

A Meta-analysis on the Factors Influencing the Mathematics Achievement of Students

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ABSTRACT

This studies the performed researches alongside determinants of Mathematics success of college students with inside the different State Universities and Colleges (SUCs) with inside the Philippines-Region I from the years 2007 to 2016 thru a meta-analysis approach.

The following are the findings of the study. The determinants of arithmetic success of college students have the maximum wide variety of researches performed via way of means of graduate arithmetic college students from the years 2007 to 2016. Most of the diagnosed demographic elements showed a small to very small impact length index. High college popular average, grade factor average, college front examination; and a wide variety of years coping with the topics have massive to very massive impact length estimates.

Keywords: Effect size estimate, graduate mathematics theses, heterogeneity test and socio-demographic profile, meta-analysis.

1. INTRODUCTION

Improving training is one of the essential worries of the prevailing management and a lot of factors must be taken into consideration with a view to accomplish such a thing. We have to illustrate and apprehend what we need to change. This is why the government and intellectuals are making researches and create new theories and ideas as their manual on such circumstances.

Research assists instructors apprehend what techniques in coaching works and the way those works. It must be destiny-oriented and designed to advantage rookies in place of the researchers themselves. Policymakers apprehend what the quick and long-time implications are, and offer justification and reason for making judgments and actions.

On one side, with inside the Philippines, much research carried out targeted at the set of things or

variables that could probably have an effect on the mathematical overall performance or achievements of college students. Researchers generally need to understand what unique issue promotes fulfilment of college students in arithmetic. Though many elements were taken into consideration,

hypothesized, and researched upon, there are nonetheless inconsistencies at the outcomes. There are instances that the end result of one take a look at enhances the outcomes of others, however often outcomes contradict each different. This is the motive why researchers appear to be putting on an entire photo of the instructional fulfilment of college students.

Based on foregoing scenarios encountered, the researcher desires to decide sincerely the repute of arithmetic researches especially in Region I and need to understand the capacity elements influencing the arithmetic overall performance of college students thru a meta-analysis take a look at. Meanwhile, meta-analysis is a manner of reviewing researches and taken into consideration as a quantitative take a look at in which a fixed of statistical techniques is used to summarize and synthesize the outcomes of some of independently carried- out studies research. If achieved well, it may be very treasured to a researcher as it presents an intensive bibliography of present studies on a subject at the same time as additionally offering a mixed evaluation of the outcomes of a number of research.

Archa (2008) carried out a take a look at the meta-evaluation the usage of the Glass' Meta-evaluation concerning the effect of instructors on scholar fulfilment and on different factors of training. The take a look at taking into consideration the outcomes of a big number of researches at the impact of trainer credentials and traits at the scholar fulfilment within side the Philippines and have been decreased thinking about only research that has been posted and carried out within side the Philippines. The correlation coefficient became used as a degree of impact length within side the take a look at. It became concluded from the meta-

assessment done that after the pattern length is sufficiently big, outcomes could be usually steady with the panel, longitudinal data at the consequences of trainer credentials on scholar fulfilment, i.e., trainer credentials do now no longer, in general, have an effect on scholar fulfilment.

The take a look at carried out with the aid of using Chuanchai (1989) became to synthesized the findings of research evaluating the instructional fulfilment of topics taught with the aid of using individualized guidance and people taught with the aid of using the traditional method, the usage of Glass' meta-analytic technique. Teaching effectiveness became measured in phrases of impact length, a standardized difference among the individualized and the lecture classes.

The pattern of this take a look at protected 124number one research carried out in Thai faculties all through the duration 1963 to 1987. A study's precis shape became used to code the studies take a look at in step with its important traits and its methodological traits. Then the impact sizes have been calculated.

The aforementioned research carried out inform us that engaging in meta-analytic studies is useful for us educators due to the fact, we do radical studies evaluate the literature. The foremost awareness of this kind of take a look at is to provide a precis and synthesis approximately the carried out theses and dissertations of graduate research alongside arithmetic training of SUCs in Region I. It will similarly pick out regions of worries which might be over studied and what to be targeted in engaging in destiny researches. Hence, these studies could be very beneficial especially researchers in selling new understanding and records approximately arithmetic training.

2. OBJECTIVES OF THE STUDY

This take a look at analyzed finished graduate mathematics researches in State, Universities and Colleges (SUC) in Region I. Specifically, the researcher characterized the graduate researches along determinants of mathematics achievement of college students. The researcher also looked into the effect sizes of the researches to synthesize the findings.

3. METHODOLOGY

The researcher made use of the descriptive-quantitative technique of studies to systematically evaluate and examine the finished theses in arithmetic training from the SUCs in Region I supplying graduate training programs.

The descriptive technique of studies become used with inside the observe because it includes collecting statistics with the aid of using going over and inspecting finished researches with inside the graduate degree. It additionally offers a correct

description or picture of the fame or traits of the researches performed (Burke, et al. 1941).

It is likewise a quantitative study, as it specializes in checking out theories and hypotheses, using quantitative information to look if they may be showed or now no longer (Burke, et al. 1941). It additionally includes numerous statistical tactics in reviewing and reading the finished researches, in particular, it used the meta-analysis approach.

The finished researches have been taken from all graduate research libraries of the kingdom universities and schools in Region I for the duration of the years 2007 to 2016.

To arrange the meta-anlysis procedure, the researcher recognized the unit of evaluation. The unit of evaluation of the researcher have been the finished theses and dissertations of graduate arithmetic training of SUCs in Region I. After which, the researcher retrieved the lists of the researches considering right tactics and ethics.

The ninety-two researches of the graduate mathematics college students have been thoroughly screened following the inclusion and exclusion standards. For the inclusion and exclusion, these researches have been subjected to screening tactics. First, research performed for the beyond 10 years have been protected for the second one screening, which offers enough information to be reviewed and analyzed. Other researches that did now no longer meet the set standards have been mechanically being excluded. The end result of the inclusion and exclusion of researches, the researcher got here up with the most effective 35 to be had research for the evaluation. Moreover, the outcomes have been extracted, coded, and recorded via using a built Research Summary Form.

In the collection of statistics, the researcher characterized the protected researches as to year while the studies become performed, instructional degree of the topics, locale wherein the studies become performed, kind of college wherein the topics have been taken, studies layout used, studies instrument/s used, and wide variety of topics used. After characterizing the researches, the researcher focused on synthesizing the findings of the researches via the meta-analysis approach.

4. RESULTS

4.1. Characteristics of graduate Mathematics researches in Region I

Table 1 presents the distribution of the 35 identified graduate mathematics researches along determinants in mathematics performance and achievement of students.

It shows that nine or 25.71 percent of the researches were produced in the mind of 2007-2016. In the years 2009 to 2010 and 2015 to 2016, state universities and colleges produced six or 17.14 percent researches, respectively. It can be

gleaned from the table that researchers used secondary students in their researches as manifested in the frequency value of 17 or 48.57 percent. This indicates that majority of the graduate mathematics education students in the region who conducted determinants of mathematics achievement of students are secondary teachers. The table exhibits that most of the researches are located from the province of Ilocos Sur. It is observed that most of the researches are located from the province of Ilocos Sur. It is observed that

most of the researches used public schools as locale for the study.

Meanwhile, most of the researches used a descriptive-correlational research as their research design. Almost all of the researches used personal information sheets and achievement test to determine the profile of the respondents and their level of performance or achievement. The table further shows that 10 (28.57%) researches used 200-274 number of subjects while 1 (2.86%) research only used 300 and above.

Table 1.

Distribution of the Identified Characteristics of the Selected Researches

Characteristics	f n=35	% 100
Year when the research were conducted		
2007-2008	7	20.00
2009-2010	6	17.14
2011-2012	9	25.71
2013-2014	7	20.00
2015-2016	6	17.14
Educational level of the subjects		
Elementary	3	8.57
Secondary	17	48.57
Tertiary	15	42.86
Locale where the researches were conducted		
Ilocos Norte	5	14.29
Ilocos Sur	28	80.00
La Union	1	2.86
Others	1	2.86
Type of school where the subjects were taken		
Public	29	82.86
Private	5	14.29
Research design used		
Descriptive- Correlation	32	91.43
Descriptive- Correlation with comparative	3	8.57
Research instruments used		
Constructed information sheets and achievement test	34	97.14
Constructed information sheets and achievement	1	2.86
Test with retrieval of public documents		
Number of subjects used		
50-124	8	22.86
125-199	7	20.00
200-274	10	28.57
275-349	9	25.71
350-425	1	2.86

4.2. Effect size Estimates for Researches along Determinants of Mathematics Achievement Results of Heterogeneity Test in the Effect Sizes

4.2.1. Student-Related Factors (St-RF)

According to Rosenthal (1991), r is the widely used index of effect that conveys information both on the magnitude of the relationship between variables and its direction.

It can be gleaned from Table 2 that the two examined St-RF namely school entrance examination and grade point average showed a very large amount of effect size estimates of 0.79 and 0.72, respectively.

Moreover, the high school general average, shows a large ES estimate of 0.55.

The reason behind this very large amount of ES estimates is that there is no shared variance among

these factors. It means that the three identified factors only have one study underlying in them. Another reason is that the computed r is high and in this study the researcher used the r coefficient as an ES; therefore, the effect size estimate is also high. The factors sex, age, average grade in previous years, type of high school graduated from, exposure to media, time schedule, rank in the family, and participation in an organization showed a small amount of ES as seen in their average ES values of 0.11, 0.16, 0.12, 0.15, 0.19, 0.22, and 0.17 respectively.

Meanwhile, the researcher also found out that other factors in the St-RF such as type of elementary school graduated from, time spent in studying, learning styles, height, weight, exposure to technology, civil status, and the number of mathematics subjects taken had very small average ES of 0.08, 0.09, 0.06, 0.01, 0.008, 0.06, 0.01, and 0.05 respectively.

Going deeper, there are factors that undergone subgrouping/reclassification using moderator variables due to a high variation on the ES when heterogeneity test was administered

Table 2.
Combined Effect Sizes of the Student-Related Factors across Researches

Variables	ES	Description
<i>Student-Related Factors</i>		
Sex	0.11	Small
Age	0.16	Small
Average grade in previous years	0.12	Small
Type of high school graduated from	0.15	Small
Type of elementary graduated from	0.08	Trivial/Very Small
Exposure to media	0.19	Small
Print media exposure		
Moderated by		
Year when the researches were conducted (2007-2008)	0.10	Trivial/Very Small
Educational level of the subjects (Secondary)	0.10	Trivial/Very Small
Number of subjects used (200-274)	0.11	Small
Broadcast media exposure		
Moderated by		
Educational level of the subjects (Secondary)	0.09	Trivial/Very Small
Number of subjects used (125-199)	0.27	Small
(200-274)	0.05	Trivial/Very Small
Time schedule	0.21	Small
Time spent in studying mathematics	0.09	Trivial/Very Small
Learning styles	0.06	Trivial/Very Small
Study habits		
Moderated by		
Year when the researches were conducted (2009-2010)	0.19	Small
(2011-2012)	0.02	Trivial/Very Small
Educational level of the subjects (Tertiary)	0.09	Trivial/Very Small
Number of subjects used (125-199)	0.05	Trivial/Very Small
Attitudes toward mathematics		
Moderated by		
Year when the researches were conducted (2009-2010)	0.23	Small
(2011-2012)	0.06	Trivial/Very Small
(2013-2014)	0.19	Small
Educational level of the subjects (Tertiary)	0.17	Small
Locale where the researches were conducted (Ilocos Norte)	0.21	Small
Number of subjects used (50-124)	0.15	Small
(125-199)	0.06	Trivial/Very Small
Source of Education Support		
Moderated by		
Educational level of the subjects (Secondary)	0.21	Small
Locale where the subjects were taken (Ilocos Sur)	0.11	Small
Type of school where the subjects were taken (Public)	0.21	Small
Number of subjects used (200-274)	0.15	Small
School entrance examination	0.79	Very Large
Rank in the family	0.22	Small

Grade point average	0.72	Very Large
Height	0.01	Trivial/Very Small
Weight	0.01	Trivial/Very Small
High school general average	0.55	Large
Exposure to technology	0.06	Trivial/Very Small
Daily allowance	0.31	Moderate
Civil status	0.01	Trivial/Very Small
Number of mathematics subjects taken	0.05	Trivial/Very Small
Participation in an organization	0.17	Small

The researcher found out that print media exposure moderated by the year when the researches were conducted (2007-2008) and educational level of the subjects (secondary) have very small ES index (0.10) in each moderator while the studies which belong to the moderator number of subjects used (200-274) is found to have a small ES.

On the other hand, when the ES of broadcast media exposure were synthesized across studies from the moderator variables educational level of the subjects (secondary) and number of respondents used particularly in the subgroup 200-274, there was very small ES index. Moreover, a small ES index was found in the subgroup 125-199 of the moderator variable number of subjects used.

Furthermore, the moderator year when the researches were conducted especially the year interval 2009-2010 displays a small effect size of 0.19 on the factor study habits while other moderators such as the year interval 2011-2012, educational level of the subjects (tertiary) and the subgroup 125-199 number of subjects shows a trivial amount of effect size index (0.02, 0.09) and 0.05 respectively, were not significant in terms of variation of effect sizes across studies.

The set of studies that examined attitudes toward mathematics which manifest significant variation

on ES show to have a small ES index in the following moderators years when the researches were conducted under the subgroups 2009-2010 and 2013-2014, educational level of the subjects under the category tertiary, locale where the researches were conducted particularly in Ilocos Norte, and number of subjects used under the subgroup 50-124. In addition, a very small ES index of 0.06 was observed from the categories 2011-2012 year interval, and 125-199 number of subjects used.

Lastly, all the moderator variables that help moderate the ES of the studies that examined the factor source of education support all manifest small amount of effect sizes.

4.2.2. Home-Related Factors (H-RF)

As observed on Table 3, the father's educational attainment moderated by year when the researches were conducted in the category 2007-2008, educational level of the subjects particularly in the secondary level and 275-349 number of subjects were found to have very small ES indices (0.09, 0.08 and 0.05). On the other hand, the factor had small ES index in the moderators 2011-2012 and 2013-2014 in the year when the researches were conducted (0.16 and 0.13, respectively), and 125-199 number of subjects (0.16).

Table 3.
Combined Effect Sizes of the Home-Related Factors across Researches

Variable	ES	Description
<i>Home-Related Factors</i>		
Parents' Educational Attainment		
Father		
Moderated by		
Year when the researches were conducted (2007-2008)	0.09	Trivial/Very Small
(2011-2012)	0.16	Small
(2013-2014)	0.13	Small
Educational level of the respondents (Secondary)	0.08	Trivial/Very Small
Number of subjects used (125-199)	0.16	Small
(275-349)	0.05	Trivial/Very Small
Mother		
Moderated by		
Year when the researches were conducted (2007-2008)	0.12	Small
(2013-2014)	0.09	Trivial/Very Small
Educational level of the subjects (Secondary)	0.12	Small
Parents' Occupation		
Father		
Moderated by		
Year when the researches were conducted (2007-2008)	0.07	Trivial/Very Small
(2011-2012)	0.03	Trivial/Very Small

Number of subject used (125-199)	0.06	Trivial/Very Small
(275-349)	0.03	Trivial/Very Small
Mother Moderated by		
Year when the researches were conducted (2009-2010)	0.11	Small
(2011-2012)	0.02	Trivial/Very Small
Number of subjects used (275-349)	0.02	Trivial/Very Small
Type of Residence Moderated by		
Year when the researches were conducted (2007-2008)	0.17	Small
(2009-2010)	0.17	Small
(2011-2012)	0.05	Trivial/Very Small
Educational level of the subjects (Secondary)	0.13	Small
Locale where the researches were conducted (Ilocos Sur)	0.11	Small
Type of school where the subjects were taken (Public)	0.11	Small
Number of subjects used (125-199)	0.1	Trivial/Very Small
(200-274)	0.17	Small
(275-349)	0.07	Trivial/Very Small
Monthly Family Income Moderated by		
Educational level of the subjects (Secondary)	0.14	Small
Type of school where the subjects were taken (Public)	0.14	Small
Number of subjects used (200-274)	0.14	Small
<i>Home-Related Factors</i>		
Learning Assistance Received	cannot be combined	
Parents' Assistance Moderated by		
Type of school where the subjects were taken (Public)	0.13	Small
Family Size Moderated by		
Year when the researches were conducted (2009-2010)	0.13	Small
(2011-2012)	0.008	Trivial/Very Small
Educational level of the subjects (Tertiary)	0.08	Trivial/Very Small
Locale where the researches were conducted (Ilocos Sur)	0.05	Trivial/Very Small
Type of school where the subjects were taken (Public)	0.05	Trivial/Very Small
Number of subjects used (125-199)	0.06	Trivial/Very Small
(200-274)	0.06	Trivial/Very Small

The H-RF father's occupation showed a trivial effect size estimate in all the tested subgroups which served as moderators on the variances of ES across studies.

In the monthly family income, moderated by secondary level (educational level of the subjects), public (type of school where the subjects were taken), and 200-274 number of subjects had an ES of 0.14 described as a small effect size value.

All the computed ES of the factor- family size in the tested moderator variables except the category 2009-2010 in the year when the researches were conducted were found to have a very small ES

(0.008, 0.08, 0.05, 0.05, 0.06 and 0.06 respectively).

small to very small/trivial ES indices which indicate that they are weak in influencing the mathematics achievement of the students.

4.2.3. Teacher-Related Factors (T-RF)

Table 4 displays the synthesis of every independent variables along T-RF studied by the graduate mathematics students in the region and one believed to have a significant effect in improving the mathematics performance of students.

Table 4.
Combined Effect Sizes of the Teacher-Related Factors across Researches

Variable	ES	Description
<i>Teacher Related Factors</i>		
Educational attainment	0.002	Trivial/ Very Small
Number of years handling the subjects	0.63	Large
Number of trainings and seminars attended	<i>cannot be combined</i>	
Area of specialization	0.01	Trivial/ Very Small

Length of service	0.0003	Trivial/ Very Small
Methodology used in teaching	0.009	Trivial/ Very Small
Position	0.01	Trivial/ Very Small
Time schedule	0.16	Small

As gleaned from the table, the variable number of years handling the subjects shows a large ES estimate of 0.63 while the variable time schedule presents a small effect size. Moreover, the other related variables such as educational attainment, area of specialization, length of service, methodology used in teaching, and position were found to be the weakest in affecting the mathematics performance of the students as indicated in their respective ES of 0.002, 0.01, 0.0003, 0.009 and 0.01. This means that these set of

teacher-related factors did not demonstrate a significant effect on the mathematical achievement of students. It still depends the learners on how he/she will drive his own learning.

4.2.4. School-Related Factors (Sc-RF)

Table 5 shows that only the variable adequacy of instructional materials moderated by the variable secondary in the educational level of the subjects were found to have a small effect size estimates of 0.28 when the set of researches were summarized.

Table 5.

Combined Effect Sizes of the School-Related Factors across Researches

Variable	ES	Description
<i>School-Related Factors</i>		
Adequacy of school equipment and facilities	0.05	Trivial/ Very Small
Adequacy of instructional materials		
Moderated by		
Educational level of the respondents (Secondary)	0.28	Small
Type of school where the subjects were taken (Public)	0.08	Trivial/ Very Small
Physical plants and facilities	0.03	Trivial/ Very Small
Classrooms	0.04	Trivial/ Very Small
Offices and staffs' rooms	0.03	Trivial/ Very Small
Library	0.005	Trivial/ Very Small
Class size		
Moderated by		
Year when the research was conducted (2013-2014)	0.08	Trivial/ Very Small
Class schedule	0.06	Trivial/ Very Small
Location of school	0.009	Trivial/ Very Small

The other factors that were identified are found to have a very small ES estimate. This means that students prefer a more interactive instructional materials used by their teachers inside the classroom.

Going deeper, it can be noted that the factor library has the least computed effect size value. It only implies that students nowadays do not regularly visit their school libraries. Instead, they prefer to use their own learning resources such as gadgets or other forms of technology.

5. CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

- Researches along determinants of mathematics achievement of students dominate graduate theses and dissertations in SUCs, Region I.
- Almost all the demographic profile of students which were examined are found to have a small to very small/ trivial effect size estimates although

some of these factors were found to be significant in terms of p-values, they are still considered weak as factors in improving the mathematics performance of the students.

6. RECOMMENDATIONS

In the light of the findings and conclusions, the researcher recommend the following:

- The variables that were only used once is still recommended to be used and tested in future researches to see the complete picture of mathematics achievement of students.
- Since the examined factors were found to be weak in terms of effect size, future researches should consider other set of factors which are believed to have a great impact on the influence of mathematics on performance of students.

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