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Factors That Affect the Performance of Selected High School Students from The Third District of Albay In International Mathematics Competitions

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ABSTRACTS

This study focused on selected Albayano high school students who have been consistent contestants of their school in various Mathematics competitions. They were the ones who joined competitions internationally. Five Albayano students were interviewed and asked about the factors that affect their performance as they join contests in Mathematics. Classroom observations and interviews were conducted to answer the sub-problems. Results of the observations and interviews were analyzed and organized to distinguish the factors that affected their performance before, during and after the competition. Findings showed that the efforts of coaches, priorities of schools and community, their learning style, dominating multiple intelligences, and study habits were some of the factors that positively contributed to their performance in joining Mathematics competitions. They were also highly motivated both intrinsically and extrinsically, practicing positivism, and confident. Whereas financial problem and anxiety are the factors which at some point hinders their success as they participate in the said contests. These were the factors that affected the performance of the selected high school students in participating to different international Mathematics competitions.

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1. INTRODUCTION

Mathematics competitions, together with the people and organizations engaged with them, form an immense and vibrant global network today. This network has many roles. Competitions help identify students with higher abilities in mathematics. They motivate these students to develop their talents and to seek professional realization in math.

Math competitions provide a place for showcasing talent in a rigorous, enjoyable, and structured setting. Math contests are one of several opportunities for students to display their intellectual capacity and dedication to the subject (Lubinski & Benbow, 2006). Students will improve their math skills through practice and preparation, which will also improve their grades, exam results, and standardized test scores. Students will also be able to build critical thinking and computational abilities that will serve them well throughout their life.

Competitions have positive impact on education and on educational institutions (Van Nuland *et al*., 2015). Every year, hundreds of tournaments and competition-like events with regional, national, and international significance are organized and attended by millions of students, teachers, research mathematicians, educational authorities, and parents. Even more numerous are the books, journals, and other printed and electronic materials available to assist students and mentors in preparing for various competitions.

In Asia, mathematics is viewed as one of the most critical subjects wherein students are encouraged to study the discipline (Leatham & Peterson, 2010). In the Philippines, mathematics is a general education subject in primary and higher education where learners are expected to gain understanding and appreciation of its principles as an applied-using appropriate technology in problem-solving, critical thinking, communicating, reasoning, making connections, representations, and decisions in real life (K to 12 Basic Education Curriculum).

Eessential hence required as a subject almost in every field. However, problems related to mathematics achievement are still evident not only in the Philippine setting but also right in other countries. In the Philippines, educational modules in Mathematics feature a specific topic and instructional plan requirements to enable understudies to develop consistent and numerical abilities required to grasp fundamental mathematical ideas. However, there is still evidence of poor performance in this area.

Trends in International Mathematical and Science Study (TIMSS) 2013 showed that the Philippines has been the 41st out of the 45 participating countries (Song *et al*., 2013). Also, the TIMSS-Advanced 2008 revealed that the country has been the 10th placer out of the 10 participating countries. 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.

Various factors influence students' mathematical performance, as seen by their grades. The same concept applies for their performance in Mathematics competitions. Among the different aspects, this research will focus on both the factors that led to their success and the factors that prevented them from performing well during the competition.

This is a qualitative case study focusing on the selected Mathematics student contestants in the secondary level within the province of Albay, Philippines. 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

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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. Therefore, their significant experiences can determine more factors that positively and negatively affected their performance before, during and after the competition.

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. The study determined the factors that affected the performance of the selected Mathematics student contestants in the various international Mathematics competitions that they have joined.

The study was anchored to the attribution theory (**Figure 1**). 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. Moreover, attribution theory is concerned with how and why ordinary people explain events as they do. The study applied the concept of attribution theory by gathering data from the seven Albayano Mathematics student contestants and utilizing the results to generalize on the factors that serve as driving force for them to continue pursuing to achieve those awards in spite of the challenges faced, the hindering issues.

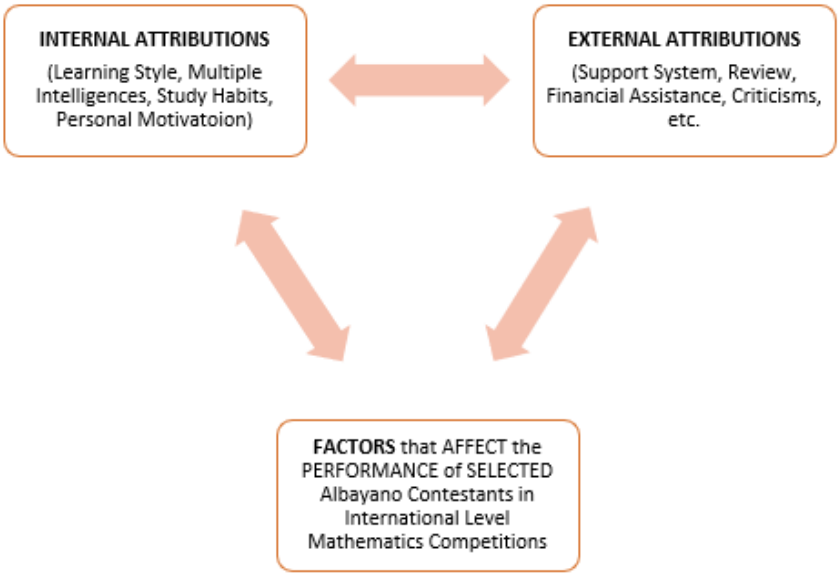

Figure 1. Theoretical Paradigm.

Both the internal and external attributions were weighed on how they contributed to the overall performance of the Math contestants. The internal attributions include their 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. 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 affected the student contestants before, during and after joining regionwide, nationwide or global wide Mathematics competitions.

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Information on the positive and negative factors that affected the respondents' performance were solicited.

2. METHODS

2.1. Research Design

This qualitative study employed case-study research on selected Mathematics student contestants from selected public secondary schools in Albay, Philippines. It involved the search for relevant profiles of the research respondents, data analysis and interpretation of the data gathered. The seven Albayano Mathematics contestants were chosen by purposive sampling. To triangulate the results of the study, the researcher made use of respondent observation, personal interviews, and accessible documents. The respondents were observed during class hours and were personally interviewed using a researcher made interview guide that was validated. The student contestants also presented their supporting documents and awards received during the interview proper.

2.2. Respondents

The researcher purposively chose respondents who recently won in the various Mathematics competitions in the international level by the time that the study was being conducted. They are Albayano secondary students, from Grade 7 to Grade 12, who topped various Mathematics contest from selected public secondary schools. These student contestants have successfully won selected competitions in Math during their stay, as secondary students, in their respective schools. To identify the desired respondents, only those Math competitors who received a medal/merit award in an international level competition were taken. Additional data were also solicited from the mentors/teachers, friends/classmates, and family members of the respondents.

2.3. Research Instrument

The study made use of the face-to-face interview approach, guided by a prepared and validated interview questionnaire guide, paired with series of classroom observations. The interview proper was divided into four parts: (1) Respondents' Profile, (2) Successfully Won Competitions, (3) Distinctive Characteristics of Respondents, and (4) Contributing and Hindering Factors Encountered before, during, and after the Competition.

Part of the distinctive characteristics of respondents were the type of learning styles and the most dominant multiple intelligences that they possess. To successfully identify the learning style/s of the student contestants, the research adopted the Modality (Learning Preference) Questionnaire. For their multiple intelligence, the study utilized the Multiple Intelligences (M.I.) Inventory by Walter McKenzie in 1999.

To solicit more data, the mentors, classmates and friends, and significant family members were also interviewed using a separate set of interview guide questions. Most of the questions used were open-ended to assure that the respondents would provide as much information that they can. The separate interviews and semi-structured interview guide were implemented to assure that all important details deemed significant in this research would be collected, which includes the factors that both positively and negatively affected the respondents.

2.4. Procedur

The researcher started by sending appropriate letters to the Department of Education (DepEd), Albay Division and Ligao City Division, requesting for the conduct of the study.

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Letters asking for permission to implement the study were also sent to the respective school heads of the selected schools attended by the target respondents. Following the submission and approval of the request letters, classroom observations were scheduled. The respondents were observed during classroom discussions with their respective Mathematics teachers and classmates. After observing, a separate schedule for the conduct of interview was set during their available time. The face-to-face semi-structed interviews were documented using smartphone voice recorder, and camera for taking photos. Substantial details were carefully taken down and photos of the respondents and their awards were taken for documentation purposes. They respondents were interviewed with liberty, letting them share their experiences the way they wanted it to be, as long as the needed data were given.

Separate interviews were done for the Math contestants, their coach/es, classmates/friends, and family members. With granted request, photos taken during the competition, their medals and certificates earned during the international Mathematics contests were personally presented. The tape-to-paper technique was utilized to record the responses, enabling the researcher to play back testimonies given by the respondents and include some imperceptible answers. Results were then consolidated and interpreted through tables. The researcher used pseudo names to assure utmost anonymity and confidentiality of the data collected.

2.5. Data Analysis

Respondent observation, personal interview, and accessible documents were used to triangulate the results of the research study. Content analysis of the responses was done to identify patterns and similarities on the factors that affected their performance by either contributing or hindering their success before, during and after participating a Mathematics competition.

3. RESULTS AND DISCUSSION

3.1. Respondents' Profile

The data gathered revealed that most of the research respondents were from the junior and senior high school level during the time of the conduct of the study. All of them were from selected public high schools in the third district of Albay, Philippines. **Table 1** shows that regardless of the type of family they were in, and their family's socioeconomic status, the students were able to successfully participate Mathematics contests. Joining such competitions were made possible for these respondents due to some contributing factors (discussed on Contributing and Hindering Factors Encountered before, during, and after the Competition).

Table 1. Profiles of selected mathematics student competitors in Albay, Philippines.

Case	Grade Level	School	Type of Family	Average Family's Monthly Income (In Philippine Peso)
Student A	Grade 10	High School 1	Nuclear	P40 000
Student B	Grade 9	High School 1	Extended	100 000
Student C	Grade 9	High School 2	Grandparent	50 000
Student D	Grade 12	High School 3	Nuclear	20 000
Student E	Grade 12	High School 3	Nuclear	30 000

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3.2. Successfully Won Competitions

Pseudo names were used to protect their identities. All the respondents successfully earned awards and medals in the various international competitions that they have participated from year 2016 to 2018. (see **Table 2**).

Table 2. International Math Competitions participated, and Awards received.

Case	Competition	Level	Award/S Received
Student A	2017 MTG- International Math Open for Young Achievers (IMOYA)	International	Gold Medalist
	2016 MTG- International Mathematics Wizards Challenge (IMWIC)		Gold Medalist
Student B	2018 Asia International Mathematics Olympiad (AIMO)	International	Silver Medalist (Individual Category)
	2017 MTG- International Math Open for Young Achievers (IMOYA)		Silver Medalist (Team Written Category)
Student C	2018 Asia International Mathematics Olympiad (AIMO)	International	Silver Medalist
Student D	2017 MTG- International Math Open for Young Achievers (IMOYA)	International	Bronze Medalist
Student E	2017 International Mathematics Competition (IMC)	International	Merit Awardee

3.3. Distinctive Characteristics of Respondents

The data revealed that the Albayano Mathematics competitors came from the Science, Technology and Engineering (STE) curriculum for junior high school level and Accountancy, Business and Management (ABM) strand for senior high school. They were dominantly visual learners. Their study habits were associated to their learning styles and dominant multiple intelligences (see **Table 3**).

Table 3. Respondents' Learning Styles and Dominant Multiple Intelligences.

Name	Curriculum	Learning Style	Dominant Multiple Intelligence/S
Student A	STE	Visual	Logical-Mathematical, Linguistic, Musical
Student B	STE	Visual-Kinesthetic	Logical-Mathematical, Bodily Kinesthetic, Intrapersonal
Student C	STE	Visual	Logical-Mathematical, Linguistic, Interpersonal
Student D	ABM	Visual	Logical-Mathematical, Existential, Musical
Student E	ABM	Visual	Logical-Mathematical, Interpersonal, Naturalistic

3.4. Factors That Affected Their Performance Before, During and After the Competition

The mathematics contestants from the third district of Albay were highly motivated in participating and winning the various international Mathematics competitions. Their wins will not be possible with them alone. There were other factors which contributed to their successes. These contributing factors were the ample preparations done, support system and motivation, both intrinsic and extrinsic.

The major hindering factors faced by the selected Albayano Math contestants in joining international competitions were financial problem and anxiety. They overcome these through financial support from concerned people/institutions and practicing positivism. The mathematics contestants from the third district of Albay were highly motivated in overcoming all the hindering factors and were strengthened by the contributing factors (see **Table 4**).

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Table 4. Contributing and hindering factors encountered.

Case	Attribution	Contributing Factors	Hindering Factors
Student A	Internal	• Intrinsically Motivated	Anxiety
	External	• Moral Support, Financial Support and Motivation from the Family. • Months Extensive Review, with 10 coaches. • Motivation from friends/classmates. • Financial assistance from the school and concerned individual/institutions	
Student B	Internal	• Intrinsically Motivated	• Insufficient Knowledge • Nervousness • Tension
	External	• Moral Support, Financial Support and Motivation from the Family. • 1-2 Months Extensive Review, with 10 coaches. • Motivation from friends/classmates. • Financial assistance from the school and concerned individual/institutions.	
Student C	Internal	• Intrinsically Motivated	• Anxiety
	External	• Moral Support, Financial Support and Motivation from the Family. • Reviewed as early as she learned about the competition, with 1 coach. • Motivation from friends/classmates. • Financial assistance from the school and concerned individual/institutions.	• Financial Problem • Family Issues
Student D	Internal	• Intrinsically Motivated	• Nervousness
	External	• Moral Support, Financial Support and Motivation from the Family • 3-4 Months Review, with 1 coach • Motivation and voluntary Financial Support from friends/classmates • Financial assistance from the school and concerned individual/institutions.	• Financial Problem
Student E	Internal	• Intrinsically Motivated	
	External	• Moral Support, Financial Support and Motivation from the Family. • 3-4 Months Review, with 1 coach. • Motivation and voluntary Financial Support from friends/classmates. • Financial assistance from the school and concerned individual/institutions.	• Financial Problem • Insufficient Time for Review • Sudden Changes in the Level to compete during the competition • Criticisms after the Competition

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4. CONCLUSION

Based on the results of the study, it can be inferred that regardless of their curriculum, students could successfully win international level competitions depending on the quality and length of review that they have received. The study habits of the respondents followed their visual learning style, and dominant multiple intelligences such as logical-mathematical, linguistic, etc. The respondents were able to counterfeit the hindering factors along the way by being motivated and focusing on the contributing factors in their successful wins.

The findings also indicated that having a greater number of coaches for a longer period ensures better achievement in Math contests. When a school (external) is motivated to maintain good performance and gain/regain trust, and teachers/coaches (external) are motivated to help showcase talents for professional growth and satisfaction, opportunities for students from public schools who have the abilities and confidence (intrinsic motivation) to compete and win international Mathematics competitions are widely opened.

The researcher recommends that: (1) There must be continuous profiling of the subsequent Albayano mathematics student contestants as their experiences would be of great basis for the factors affecting their performance, which must be greatly considered in strengthening and improving the performance of such students in joining international Mathematics contests. (2) More trainings on coaching students for international competitions must be given to teachers for them to be more skilled and competent enough in unraveling the potentials and preparing the student competitors. (3) The organizers of awarding bodies and other concerned agencies should be more concerned in providing assistance and rewards to these students representing and bringing honor to the country.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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