An Exploratory Study of Grade 6 Students' Numeracy

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Abstract

The primary objective of this study was to investigate the grade 6 students' numeracy. Then, gender difference on grade 6 students' numeracy was explored. In addition, to examine the whether or not difference between rural school students' numeracy and urban school students' numeracy was next of interest. Design of this study was cross sectional in nature. Quantitative approach was used in this study. Questionnaire survey method was used to measure students' numeracy. This study was conducted at Yangon Region, Ayeyarwaddy Region, and Rakhine Region, Myanmar. Simple random sampling technique was used in this study. The total of 546 grade 6 students from above mentioned Regions participated in this study. Numeracy Test for Grade Six Students was used as the research instrument. Alpha reliability for Numeracy Test for Grade Six Students revealed at 0.85. In this study the mean score of female students was higher than that of male students on three out of four subcomponents of numeracy test as well as the whole numeracy test. Gender related difference revealed on number operation sense component, measurement and shape component, statistics component and the whole test of numeracy. Looking across the four subcomponents, grade six students perform best on statistics component and the second highest was number and operation sense among four subscales of numeracy test. In addition, results also revealed that the mean score of Grade 6 students from urban schools was higher than that of Grade 6 students from rural schools on each subscale of numeracy test as well as a whole numeracy test.

Key Terms: numeracy, gender, rural, urban

Introduction

Education is an essential basis for building a modern developed nation. One of the objectives of education is to enable the every citizen of the Republic of the Union of Myanmar to become an intellectual worker who was well equipped with quality education, good health and moral character. Branford (2000) described that educational goals for 21st century are very different from the goals of earlier times. By the start of 20th century, education focused on the reading, writing, and arithmetic. In the 21st century, the nature of employment is also changing and the global shift of economic markets is marking for a different view of what is means to have a well educated and well reasoned workforce. Every young person needs to be literate and numerate.

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Department of Education and Skills (2011) stated that numeracy encompasses the ability to use mathematical understanding and skills to solve problems and meet the demands of day-to-day living in complex social settings. People use the basic skills of literacy and numeracy in almost every part of their lives. Without the skills of literacy and numeracy, a young person or adult is cut off from full participation in many aspects of life: they cannot perform basic tasks, such as reading or sending an e-mail; advertisements and notices are meaningless to them; they cannot jot down a shopping list or understand a utility bill; and they are cut off from participating in and contributing to many aspects of the society and culture in which they live.

Literature Review

Numeracy

According to Steen (1990), numeracy is to mathematics as literacy is to language. Each represents a distinctive means of communication that is indispensable to civilized life (as cited in Kemp, 2005). Bynner & Parsons (1997), Gleeson (2005), Parsons, & Bynner (2005) found that poor numeracy skills had more impact on an individual's life than poor literacy skills. Kemp (2005) argued that the term numeracy is used in a variety of ways in the literature. According to Dossey (1997), numeracy may be defined as the ability to interpret and apply the aspects of mathematics such as date representation, number and operation sense, measurement, variables and relation's geometric shapes and spatial visualization (as cited in Kemp, 2005). There is certain particularly about numeracy and definition of numeracy is the mathematical knowledge needed by the every citizen to empower them for life in that society. Literacy and numeracy, at a basic rather than an advanced level, have been yoked ever since, with numeracy often subsumed within literacy.

One view equates numeracy with mathematics and computational skills, in much the same way that literacy is viewed as mastery of basic reading and writing. A much broader view of numeracy focuses on people's capacity and propensity to interact effectively and critically with the quantitative aspects of the adult world (Gal, 2002a). Similarly, in relation to literacy, some argue that numeracy is subsumed in literacy, whereas others argue that debates about numeracy within the context of literacy limit the full operationalization of both concepts. Elvin (2000) defined that numeracy comprises a reasonable sense of number, including the ability to estimate orders of magnitude within a certain range, the ability to understand numerical data, the ability to read a chart or graph, and the ability to follow an argument based on numerical or statistical evidence (as cited in Kemp, 2005).

Ginsburg L, Manly M & Schmitt M.J (2006) proposed three major components; (1) context, (2) content, (3) cognitive and affective. Context is the use or purpose for which an individual takes on a task with mathematical demands. In societal contexts, family or personal is related to an individual's role as a parent, head of household or family member. The demands include consumer and personal finance, household management, family and personal health care, and personal interests and hobbies. Work place deals with the ability to perform tasks on the job and to adapt to new employment demands. Community includes issues around citizenship, and other issues concerning the society as a whole, such as the environment, crime, or politics. Further learning is connected to the knowledge needed to pursue further education and training, or to understand other academic subjects. The focus on applying mathematics in a context or having a social purpose to the use and application of the mathematics provides motivation for learners to engage with and learn about mathematics. This leads to conclude that it is the focus on, and prioritization of, context that differentiates an adult numeracy framework from a formal school mathematics framework.

The content component of numeracy consists of the mathematical knowledge that is necessary for the tasks confronted. Numeracy content will also vary from context to context within the same time period. For example, a carpenter need a high level of practical understanding of measurement and geometry to ensure accurate fits and structural integrity; an office worker may need an understanding of the algebraic concepts of variables and equations to use spreadsheets effectively; and a factory worker may use statistical process control measures that require an understanding of what constitutes abnormal deviation in the quality of the output of a certain machine. At the beginning of the twenty-first century, general numeracy content organizes around four mathematical strands; namely, number and operation sense, patterns, function, and algebra, measurement and shape and data, statistics, and probability (Ginsburg L, Manly M & Schmitt M.J, 2006).

Number and operation sense is a sense of how numbers and operations work and how they relate to the world situations that they are represent. Patterns, functions and algebra is an ability to analyze relationships and change among quantities, generalize and represent them in different ways, and develop solution methods based on the properties of numbers, operations and equations. Measurement and shape is the knowledge of attributes of shapes, how to estimate and determine the measure of these attributes directly, or indirectly, and how to reason spatially. Data, statistics and probability is the ability to describe populations, deal with uncertainty, assess claims, and make decisions thoughtfully (Ginsburg L, Manly M & Schmitt M.J, 2006).

The major purpose of this study is to investigate the students' numeracy. To develop a numeracy test to measure the numeracy of Grade 6 students in Myanmar is of next interest. And then, this study sought to construct a numeracy test by using the two-parameter logistic IRT model and also tend to get a wider knowledge of assessing students' numeracy through item response theory.

Methodology

Research Design

Quantitative perspective was used in this study. Questionnaire survey method was used to measure students' numeracy. Four aspects of Numeracy such as number and operation sense, algebra, measurement and shape, and statistics were measured. Simple random sampling technique was used in this study. First of all, the sample for 14 High Schools and 6 Middle Schools such as 4 High Schools and 3 Middle Schools from Yangon Region, 6 High Schools and 3 Middle Schools from Ayeyarwaddy Region, 4 High Schools from Rakhine State were selected. A total of 1005 Grade 6 students participated in this study. Out of 1005 Grade 6 students, 464 (46.2%) are boys and 541 (53.8%) are girls and their ages range from 10 to 13 years. The socioeconomic status of the sample ranged from lower, middle and upper class families.

Instruments

The present study investigated the Grade 6 students' numeracy. The instrument to measure Grade 6 students' numeracy was constructed by researcher. This process was undertaken by the guidance of National Center for the Study of Adult Learning and Literacy (NCSALL) Occasional Paper by Ginsburg. L Manly. M, and Schmitt. M. J.,(2006). The NCSALL Occasional Paper states the three major components of numeracy such as context, content and cognitive and affective component. Among these, content component comprises

four sub-components such as (1) number and operation sense, (2) patterns, function and algebra, (3) measurement and shape and (4) data, statistics and probability.

The instrument used in this study was constructed under the guidance of experts in educational test and measurement field and with the guidance of Teacher Guide Book and Grade 6 Mathematics Text Book to be suitable for Grade 6 students in Myanmar. The detail procedures for constructing a numeracy test for Grade 6 students were as follows. Based on the table of specification, 25 multiple-choice items were constructed for each sub-component such as (1) number and operation sense, (2) algebra, (3) measurement and shape and (4) statistics, totally 100 items. According to, Gronlund (1977) & Osterlind (1992), a table of specification is necessary to develop a blueprint for the test instrument (as cited in Aye Aye Myint, 2001). Aye Aye Myint (2001) stated that the purpose of the table of specification is to define as clearly as possible the scope and emphasis of the test, to relate the intellectual outcomes to the content, and to conduct a balanced test.

After preparing the table of specification, expert review was conducted for face validity and content validity by 14 experts who have sound knowledge and closed relationship with this study area. The instrument was reviewed by ten experts from Educational Psychology Department, two experts from Educational Methodology Department, one expert from Educational Theory Department of Yangon Institute of Education and one retired expert from Educational Psychology Department of Yangon Institute of Education. Next, revisions in item length, and the wording of items were made according to supervision and editorial review of these experts. Pre-pilot study was done with a sample of 50 Grade 6 students from Basic Education High School, Thuwana to test whether the wording of test items had clarity or not and items were appropriate and relevant to Grade 6 students. According to the pre-piloting result, numeracy test was modified. According to the purpose of this study, the numeracy test was constructed. So, the revised numeracy test remained 48 items.

Grade 6 students' numeracy test was used as research instrument in this study. The instrument to measure students' numeracy skill was developed by researcher. This process was undertaken by the guidance of National Center for the Study of Adult Learning and Literacy (NCSALL) Occasional Paper by Ginsburg. L, Manly. M, and Schmitt. M. J.,(2006). The (NCSALL) Occasional Paper states the three major components of numeracy such as context, content and cognitive and affective component. Among these, content component comprises four sub-components such as (1) number and operation sense, (2) patterns, function and algebra, (3) measurement and shape and (4) data, statistics and probability. In this study, researcher adapted from the content components of NCSALL Occasional Paper (2006). The instrument used in this study was constructed under the guidance of experts in educational test and measurement field and with the guidance of Teacher Guide Book and Grade 6 Mathematics Text Book to be suitable for Grade 6 students in Myanmar. With the permission of administrative personnel of respective schools, the numeracy test was administered to the Grade 6 students from respective schools. Then, descriptive statistics and inferential statistics were applied to the data set in order to interpret and report the results.

As an initial phase of this study, the pre-pilot testing was carried out at the end of November, 2013. For the pre pilot study, one Basic Education High School was selected. Samples were 50 Grade 6 students. Based on the results of the pre-pilot study, the researcher improved the wording of items and changed kinds of questions which are inappropriate and could get incomplete responses. After that, the instrument was sent to selected schools in the first week of December, 2012. The socioeconomic status of students can affect their numeracy. Thus, in this study, checklists were prepared to get some information deal with students' socioeconomic status such as students' living status, father's occupation, father's educational level, mother's occupation, mother's educational level, family income, number of family member, health care condition, usage of mobile at home, usage of computer at home,

usage of internet at home, usage of vehicle at home. With the big assistance of the heads and teachers from respective schools, Grade 6 students were asked to gather in a room and sat the questionnaire.

Data Analysis and Result

Grade 6 Students' Numeracy Components by Standard Z Score

The standard z-scores for Grade 6 students' numeracy components are shown in Table 3.1. Numeracy test includes four components such as number and operation sense, algebra, measurement and shape and statistics.

Table 1 Grade 6 Students' Numeracy Components by Standard Z Score

Numeracy Components	No. of Items	Z Score
Number and Operation Sense	13	0.099
Algebra	18	0.065
Measurement and Shape	12	0.075
Statistics	5	0.109

Table 1 showed that the standard score of statistics (S) component of the Grade 6 students was the highest in the four components and that of number and operation sense (NO) component was the second highest. The standard score of measurement and shape (MS) component of the Grade 6 students was the third highest and that of algebra (A) component was the lowest on the whole numeracy test. Therefore, it can be said that Grade 6 students perform the best in statistics component than other components of numeracy. The standard score of algebra (A) component of the Grade 6 students was found to be the lowest on the entire numeracy test. It can reasonably be concluded that students performed best in statistics component because items from this component are more concrete than other components. Students' performance on number and operation sense component was the second highest among all components. It can reasonably be said that number and operation sense items were more familiar with students since they had exposure since their early childhood mathematics learning. The standard score of measurement and shape component was the second last stand because students cannot thoroughly understand the relationships between different systems of unit identify equivalent period of unit within a system and carry

out conversions with units of time, year, money, length, volume and weight. It can reasonably be concluded that students performed lowest in algebra component because the items from this component are more abstract than other components.

Comparison of Grade 6 Students' Numeracy by Gender

Whether there was gender difference, or not, in Grade 6 students' numeracy was worthwhile to explore. It was observed that the mean score of female students was higher than that of male students on the whole numeracy test. The mean scores for each subscale of female students' numeracy were also higher than that of male students.

Table 2 Results of Independent Sample t-test for Grade 6 Students' Numeracy by Gender

Subscales of Numeracy Test	Male	Female	*t*	*p*
Number and Operation Sense	8.12	8.65	-2.611	**.009**
Algebra	10.01	10.52	-1.717	.087
Measurement and Shape	5.11	5.52	-1.979	**.048**
Statistics	2.44	2.73	-2.873	**.004**
Whole Numeracy Test	25.67	27.42	-2.667	**.008**

Again, the independent sample t-test was used to examine whether these differences were significant or not. According to table 3.2, there was significant difference in Grade 6 students' numeracy by gender at 0.05 level. It may be concluded that female students were better than male students in numeracy. Moreover, there was significant difference in Number and Operation Sense by gender at 0.05 level and it can be interpreted that female students were better than male students in Number and Operation Sense. There was also significant gender difference in Measurement and Shape at 0.05 level and it can be interpreted that female students were better than male students in Measurement and Shape. Similarly, significant difference was found to be on Statistics by gender at 0.05 level and it can be interpreted that female students perform better than male students on Statistics (see Table 2). Female students perform better than male students on the whole numeracy test because girls are more concerned with helping their parents in buying groceries, commodities and stationery for their family.

Comparison of Grade 6 Students' Numeracy Between Rural Schools and Urban Schools

In order to investigate whether there was siginificant difference in Grade 6 students' numeracy between rural schools and urban schools, the independent sample t-test was used to examine whether these differences were significant or not. According to the results of table 3, there was significant difference in Grade 6 students' numeracy between rural schools and urban schools at 0.05 level. It may be concluded that Grade 6 students from urban schools performed better than Grade 6 students from rural schools in the whole numeracy test. Moreover, there was significant difference on Number and Operation Sense between rural schools and urban schools at 0.05 level and it can be interpreted that Grade 6 students from urban schools performed better than Grade 6 students from rural schools in number and operation sense subscale. There was also significant difference in algebra subscale between rural schools and urban schools at 0.05 level and it can also be interpreted that Grade 6 students from urban schools performed better than Grade 6 students from rural schools in algebra subscale. There was also significant difference in measurement and shape subscale between rural schools and urban schools at 0.05 level and it can also be interpreted that Grade 6 students from urban schools performed better than Grade 6 students from rural schools in measurement and shape subscale. Similarly, there was also significant difference in statistics subscale between rural schools and urban schools at 0.05 level and it can also be interpreted that Grade 6 students from urban schools performed better than Grade 6 students from rural schools in statistics subscale. There was also significant difference in the whole numeracy test between rural schools and urban schools at 0.05 level. It can be concluded that Grade 6 students from urban schools performed better than Grade 6 students from rural schools. The students from urban schools perform better than students from rural schools on each subscale of numeracy test as well as on the whole numeracy test. It can reasonably be said that students from urban schools had more opportunities to apply their numeracy skills

in day by day experience from their environment than students from rural schools. (see Table 3).

Table 3 Results of Independent Sample t-test for Grade 6 Students' Numeracy Between Rural Schools and Urban Schools

Subscales of Numeracy Test	**Rural**	**Urban**	*t*	***p***
Number and Operation Sense	7.33	8.66	-5.080	**.000**
Algebra	8.53	10.69	-5.767	**.000**
Measurement and Shape	4.48	5.53	-3.914	**.000**
Statistics	2.18	2.69	-3.911	**.000**
Whole Numeracy Test	22.53	27.56	-6.098	**.000**

Comparison of Grade 6 Students' Numeracy by Socioeconomic Status

In order to test whether Grade 6 students' numeracy were depend on their socioeconomic status or not, checklists were prepared to get some information deal with students' socioeconomic status such as living status, father's occupation, father's educational level, mother's occupation, mother's educational level, family income, number of family members, number of graduated members in family, health care condition, usage of mobile at home, usage of computer at home, usage of internet at home, internet usage time, usage of vehicles at home, usage of electricity, electricity usage time, the number of reading time in library.

Table 4 ANOVA result of Grade 6 Students' Numeracy by SES Level

Subscales of Numeracy Test	**SES Level**	**N**	**Mean**	**S.D**	***F***	***p***
Number and Operation Sense	Low SES	282	7.55	2.208	47.253	**0.000**
	SES Middle	131	9.02	2.182		
	SES High	133	9.65	2.263		
Algebra	Low SES	282	8.82	3.149	67.853	**0.000**
	SES Middle	131	11.43	3.026		
	SES High	133	12.30	3.116		
Measurement and Shape	Low SES	282	4.55	2.087	36.472	**0.000**
	SES Middle	131	5.95	2.506		
	SES High	133	6.42	2.459		
Statistics	Low SES	282	2.39	1.238	9.910	**0.000**
	SES Middle	131	2.77	1.042		
	SES High	133	2.88	1.135		

Whole Numeracy Test	Low SES	282	23.30	6.515	72.993	**0.000**
	SES High	133	31.26	7.296		

In order to investigate whether Grade 6 students' numeracy was different by their socioeconomic status, descriptive statistics was done. Based on the result of table 4, it was observed that the mean score of the students from high socioeconomic status was highest on each subscale as well as on the whole numeracy test (see Table 4).

To make the confirmation of the significant differences of Grade 6 students' numeracy by their level of socioeconomic status, ANOVA was executed. According to the results of table 4.6, there was significant difference in Grade 6 students' numeracy across different socioeconomic status at 0.05 level. It can reasonably be concluded that the students from the high socioeconomic status families were the best among the students from other groups (middle socioeconomic status families and low socioeconomic status families) on each subscale as well as on the whole numeracy test. To obtain more detailed information, the Post-Hoc Test carried out by Tukey method (see Table 5).

Table 5 Results of Tukey HSD Multiple Comparisons for Grade 6 Students' Numeracy by SES Level

Subscales of Numeracy Test	(I) SES Level	(J) SES Level	Mean Difference (I-J)	*P*
Number and Operation Sense	SES Middle	Low SES	1.473*	.000
	SES High	Low SES	2.104*	.000
Measurement and Shape	SES Middle	Low SES	2.605*	.000
	SES High	Low SES	3.478*	.000
Algebra	SES Middle	Low SES	1.400*	.000
	SES High	Low SES	1.875*	.000
Statistics	SES Middle	Low SES	.384*	.006
	SES High	Low SES	.493*	.000
Whole Numeracy Test	SES Middle	Low SES	5.863*	.000
	SES High	Low SES	7.951*	.000
		SES Middle	2.088*	.035

Note: * The mean difference is significant at 0.05 level.

Concerning the whole numeracy test, the mean score of students from high socioeconomic status families was significantly higher than that of students from low socioeconomic status families and middle socioeconomic status families. With regard to

number and operation sense subscale, the mean scores of students from middle socioeconomic status families and higher were higher than that of students from low socioeconomic status families. In regard to algebra subscale, the mean scores of students from middle socioeconomic status families and high socioeconomic status families were higher than that of students from low socioeconomic status families. In related to measurement and shape scale, the mean scores of students from middle socioeconomic status families and high socioeconomic status families were higher than that of students from low socioeconomic status families. Regarding the statistics subscale, the mean scores of students at middle socioeconomic status families and high socioeconomic status families were higher than that of students at low SES level (see table 5). The students from high socioeconomic status were highest on each subscale as well as on the whole numeracy test than students from middle and low socioeconomic status. It can reasonably be concluded that students from high socioeconomic status get many opportunities to enhance their numeracy because of their rich and conducive living environment for their learning.

Conclusion and Discussion

Since the earliest days, education has been highly regarded in Myanmar. Myanmar regards children as precious gems for a future community. The strong tradition of monastic education has contributed significantly to a high literacy level since the time of the Myanmar kings. Nowadays, education places more emphasis on the formal system with its schools and institutions at primary, secondary and tertiary levels. The Ministry of Education (MOE) and 12 other ministries provide varied and diverse courses for learning in higher education sector, but the MOE is also responsible for the basic education schools for all children. To create an education system that will generate a learning society capable of facing the challenges of the Knowledge Age is our country's vision. Our Motto is Building a modern developed nation through education (as cited in Su Wai Han, 2011).

Nowadays, interest in numeracy has been increasing in education because it can predict education and professional success. However, in Myanmar there was relatively rare awareness of the important of numeracy and there were relatively standardized numeracy test. Therefore, in this research numeracy test was using two-parameter IRT logistic model. Consequently, the numeracy test composed of 48 items was developed.

A number of studies have suggested that numeracy is grounded in number competence (such as recognizing the value of quantities and grasping the principles of counting) (Jordan, Kaplan, Rameni, & Locuniak, 2009), informal number sense (e.g., understanding terms such as "more", "less", "bigger" and "smaller"; knowing that numbers in a counting sequence refer to specific quantities and that higher numbers reflect greater quantities) (Griffin, 2004), and more general factors sometimes characterized as "working memory" (Raghubar, Barnes, & Hecht, 2010). Reid (2008) showed that an informal understanding of quantitative relationships provides the basis for developing formal mathematical knowledge. Numeracy test includes four components such as number and operation sense, algebra, measurement and shape and statistics. Since the numbers of items in four components were not equal, the marks for the items were transformed to standard score. The standard score of statistics component of the Grade 6 students was the highest in the four components and that of number and operation sense component was the second highest. The standard score of measurement and shape component of the Grade 6 students was the third highest and that of algebra component was the lowest on the whole numeracy test. Therefore, it can be said that Grade 6 students perform the best in statistics component than other components of numeracy. The standard score of algebra component of the Grade 6 students was found to be the lowest on the entire numeracy test. It can reasonably be concluded that students performed best in statistics component because items from this component are more concrete than other components. Students' performance on number and operation sense

component was the second highest among all components. It can reasonably be said that number and operation sense items were more familiar with students since they had exposure during their early childhood mathematics learning. The standard score of measurement and shape component was the second last stand because students cannot thoroughly understand the relationships between different systems of units identify equivalent period of unit within a system and carry out conversions with units of time, year, money, length, volume and weight. It can reasonably be concluded that students performed lowest in algebra component because the items from this component are more abstract than other components.

Next, significant difference between gender, region and between different levels of socioeconomic status were also found on Grade 6 students numeracy test. There was significant difference in Grade 6 students' numeracy by gender at 0.05 level. It may be concluded that female students were better than male students in numeracy. Moreover, there was significant difference in Number and Operation Sense by gender at 0.05 level and it can be interpreted that female students were better than male students in Number and Operation Sense. There was also significant gender difference in Measurement and Shape at 0.05 level and it can be interpreted that female students were better than male students in Measurement and Shape. Similarly, significant difference was found to be on Statistics by gender at 0.05 level and it can be interpreted that female students perform better than male students on Statistics. Female students performed better than male students on the whole numeracy test because girls are more concerned with helping their parents in buying groceries, commodities and stationery for their home. There was also significant difference in the whole numeracy test between rural schools and urban schools at 0.05 level. It can be concluded that Grade 6 students from urban schools performed better than Grade 6 students from rural schools. The students from urban schools perform better than students from rural schools on each subscale of numeracy test as well as on the whole numeracy test. It can reasonably be said that

students from urban schools had more opportunities to apply their numeracy skills in day by day experience from their environment than students from rural schools.

In order to test whether Grade 6 students' numeracy were depend on their socioeconomic status or not, checklists were prepared to get some information deal with students' socioeconomic status such as living status, father's occupation, father's educational level, mother's occupation, mother's educational level, family income, number of family members, number of graduated members in family, health care condition, usage of mobile at home, usage of computer at home, usage of internet at home, internet usage time, usage of vehicles at home, usage of electricity, electricity usage time, the number of reading time in library. There was significant difference in Grade 6 students' numeracy across different socioeconomic status at 0.05 level. It can reasonably be concluded that the students from the high socioeconomic status families were the best among the students from other groups (middle socioeconomic status families and low socioeconomic status families) on each subscale as well as on the whole numeracy test. The students from high socioeconomic status were highest on each subscale as well as on the whole numeracy test than students from middle and low socioeconomic status. It can reasonably be concluded that students from high socioeconomic status get many opportunities to enhance their numeracy because of their rich and conducive living environment for their learning.

Suggestion for Future Research

This investigation highlights the need for a clearer operational definition of the construct of numeracy as well as additional research into other components of numeracy not included in this study. The limited study area pointed out the necessity to conduct a nationwide study to explore more detailed differences between rural and urban areas. In this study, the sample of students were chosen from Yangon Region, Ayeyarwady Region, and Rakhine State, so

further research should be carried out by selecting students from other states and regions so that samples might be more representative.

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Appendix

Sample Item of Numeracy Test

အောက်ပါတို့မှ အဖြေမှန်ကိုရွေးချ၍ အဖြေမှန်၏ အကွာရာကို အဖြေရေးရန်နေရာတွင်ရေးပါ။

Number and Operation Sense

(၁) **အပြည့်ကိန်းတစ်ခုနှင့် အပိုင်းကိန်းတစ်ခုတို့ ပေါင်းစပ်ဖော်ပြထားခြင်းကို**

(က) ဒသမကိန်း (ခ) ကိန်းတု (ဂ) ကိန်းရော (ဃ) အပိုင်းကိန်း ဟုခေါ်သည်။

Algebra

(၂) 9 x k x q x k x q ကို ထပ်ညွှန်းပုံစံပြောင်းလျှင်

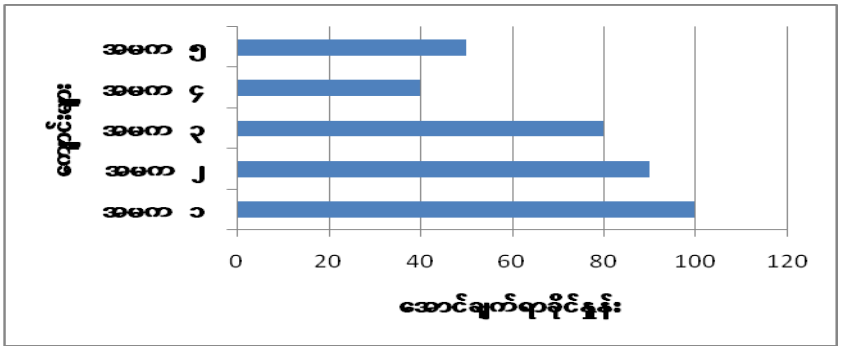
(က) 9kq (ခ) $9k^2q$ (ဂ) $9kq^2$ (ဃ) $9k^2q^2$ ဖြစ်သည်။

Measurement and Shape

(၃)ကားတစ်စီးသည် တစ်နာရီလျှင် ၈၀ မိုင်နှုန်းဖြင့်သွားသော် အချိန် ၁၅ မိနစ်ကြာသောအခါ ထိုကားသည် မိုင်ပေါင်းမည်မျှ ရောက်မည်နည်း။

(က) ၁၆ မိုင် (ခ) ၁၈ မိုင် (ဂ) ၂၀ မိုင် (ဃ) ၂၂ မိုင်

(၄) အောက်ပါဇားဂရပ်သည် မြို့နယ်တစ်ခုမှ အမကကျောင်း ၅ကျောင်း၏ ၂၀၀၀ ခုနှစ် စတုတ္ထတန်းအောင်ချက် ရာခိုင်နှုန်းကို ဖော်ပြသည်။



အထက်ပါဗားဂရပ်အရအောင်ချက်ရာခိုင်နှုန်း ‘ဒုတိယအနည်းဆုံးကျောင်းမှာ
(က) အမက (၁) (ခ) အမက (၂)
(ဂ) အမက (၃) (ဃ) အမက (၅) ဖြစ်သည်။