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Importance of Math and Difficulties in Learning Perceived by Cambodian Grade 10 and 11 students

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ABSTRACT

Math is an important subject for other fields of sciences and useful for solving real-world problems. But there seems to be a decline in the attention towards this subject, also including Cambodian context. It is necessary explore the causes behind this issue and to promote the learning of this subject. In this paper, the researcher uses a sample from existing data obtained from grade 10 and 11 Cambodian students of public secondary schools in 2019 to analyze students' perceptions of how they know the importance of Math and perceptions of the obstacles/difficulties in learning the subject using principle component analysis. Findings reveal three components/variables, two of which are obstacle-related, and another is of sources of knowledge of math importance. The analysis of data also includes testing the difference in perceptions of rural-school students and urban-school students over the obstacles/difficulties of learning math and the sources of knowledge of math importance, using Mann-Whitney U test. The results show no different perceptions over the sources of knowledge of math importance but significant difference in perceptions over the obstacles of learning math.

Keywords: Perception, importance of math, learning math, Mann-Whitney U test, principal component analysis, PCA.

1. INTRODUCTION

In Cambodian education system math is one of the required subjects in the school curriculums from grade 1 to grade 12. It is an indispensable subject and treated as "the mother of all sciences"(Chiu, 2007; Faluyi, 2016; Najeeb, 2018, October 30).

It is widely recognized that science, technology, engineering and math (STEM) education is a key factor for promoting economic growth and wellbeing (Freeman, Marginson, & Tytler, 2019). Students may face big struggles in STEM courses if they lack of strong basic mathematical knowledge (Hewson, May 2011). Unfortunately, there seems to be a decline in attention of learning math(Palmer, 2018, December 6; "Students' Math Abilities on the Decline," 2017, Stember 19). Many students don't like math and perceive that it is a difficult subject (Berch & Mazzocco, 2007; Dowker, 2004; Gafoor & Kurukkan, 2015; Lithner, 2011; "Maths remain most challenging subject of all for students, study," 2019, June 3)

Although the education policy issued by Ministry of Education, Youth and Sport (MoEYS) insures the same quality of education for all, there may be, to some extent, a gap between students' learning in rural and urban schools.

The aim of this research paper is to compare the perception of how students know the importance of math and the perception of obstacles/difficulties in learning math between the students from rural schools and urban schools. Specifically, this research will fulfill the following objectives:

1) Determine the constructs behind the students' perception of how they know the importance of math and perception of the obstacles/difficulties in learning math.
2) Determine if there is a difference in perception of how students know the importance of math between rural school students and urban school students.
3) Determine if there is a difference in perception of the obstacles/difficulties in learning math between rural school students and urban school students.

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2. LITERATURE REVIEW

Although there are plenty of researches about math study, there has been few about cases at secondary schools in Cambodia. Chan (n.d.) reveals about general situation of math education at primary level. Chun (2017) discussed about higher math educations at Royal University of Phnom Penh and National Institute of Education. Alcocer (n.d.) observed that students may find no use of math beside the mandatory subjects in school curriculums and highlighted two types of the obstacles for the students in learning math: no support from the surrounding people and the negativity of experience in math. Anxiety is one of the causes of the fact that why math is perceived as a difficult subject (Das, Das, & Prince, 2018). Concerning math learning issues, Fuqoha, Budiyono, and Indriati (2018) conducted a study under the title "Motivation in Math Learning" on 10th grade students in Purbalingga, Indonesia and the study finally concluded that the students admit to the importance of math subject but level of motivation does not seem to relate with the satisfactoriness of learning achievement. A study conducted by Ashby (2009) with year 3 children, exploring the negative attitude towards math, mentioned some issues: children's difficulty in making connection between math and its practical applications, low self-confidence in their numeracy ability, the difficulties with the language of math which leads to confusion, and the importance of reflection (theory of reflective abstraction). Paul and Ngirande (2014), in their study with high school students in South Africa investigate the influences of students' perception on their math achievement. They found that perception constructs such as self-confidence, interest in math, family background and support, weaknesses in math, and myths and beliefs about math are significant predictors of math performance. Knowing the importance of math is believed to be a motivation to learn the subject. As an example, Lawal and Ijadunola (n.d.) found a significant relationship between these two variables. As perceived by math teachers, the lack of sufficient effort by the students themselves is also the cause of the difficulty in learning math (Gafoor & Kurukkan, 2015). The math learning difficulties were also studied by Udousoro (2011). The researcher found that there is a negative significant relationship between the perception and the reality of the difficulty in learning. According to the findings of Acharya (2017) the main causes of students' math learning difficulties are teacher-related factor, math anxiety, the negativity toward math, economic condition, educational backgrounds, management system of the school, poor school infrastructure and poor school assessment system. Other difficulties that can be the obstacle in learning math are math symbols, the concept and procedures as investigated by Yetkin (2003).

In this modern era, using technological devices is helpful and, in some cases, indispensable in wide range of activities. The lack of these kinds of devices can be, to some extent, the difficulty in learning certain subjects such as math. The advantage of using the mobile devices are recognized by a number of researchers such as Anshari, Almunawar, Shahrill, Wicaksono, and Huda (2017), Supandi, Ariyanto, Kusumaningsih, and Aini (2018), Fabian, Topping, and Barron (2018), Button (2018), Tetzlaff (2017) and Aker, Ksoll, and Lybbert (2012).

A number of studies compare the education for rural and urban students. UKEssays (November 2018) examined the difference of rural-urban students' performance and determined the factors of low performance for rural students. Students' learning strategies are also important factors. A study conducted by Khanal (2016) found a significant difference in learning strategies of rural and urban students. Bora (2012) compared the attitude toward math between rural students and urban students and found that it is not the same. Other studies compared math achievement of rural and urban school students and found that urban students did better (Graham & Provost, 2012; Singh, Rahman, & Hoon, 2010; Young, 1998).

3. METHODOLOGY

Participants

The analysis uses the data obtained from a total of 1473 public school students (63.4% females and 36.6% males) who were studying grade 10 and 11 in year 2019 in 42 urban and rural secondary schools , in which 857 students (58.2%) were of rural schools and 616 students (41.8%) urban schools. This sample was purposively selected from a sample of 8332-student survey conducted by Institute of Science and Technology on "កត្តានិងបញ្ហាប្រឈមនៃការសិក្សាគណិតវិទ្យានៅមធ្យមសិក្សានៃប្រទេសកម្ពុជា" translated as "Factors and Challenges of Math Learning in Secondary Schools in Cambodia" ("កត្តានិងបញ្ហាប្រឈមនៃការសិក្សាគណិតវិទ្យានៅមធ្យមសិក្សានៃប្រទេសកម្ពុជា", 2019) .

Instruments

To obtain the data, the interviewers used a questionnaire written in Khmer language. After they explained and clarified each question, they handed copies to students. Those copies were collected back after the students finished.

Two main questions, one containing items describing the students' perception of how they know the importance of math and another the students' perception of the difficulties or obstacles in learning the subject, are used for the source of the data for this research. Each item is measured on scale 1-5, with 1 is the least and 5 is the most.

How students know the importance of math is measured by 6 items: 1) via math teachers (Imp1), 2) the use of math in other subjects such as physics, chemistry, economics, and the like (Imp2), 3) the explanation from seniors (Imp3), 4) via internet search (Imp4), 5) via math textbooks (Imp5), and 6) Others. The last item is dropped out from the analysis since it is not clearly specified. The difficulties in learning math contains 10 items: 1) don't like math (Obs1), 2) teachers' explanation (Obs2), 3) too low basic knowledge (Obs3), 4) the lack of mobile technological devices such as smartphones or tablets (Obs4), 5) lack of learning material for self-study (Obs5), 6) too much house work in helping the parents (Obs6), 7) lack of teachers' teaching aids (Obs7), 8) too few in-class hours for math (Obs8), 9) lack of friends who are strong in math (Obs9), and 10) family poverty (Obs10).

Procedures

The principle component analysis (PCA) is used to determine the components (new variables) behind students' perception of how they know the importance of math and perception of the obstacles/difficulties in learning math.

After determining those variables, independent samples Mann-Whitney U test is used to test the differences in students' perceptions of how they know the importance of math and perceptions of the obstacles/difficulty in learning math between the students in rural schools and urban schools.

Results

Principal components analysis with varimax rotation was conducted to assess how perception variables (items) clustered. The original variables were: via math teachers, the use of math in other subjects such as physics, chemistry, economics, and the like, the explanation from seniors, via internet search , via math textbooks, don't like math, teachers' explanation, too low basic knowledge, the lack of mobile technological devices such as smartphones or tablets, lack of learning material for self-study, too much house work in helping the parents, lack of teachers' teaching aids, too few in-class hours for math, lack of friends who are strong in math and family poverty.

Table 1

Component loadings for rotated components (N= 1473)

	Compent			Communality
	1	2	3	
don't like math	0.74			0.47
teachers' explanation	0.73			0.44
too low basic knowledge	0.62			0.47
too much house work in helping the parents	0.58			0.45
lack of friends who are strong in math	0.52			0.54
too few in-class hours for math	0.48			0.54
via math textbooks		0.73		0.54
via math teachers		0.68		0.42
via the explanation from seniors		0.68		0.55
via the use of math in other subjects such as physics, chemistry, economics, and the like		0.67		0.51
via internet search		0.67		0.41
the lack of mobile technological devices such as smartphones or tablets			0.72	0.49
lack of learning material for self-study			0.69	0.35
lack of teachers' teaching aids			0.68	0.40
family poverty	0.41		0.50	0.42
Eigenvalues	3.64	2.33	1.03	
% of variance	16.91	15.87	13.88	

Note. Loadings < .40 are deleted.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .85, and Bartlett's test of sphericity was significant ($\chi 2$ (105) = 4157.85, $p < .05$), which is good and indicates that the correlations are not near zero.

Three components were rotated based on the eigenvalues over 1 criterion. After rotation the first component, named "math learning obstacle

1-MLO1", accounted for 24.24% of the variance, the second component, named "knowledge of math importance-KMI", accounted for 15.56% of the variance, and the third component, named "math learning obstacle 2-MLO2", accounted for 6.87%. Table 1 displays the items and component loadings for the rotated components, with loadings less than .40 deleted to improve clarity. Cross loading occurred with the variable "family poverty", however, it is kept in component 3.

After the components (factors) were determined, the composite scores for each of the three components were calculated, based on the mean of the items which had loadings on each component. The descriptive statistics for the three components, MLO1, KMI, MLO2 are presented in table 2.

Table 2

Descriptive Statistics for the three components

Compo-nent	Number of items	M(SD)	Skewness	Kurtosis	Cronbach's alpha
MLO1	6	3.02(.74)	.082	-.522	.73
KMI	5	2.35(.67)	.393	.042	.72
MLO2	4	2.52(.76)	.336	-.089	.66

Note: For overall reliability, Cronbach's alpha is .76.

To reach the objective 2 and the objective 3, hypothesis testing was used. Comparison of the means of the distribution of variables MLO1, KMI and MLO2 was needed upon school location (whether students were from rural schools or urban schools) but due to the non-normality of the variables, a Mann Whitney test was used instead. For MLO1 the mean rank for rural schools (717.33) is significantly higher than the mean rank for rural schools (764.37), U(Nrural=857, Nurban=616) = 247097.00, z = -2.10, p= .035. Contrariwise, for KMI there is not significant difference between rural schools and urban schools, U(Nrural=857, Nurban=616) = 262806.50, z = -.143, p= .886. But for MLO2, the mean rank for rural schools (783.15) is significantly higher than the mean rank for rural schools (672.79), U(Nrural=857, Nurban=616) = 224405.50, z = -4.94, p< .001. Independent samples t test (equal population variances) also showed the same results (table 3).

Table 3

Independent Samples t test for difference in each of MLO1, KMI, and KLO2 for school location

Variable	M1(SD1) (Rural)	M2(SD2) (Urban)	Mean difference	t	p-value	Decision
MLO1	2.99(.76)	3.07(.70)	-.08	-2.100	.036	Significant
KMI	2.354(.68)	2.346(.66)	.008	.205	.838	Not significant
KLO2	2.61(.75)	2.41(.74)	.20	4.952	<.001	Significant

Note: df = 1471, significance level = .05

Hence, the results of the tests showed that students from rural schools and urban schools have no different perception of the sources by which they know the importance of math subject, but they have different perception of the obstacles/difficulties in learning the subject.

4. DISCUSSION AND CONCLUSION

The first objective is to determine the factors (new variables) behind the variables describing the perceptions of the sources of the knowledge of the math subject importance. The findings reveal that the original variables construct three new variables: math learning obstacle 1- MLO1, which is comprised of "don't like math", "teachers' explanation", "too low basic knowledge", "too much house work in helping the parents", "lack of friends who are strong in math", and "too few in-class hours for math", knowledge of math importance-KMI, which is comprised of "via math textbooks", "via math teachers", "via the explanation from seniors", "via the use of math in other subjects such as physics, chemistry, economics, and the like", and "via internet search", and math learning obstacle 2 - MLO2, which is comprised of "the lack of mobile technological devices such as smartphones or tablets", "lack of learning material for self-study", "lack of teachers' teaching aids", and "family poverty". The findings that the dislike of math, family poverty (economic conditions) are the obstacles in learning math are consistent with the findings of Acharya (2017) and Paul and Ngirande (2014) who mentioned that economic condition and uninterestingness/negative feeling about math caused difficulties in learning math. The lack of basic knowledge is found to be one obstacle in learning math. This is not far from the findings of Yetkin (2003) and Acharya (2017). The findings that the lack of smartphones/tablets, as perceived by students, is an obstacle in learning (math) is not odd since Aker et al. (2012), Anshari et al. (2017), and Supandi et al. (2018) found that using smartphones for study purpose could enhance math achievements.

Finally, the findings reveal that rural school students and urban school students perceived differently of the obstacles in learning math, while the sources of knowledge of the importance of math subject were perceived in the same ways. The difference in perception of the obstacles in learning math could possibly be due to some gap in quality of education services and/or due to the gap in socioeconomic facts of rural school students and urban school students' family.

5. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

The findings of this study must be seen in light of some limitations, which could be addressed in future research. The first limitation is about sample selection method and targeted population. Future study should use probability sampling technique and population should include 12th grade students as well since it is the most important grade where students take the national examination. The second limitation is about designing questionnaire, which future research should include some other variables relating with the obstacles of learning math and sources of knowledge of importance of math subject based on relevant theories.

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REFERENCES

Acharya, B. R. (2017). Factors affecting difficulties in learning mathematics by mathematics learners. International Journal of Elementary Education, 6(2), 8-15.

Aker, J. C., Ksoll, C., & Lybbert, T. J. (2012). Can mobile phones improve learning? Evidence from a field experiment in Niger. American Economic Journal: Applied Economics, 4(4), 94-120.

Alcocer, Y. Y. (n.d.). Social & Academic Obstacles for Math Students. Retrieved from https://study.com/academy/lesson/social-academic-obstacles-for-math-students.html

Anshari, M., Almunawar, M. N., Shahrill, M., Wicaksono, D., & Huda, M. (2017). Smartphones usage in the classrooms: Learning aid or interference? Education and Information Technologies, 22. doi:10.1007/s10639-017-9572-7

Ashby, B. (2009). Exploring children's attitudes towards mathematics. proceedings of the British Society for Research into Learning mathematics, 29(1), 7-12.

Berch, D. B., & Mazzocco, M. M. (2007). Why is math so hard for some children. The nature and origins of mathematical learning difficulties and disabilities.

Bora, A. (2012). An Evaluation of School Students' Attitude Towards Learning Mathematics. SSRN Electronic Journal. doi:10.2139/ssrn.2263764

Button, T. (2018). Why Smartphones are a Really Useful Tool in the Maths Classroom

Retrieved from https://www.teachwire.net/news/why-smartphones-are-a-really-useful-tool-in-the-maths-classroom

Chan, R. (n.d.). Mathematics Education in Cambodia Today and National Assessment on Mathematics at Primary Education.

Chiu, M.-S. (2007). Mathematics as mother/basis of science in affect: Analysis of TIMSS 2003 data. Paper presented at the Proceedings of the 31st Conference of the International Group for the Psychology of Mathematics Education, Taiwan.

Chun, S. (2017). Mathematics Education in Cambodia: The Case of Royal University of Phnom Penh and National Institute of Education. (Master of Education), Royal University of Phnom Penh.

Das, R., Das, D., & Prince, J. (2018). Obstacles of Mathematics Learning: A Contextual Study on Learners' Perspective. International Journal of Science and Research (IJSR), 7, 1444-1449. doi: 10.21275/ART2019781

Dowker, A. (2004). What Works for Children with Mathematical Difficulties?

Fabian, K., Topping, K. J., & Barron, I. G. (2018). Using mobile technologies for mathematics: effects on student attitudes and achievement. Educational Technology Research and Development, 66(5), 1119-1139. doi:10.1007/s11423-018-9580-3

Faluyi, O. (2016). Mathematics, Mother of All Subjects. Retrieved from https://covenantuniversity.edu.ng/News/Mathematics-Mother-of-All-Subjects-Faluyi#.Xvi1XSgzZPY

Freeman, B., Marginson, S., & Tytler, R. (2019). An international view of STEM education.

Fuqoha, A., Budiyono, B., & Indriati, D. (2018). Motivation in Mathematics Learning. Pancaran Pendidikan, 7. doi:10.25037/pancaran.v7i1.151

Gafoor, K., & Kurukkan, A. (2015). Why High School Students Feel Mathematics Difficult? An Exploration of Affective Beliefs.

Graham, S. E., & Provost, L. E. (2012). Mathematics achievement gaps between suburban students and their rural and urban peers increase over time.

Hewson, S. (May 2011). The Mathematical Problems Faced by Advanced STEM Students. Retrieved from https://nrich.maths.org/6458

Khanal, B. (2016). Learning Strategies Used by Urban and Rural School Students in Mathematics. IRA International Journal of Education and Multidisciplinary Studies, 4, 387-396. doi:10.21013/jems.v4.n3.p5

Lawal, R., & Ijadunola, K. (n.d.). The Influence of Perceived Mathematics Application on Students' Motivation to Learn Mathematics.

Lithner, J. (2011). University Mathematics Students' Learning Difficulties. Educaion Inquiry. doi:10.3402/edui.v2i2.21981

Maths remain most challenging subject of all for students, study. (2019, June 3). Retrieved from https://www.livemint.com/education/news/maths-remain-most-challenging-subject-of-all-for-students-study-1559567129641.html

MoEYS. (2020). Public Education Statistics & Indicators 2019 - 2020. Retrieved from http://www.moeys.gov.kh/index.php/kh/emis/3672.html#.XvlMIygzZPY

Najeeb, A. (2018, October 30). Math Is the Mother Of Science. Retrieved from https://medium.com/@emmaan/math-is-the-mother-of-science-a9dad165815d

Palmer, J. (2018, December 6). Math on the Decline. Retrieved from https://theprofilehhs.com/1029/editorials/math-on-the-decline/

Paul, M., & Ngirande, H. (2014). The Influence of Students` Perceptions on Mathematics Performance. A Case of a Selected High School in South Africa. Mediterranean Journal of Social Sciences, 5. doi:10.5901/mjss.2014.v5n3p431

Singh, P., Rahman, A. A., & Hoon, T. S. (2010). Languages and Mathematics Achievements among Rural and Urban Primary Four Pupils: A Malaysian Experience. Journal of Science and Mathematics Education in Southeast Asia, 33(1), 65-85.

Students' Math Abilities on the Decline. (2017, Stember 19). Retrieved from https://academicpartnerships.uta.edu/articles/education/students-math-abilities-decline.aspx

Supandi, S., Ariyanto, L., Kusumaningsih, W., & Aini, A. (2018). Mobile phone application for mathematics learning. Journal of Physics: Conference Series, 983,012106. doi:10.1088/1742-6596/983/1/ 012106

Tetzlaff, D. M. (2017). Using Mobile Technology to Increase the Math Achievement and Engagement of Students with Disabilities.

Udousoro, U. J. (2011). Perceived and Actual Learning Difficulties of Students in Secondary School Mathematics. International Multidisciplinary Journal, Ethiopia, 5(5). doi:http://dx.doi.org/10.4314/afrrev.v5i5.28

UKEssays. (November 2018). Students Performance In Rural And Urban Areas Education Essay. Retrieved from www.ukessays.com/essays/education/students-performance-in-rural-and-urban-areas-education-essay.php?vref=1

Yetkin, E. (2003). Student Difficulties in Learning Elementary Mathematics. ERIC Digest.

Young, D. J. (1998). Rural and urban differences in student achievement in science and mathematics: A multilevel analysis. School effectiveness and school improvement, 9(4), 386-418.

"កត្តានិងបញ្ហាប្រឈមនៃការសិក្សាគណិតវិទ្យានៅមធ្យមសិក្សានៃប្រទេសកម្ពុជា". (2019). Retrieved from http://rac.gov.kh/royal-academy/listing/attachments/original/93.pdf