

# ELEMENTARY ARITHMETIC PERFORMANCE AMONG STUDENTS IN LOCAL AND TRANSNATIONAL PRE-UNIVERSITY PROGRAMS

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## **Abstract**

The purpose of the study is to evaluate pre-university students' performance in elementary arithmetic in one local and four transnational programs at a private college in Malaysia. The D'Amore test is employed to measure the students' proficiency in the basic mathematical skill. Overall, only 33.4% of students answered all questions correctly, which is very similar to levels of elementary mathematics deficiency found in other parts of the world. In comparing different academic programs, students of the local program are better than or compatible with those from the transnational programs in elementary arithmetic.

Keywords: pre-university, elementary arithmetic, transnational education, local program

## **1 INTRODUCTION**

Deficiency in elementary arithmetic among students has been widely reported. It was reported that only 25% of 9<sup>th</sup> graders scored all correct answers for ten elementary arithmetic questions (Cornwall, 1999). The test of ten questions was called the D'Amore test, which was named after Lou D'Amore, a school teacher in Ontario, who compiled these questions in 1992. These questions were actually chosen from a textbook of Grade 3 Mathematics, which was designed and published in 1932 (Hume, 1932). Since then, the D'Amore test has been employed to assess elementary mathematics skills of students of higher education, and the results were alarming. Only one-third of undergraduates at a liberal arts college answered all questions correctly (Standing, 2006). Another study found that only 40% of undergraduates majoring in business and economics obtained all questions correctly (Standing et al., 2006). Only 26.3% of university students answered correctly in all ten questions, and the test score was correlated with their mathematics skills without the use of calculators (Rustemeyer & Stoeger, 2007). A later study involved

undergraduates and graduates, and it was reported that only 31.7% of them passed the D'Amore test by scoring full marks in the test (Weinstein & Laverghetta, 2009). The past literature suggests that deficiency of elementary arithmetic is evident everywhere, and it may include at pre-university level.

This study attempts to measure the performance of pre-university students in elementary arithmetic. It involved one local program, two Australian programs, one UK program, and one Canadian program. The two Australian programs were labelled as "Australian Program 1" and "Australian Program 2". It is certainly a better idea to focus not only on local programs but also transnational programs, where transnational education has reached almost every corner of the globe after the World War II. This provides a platform to compare the levels of elementary mathematics deficiency among local and transnational programs. In this article, transnational education is defined as "all types of higher education study programs, or sets of courses of study, or educational services (including those of distance education) in which the learners are located in a country different from the one where the awarding institution is based" (UNESCO/Council of Europe, 2000).

## **2 METHODOLOGY**

### **2.1 Sample**

The sample consisted of 142 female and 160 male students. All of them were Malaysian. Their age ranged from 16 to 22 with  $M = 18.18$  and  $SD = .743$ . There were 72 students from Australian Program 1, 57 from the UK program, 62 from Australian Program 2, 57 from the local program, and 54 from the Canadian program.

### **2.2 D'Amore Test**

The following are the ten questions. (1) Subtract these numbers:  $9864 - 5947$ ; (2) Multiply:  $92 \times 34$ ; (3) Add the following:  $\$126.30 + \$265.12 + \$196.40$ ; (4) An airplane travels 360 kilometers in three hours. How far does it go in one hour? (5) If a pie is cut into sixths, how many pieces would there be? (6) William bought six oranges at 5 cents each and had 15 cents left over. How much had he at first? (7) Jane had  $\$2.75$ . Mary had 95 cents more than Jane. How much did Jane and Mary have together? (8) A boy bought a bicycle for  $\$21.50$ . He sold it for  $\$23.75$ . Did he gain or lose and by how much? (9) Mary's mother bought a hat for  $\$2.85$ . What was her change from  $\$5$ ? (10) There are 36 children in one room and 33 in the other room in Tom's school. How much will it cost to buy a crayon at 7 cents each for each child?

### 2.3 Procedure

Voluntary participants answered all questions without using any calculators. No time limit was given to complete the test, and no discussion was allowed during the test. The test was conducted in classrooms, library, and other study areas in the campus. One mark was given for each correct answer and no mark was given for incorrect answers.

## 3 RESULTS

The distribution of the test scores can be seen in Figure 1 with only 33.4% of students answering all questions correctly. The test score ranged from 3 to 10 with  $M = 8.77$  and  $SD = 1.304$ . A one-way ANOVA suggests there is a significant difference in the score between the five programs with  $F(4, 297) = 3.663$ ,  $p < .01$ . LSD, a Post Hoc test, was employed to compare mean scores for all the programs and the results can be seen in Table 1. It indicates no significant difference between the local program and three transnational programs (namely Australian Program 1, the UK program, and Australian Program 2) in the terms of mean scores, but the mean score of the local program is significantly higher than that of the Canadian program. And the comparisons among transnational programs show that both Australian Program 1 and the UK program are higher than both Australian Program 2 and the Canadian program. Although there are some variations in the elementary arithmetic performance among pre-university programs, all programs have average scores of at least 8 out of 10 items on the test.

Figure 1: Frequency distribution of test scores on the D'Amore test (maximum = 10)

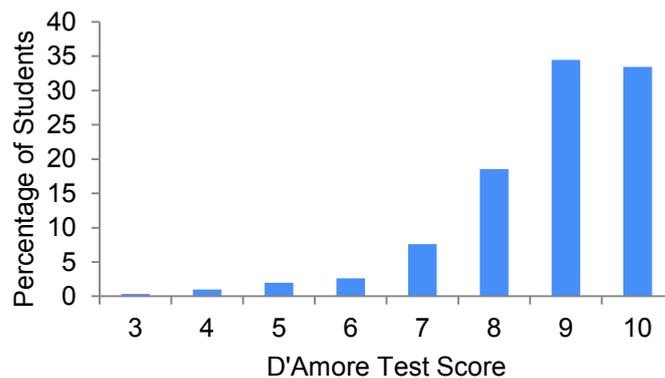


Table 1: Descriptive statistics of the test scores and comparisons between their test scores

Program	<i>N</i>	<i>M</i>	<i>SD</i>	Pair Comparison	<i>M</i> Difference	<i>p</i>
Australian 1	72	9.07	.954	Australian 1 & UK	.069	.760
				Australian 1 & Australian 2	.533	.013*
				Australian 1 & Local	.227	.318
				Australian 1 & Canadian	.736	.002**
UK	57	9.00	1.282	UK & Australian 2	.484	.040*
				UK & Local	.158	.511
				UK & Canadian	.667	.007**
Australian 2	62	8.52	1.479	Australian 2 & Local	-.326	.167
				Australian 2 & Canadian	.183	.444
Local	57	8.84	1.424	Local & Canadian	.509	.037*
Canadian	54	8.33	1.259	-	-	-

Note: \* Difference is significant at .05 level. \*\* Difference is significant at .01 level.

#### 4 DISCUSSION

Deficiency in elementary arithmetic seems to be a world phenomenon in education, and it happens at all levels of educations ranging from secondary education to higher education. The findings from this study indicate that it should not be a surprise if students at pre-university level could not perform mental calculations in addition, subtraction, multiplication and division as they are so much dependent on calculators. The most alarming aspect observed in this study is some students have difficulty in solving questions related to real-life problems, indicating that some actually lack word-problem solving skills. The skill is desperately needed in many disciplines of study. The lack of word-problem solving skill has also been reported elsewhere (e.g., Parmjit, 2009). Such an academic deficiency definitely poses a challenge to engage pre-university students in mathematics learning as it is expected that they had acquired basic mathematical skills before these students are introduced to higher levels of mathematics.

On the investigation of deficiency of elementary arithmetic across various pre-university programs, students from the local program perform better than those from one of the transnational programs and are as good as the other transnational programs in the test. It suggests that students from the local program are as good as those from transnational programs in the basic mathematical skill.

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