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Constructs Embedded in the National Achievement Test Results of the Philippines

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Abstract: ***This study aimed to determine the constructs rooted in the National Achievement Test (NAT) in the country. The data of the NAT performance of Grades 6 and 10in four subjects namely Filipino, Science, English and Mathematics of the sixteen regions in the country in the year 2009-2015were subjected to Principal Component Analysis. The study revealed that a commonality exists between Science, English and Mathematics performance of the learners. It manifested Technical-Instructional Language Index i.e., English as the medium of instruction used in teaching Science and Mathematics is a significant factor that provides empirical measures or information on the learners' capability in terms of their logical or critical reasoning skill. Non-Instructional Language Index was also established which shows that Filipino subject has nothing to do with Science and Mathematics instructions. However, the inclusion of Filipino subject in the National Achievement Test is relevant unless it is used as a medium of instruction in some other subjects. Hence, the medium of instruction is one of the most important factors that could affect the learning of the students.***

Keywords: constructs, medium of instruction, Technical-Instructional Language Index, Non-Instructional Language Index

1. Introduction

In the Philippines context, the academic achievement of basic education learners is measured thru the National Achievement Test (NAT). It is a system-based assessment designed to evaluate learning outcomes in identified periods of basic education. It includes set of examinations taken nationwide by learners in Grades 6, 10, and 12. The test is administered to determine their academic levels, strength and weaknesses, as well as their knowledge learn throughout the year divided into 5 categories; English, Filipino, Math and Science (Victorino, 2011).

The Department of Education administered the annual National Achievement Test in order to deliver empirical evidence on the achievement level of pupils/students which policy makers, curriculum planners, and administrators will use as a guide in planning the respective course of action to take. Results of the NAT will identify and examine disparities on achievement levels by region, division and schools. It will also determine the rate of improvement in every basic education institution. The above aims focus on one major component which is student achievement which gives an empirical measures or information of the totality of his learning in a particular subject or area.

This study aims to determine the constructs rooted in the National Achievement Test results of the 16 regions in the country considering Filipino, Science, English, and Mathematics subjects using principal component analysis.

2. Conceptual Framework

This study conceptualized that constructs are rooted in the National Achievement Test performance of the Grades 6 and 10 learners of the Basic Education Institutions in the country considering the four basic subjects namely Filipino, Science, English and Mathematics. The established constructs can have significant connections with the clustered components of the test which provides essential effect towards the learning competencies of the pupils/students. Thus, the figure below depicts the schematic diagram of the study.

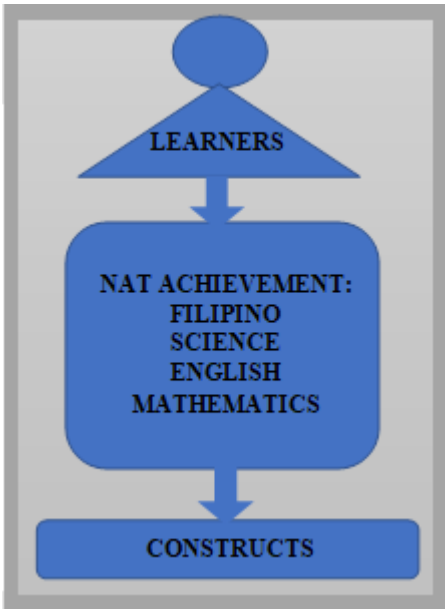

Figure 1: Schematic Diagram

3. Methodology

The study subjected the data of the National Achievement Test (NAT) performance of the sixteen regions in the country to Principal Component Analysis. The average NAT performance of each region in the subjects Filipino, Science, English and Mathematics covering the period of six years from 2009-2015 were subjected to Eigen analysis and Eigenvalue Scree Plot to reduce its dimensions. From four components of the given data set, it was condensed into two dimensions but still preserving the importance of the given information. This study utilized the lumped data set corresponding to the NAT average performance of each region.

4. Results and Discussion

The data set is the National Achievement Test performance in four subjects namely Filipino, Science, English and Mathematics of the 16 regions in the country from year

2009-2015. The NAT performance in every school belonging to each region for six years were considered.

Table 1: NAT Performance of Both Grade 6 and 10 (2009 to 2015)

Region	Average Filipino	Average Science	Average English	Average Mathematics
CARAGA	61.99	60.41	63.56	66.38
VIII	60.40	53.26	58.20	57.65
V	56.40	39.78	46.90	41.77
IX	53.74	46.47	51.91	50.96
X	54.92	45.23	52.42	48.55
XII	55.17	44.62	51.01	48.81
IV-B	59.62	43.09	49.37	47.13
VII	58.04	45.69	54.44	50.19
XI	56.25	44.98	51.71	47.84
VI	57.54	45.13	52.59	48.30
CAR	56.99	41.59	52.68	43.50
II	55.45	40.94	48.93	44.75
I	52.90	37.94	45.88	39.99
III	57.23	42.98	50.23	45.23
IV-A	58.49	38.30	47.87	40.02
NCR	59.92	41.25	51.79	43.57

Table 2: Eigen Analysis of the Four Components: Ave. Filipino, Ave. Science, Ave. English, and Ave. Mathematics

Eigenvalue	3.3321	0.6038	0.0599	0.0042
Proportion	0.8330	0.1510	0.0150	0.0010
Cumulative	0.8330	0.9840	0.9990	1.0000

Variable	PC1	PC2	PC3	PC4
Ave. Filipino	0.387	0.909	-0.152	-0.010
Ave. Science	0.534	-0.267	-0.285	0.750
Ave. English	0.535	-0.089	0.835	-0.095
Ave. Mathematics	0.528	-0.306	-0.446	-0.655

The variances of the four components are shown in Table 2 as revealed in the computed Eigenvalues. The result shows that the first two components accumulated to 98.40% of the total variance having the first component displaying the biggest Eigenvalue which comprises 83.3 % from the entire component system. Based on the accumulated proportion of the first and second components, it is believed that this proportion is sufficient enough to consider the two principal components out of the original four components. This can also be supported by the Eigenvalue Scree Plot as shown below.

Based on the Eigenvalue Scree Plot, the system has two (2) minimum number of principal components as manifested by the occurrence of the first elbow in the graph. But analyzing the cumulative proportion of the Eigenvalues, it is practical to increase the minimum number of principal components to three (3) and assumed that these will amply warrant to represent the whole system.

Table 3: Principal Component Representatives
Variable PC1 PC2 PC3

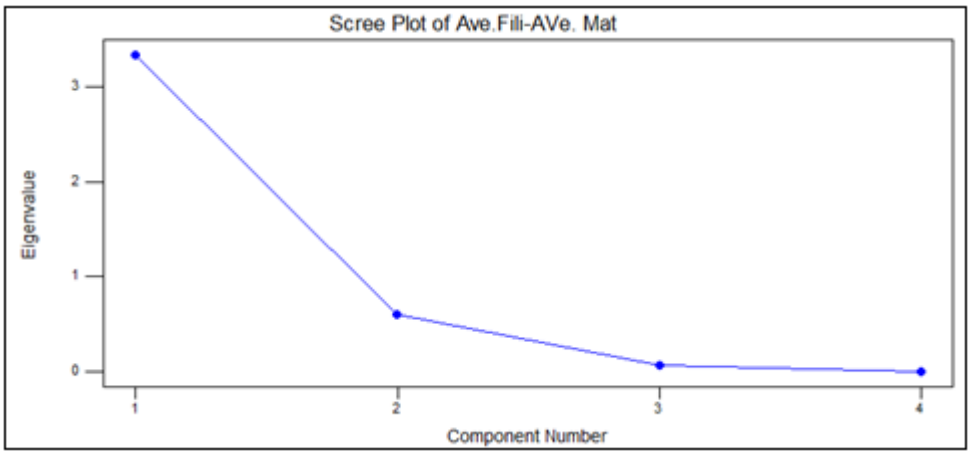

Figure 2: Graph of the Eigen value Scree Plot

Based on the Eigen analysis, the three variables in the first principal component namely average National Achievement Test performance in Science, English and Mathematics have almost the same values, this may entail that these variables are interconnected with each other thus can be clustered as "Technical-Instructional Language Index". On the other hand, Filipino component is also considered in PC2 and may be renamed asNon-Instructional Language Index. Hence, from the four components, this is reduced into two components.

In getting the values of the PC1 and PC2, it is represented by the formula, ABSO (wt* C1 + wt *C2 + wt * C3 + wt * C4), that is, the absolute value of the sum of the products of the weight of each variable considered namely Filipino, Science, English, and Mathematics and the average performance in four subjects of the 16 regions in the country from 2009-2015.

Table 3: Values of the Two Principal Components

PC1	PC2
125.302	14.2503
113.392	17.8625
90.215	23.6906
100.291	16.2284
99.086	18.3242
98.240	18.7602
97.381	23.8738
102.486	20.3558
98.712	19.8804
100.005	20.7938
95.416	22.6999
93.127	21.4248
86.393	21.6359
95.854	22.2356
89.829	26.4348
95.929	25.5118

It can be observed from the table, PC1 and PC2 have maximum values of 125.302 and 26.4348 respectively. These values are necessary to obtain the variances of the new established indices, i.e., the ultimate constructs embedding the NAT performance.

Table 4: Indices of the Two Principal Components

Technical-Instructional Language Index	Non-Instructional Language Index
1.00000	0.53907
0.90495	0.67572
0.71998	0.89619
0.80039	0.61390
0.79078	0.69318
0.78402	0.70968
0.77717	0.90312
0.81791	0.77004
0.78780	0.75205
0.79812	0.78661
0.76149	0.85871
0.74322	0.81048
0.68948	0.81846
0.76498	0.84115
0.71690	1.00000
0.76558	0.96508

Table 4 shows the constructs embedded in NAT performance of the grade 6 and Grade 10 learners in the country from 2009-2015. It is evident in PC1 thru Eigen analysis that there is a commonality existing between Science, English and Mathematics performance of the learners. It manifested Technical-Instructional Language Index i.e.,English as the medium of instruction used in teaching Science and Mathematics is a significant factor that provides empirical measures or information on the learners' capability in terms of their logical or critical reasoning skill. For PC2, Non-Instructional Language Index was established and this shows that Filipino subject has nothing to do with Science and Mathematics instructions. However, the inclusion of Filipino subject in the National Achievement Test is relevant unless it is used as a medium of instruction in some other subjects.

5. Conclusion

English is an important factor in developing Science and Mathematics competencies of the learners. Hence, the medium of instruction is one of the most important factors that could affect the learning of the students.

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