to be confident and self-motivated", "If you are self-motivated, you'll be inspired to do your best. In other terms, if you are self-motivated, you know in yourself that you can do anything."* He further added, *"All they just need is to trust themselves because if they don't believe themselves, who else will believe their abilities? If you want them to believe in you, you must first believe in yourself."*

3.2.7 Case 7: Patchi

Patchi is a Filipino Grade 12 ABM, student of High School 4. He is a merit awardee in the 2017 International Mathematics Competition (IMC). The eighteen-year-old student came from a simple family in Libon, Albay.

He shares tips and techniques on how to easily solve problems presented in the said competition. *"For me, the best technique in Math is practicing. You should practice your brain in solving problems."*

Patchi experienced criticisms from other people. He was compared to the other contestant who joined a different international contest and managed to gain a medal. Despite that, he remained silent and optimistic because he knows what truly happened during the contest which wasn't witnessed by these people. *"I have learned that not all the time, the favor is yours. You have to learn to accept and do better next time."*

He ended the interview by inspiring his fellow students: *"Students must not be afraid of Mathematics. They must learn to dream high and to exert corresponding efforts. Be positive and remember that there's always something to be thankful for."*

Pseudonyms were used to protect their identities. They were given based on the Math achievers' hobbies and talents. The first case is a dancer, named after an actress-dancer Maja Salvador. Second case is a sporty student named as Stephen from the star player of the Golden State Warriors basketball team. The third Math achiever is a Filipino-Chinese student. She was named as Chin, short for Chinese. Fourth respondent is a beauty queen of their school and named after Catriona Gray. The fifth case is an anime lover, so was named after Card captor Sakura. Thor, the sixth achiever, loves watching sci-fiction movies. And the last Math achiever is a chocolate lover, so he was named after the Lebanese chocolates, Patchi.

3.3 Challenges and Coping Mechanisms

Table 2: *Challenges Faced and Coping Mechanisms of Mathematics Achievers*

CASES	CHALLENGE/S	COPING MECHANISM/S
1: Maja	-Anxiety -Nervousness -Disappointment	-Positive Mindset -Go with the flow -Support from family and friends
2: Stephen	-Tardiness -Hunger -Disappointment	-Relaxing -Being emotionally stable
3: Chin	-Anxiety	-Self Motivation
4: Catriona	-Insufficient Knowledge -Nervousness -Tension	-Intensive Review -Proper Time Management
5: Sakura	-Financial Problem -Family Issues -Anxiety	-Solicitations done by her Coach -Guidance and Support by her Coach (explained to her father her ability and great opportunity through the contest)
6: Thor	-Financial Problem -Nervousness	-Moral/Financial Support -Inspiration (the whole community of Libon)
7: Patchi	-Financial Problem -Insufficient Time to Review -Sudden Changes to the Contest Level during the contest (from Grade 10 down to Grade 9) -Criticisms after the Contest	-Maintained Positive Mindset -Asked for God's Guidance

The major challenges faced by Math achievers in joining regional, national or international competitions were financial problem and anxiety. They overcome these challenges through financial support from concerned people/institutions and practicing positivism. They were also both highly motivated in overcoming all struggles met.

3.4 Contributing Factors to Success

Success could not be attained solely by the Mathematics achievers themselves. There were other factors which contributed to their successes. These factors were the preparation, support system and motivation. Each of the contributing factors were carefully investigated. The patterns, similarities and variances, and how these led the Math achievers to success were also discussed.

Table 3: *Contributing Factors to the Success of Math Achievers*

CASE	PREPARATION		SUPPORT SYSTEM				MOTIVATION
	Coach/es	Start of Review	Family	Friends	School	Others	
1: Maja	1	3 days before	-Moral Support -Financial Support - Motivation	Motivation	Review	--	Motivated intrinsically and extrinsically.
2: Stephen							
3: Chin	10	1-2 Months Before			-Financial assistance -Review	-Financial assistance	
4: Catriona							
5: Sakura	1	As early as she learned about the contest					
6: Thor	1	3-4 months before		-Motivation -Voluntary Financial Support			
7: Patchi	1						

Results suggested that greater number of coaches for longer time of review assure better performance in Math competitions. When the school (external) is motivated in maintaining good performance and gaining/regaining trust, and teachers/coaches (external) were also motivated in helping showcase talents for professional growth and satisfaction, opportunities are widely opened to students from public schools who have the abilities and the confidence (intrinsic motivation) to join and win Mathematics competitions not just regionally, but also nationally and internationally.

3.5 Mathematics Enrichment Program

As an off-shoot of the research, a Mathematics enrichment program entitled Project MATHulungin was proposed. The project is to primarily let the Albayano Mathematics achievers to return the favor by being part in the production of more achievers in the province. The findings of the study showed that the biggest hindrance met in joining Math competitions was the financial side. A plan was thought of where this financial assistance can be maximized, benefiting more students with potentials of being Math achievers across the province. Their school's Parent-Teacher Association (PTA), local government units, government officials and community will be gathered together to serve as the financial budget of the proposed project.

The mathematics enrichment program is like a series of tutorial classes where students who won medals and merit awards from regional, national and international competitions will

share their knowledge and expertise to help students from the same year level who have the potential skills of being the next competitors. Students with final grades of 90 and above in Math will be qualified to attend project MATHulungin. Opportunities for improving their capacities and early preparation for upcoming competitions will be offered to them. The enrichment program will address their main concern, which is financial incapacity, since it is free of any charge and based on academic performance instead. Project MATHulungin aims to initially prepare and expose the participants to specialized topics and questions from Math contests. The enrichment program is to develop their higher order thinking skills for them to be globally competitive.

4. Conclusion and Recommendation

Based from the results of the study, it can be inferred that opportunities to join Math competitions were based on the efforts of the coach/es and priorities of the school where the students are enrolled. Regardless of their curriculum, students could successfully win regional and international competitions depending on the quality and length of review that they have received. Both genders were equally good in Math and majority of the achievers were dominantly visual learners. The study habits of these achievers follow their learning style/s and dominant multiple intelligences. Students could be achievers regardless of the type of their family, source of living, number of siblings, and families' average monthly income. Results further showed that the present generation of the Math achievers compete well in regionwide, nationwide and global wide competitions. The common challenges faced in joining competitions were financial problem and anxiety. These challenges were overcome through support and motivation from the schools, teachers/coaches, families, and other concerned people/institutions of the community. Greater number of coaches for longer time of review assured better performance in Math competitions. When the school (external) was motivated in maintaining good performance and gaining/regaining trust, and when teachers/coaches (external) were also motivated in helping showcase talents for professional growth and satisfaction, opportunities were widely opened to students from public schools who have the abilities and the confidence (intrinsic motivation) to join and win Mathematics competitions regionally, nationally and internationally.

The researcher recommends that: (1) There must be continuous profiling of the subsequent Mathematics achievers in Albay for posterity as their life stories would make good reading materials for other students who are newbies in joining competitions as well as for the all the students who are daily challenged by the subject. (2) More trainings about coaching students for competitions must be given to teachers for them to be more competent and skilled enough in unraveling the potentials of the student mathematicians. (3) The organizers of awarding bodies and other government agencies should be more concerned in giving rewards and assistance to these hardworking students. (4) More Mathematics enrichment programs must be developed and proposed to help in showcasing extraordinary skills and in producing globally competitive student mathematicians.

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