

INFLUENCE OF ACADEMIC PROCESSING SPEED ON PRE-SERVICE PHYSICS TEACHERS' PERFORMANCE IN ILORIN, NIGERIA

By

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Abstract

Academic processing speed is an essential cognitive factor that determines to a greater extent the performance of every student success in their academic tasks ranging from classroom lesson, self or group learning, extra-curricular activities and writing of continuous assessment test or examination which were always carried under a specified period of time. The purpose of this study is to determine the influence of academic processing speed on performance of pre-service physics teachers. This study adopted descriptive survey type of research of ex-post facto as this method was found appropriate because it help the researchers to collect and collate numeric data and to make use of correlations among existing variables. Students' gender (female and male) occurs at two level. The population for this study comprised all college of education penultimate year students in Kwara State. Penultimate year students that offers physics as a minor course constituted the target population while one hundred and seven (107) students responded to the Google-form -prepared test and inventory via WhatsApp. 24 academic-processing-speed item adapted from Randy Kulman's academic processing speed inventory (2017) and 5 researchers designed short answered questions was used in the study. Findings from the study show a significant value from the table was 0.12 ($p > 0.05$) which was found to be higher than the alpha level of significant (0.05). The formulated research hypothesis that stated that academic processing speed has no significant influence on students' performance in physics was retained/not rejected. Recommendations from the study revealed that academic processing speed helps in categorizing students into the different levels. Also the educators at all level need to work on the students' academic processing speed in other to determine the level at which each student can carried out academic activities in timed situations.

Keywords: Academic Processing Speed, Performance, Physics and Gender

Introduction

Processing speed has been recognized in previous research work (Khalid et al., 2020; Kyllonen & Tirre, 1991) as one of the numerous cognitive factors that determine the learners' learning outcomes. The learning outcome is geared towards realization of educational courses curriculum objectives which are tailored to the betterment of immediate society and the country at large. Every facet of educational activities has been scheduled to hold within a certain time frame. Education activities like classroom lesson, extra-curricular activities, self/group / library study/self and group learning, writing of test and examination, and even leisure period were planned and designed to take place at scheduled period in the calendar prepared by various school administrators and education agencies. Hence, this research study carried out the Influence of Academic Processing Speed on Pre-service Physics Teachers' Performance in Ilorin, Nigeria.

Rindermann et al. (2004) worked on processing speed, intelligence, creativity and school performance. The study adopted the use of testing of causal hypothesis using structural equation models. The study involves two hundred and seventy one (271) students of classes nine, ten, and eleven in German gymnastics students between ages of 14 and 17. The study adopted two paper and pencil tests: Zahlen-Verbindungs-Test (ZVT) and the coding test (Kodierungs-Test, KDT). The statistical tools involved correlation and structural equation models. The result of the study revealed that there is co-relation between processing speed, intelligence, creativity and school performance. Likewise, Bennet et al. (2008) worked on academic processing speed and the influence of both externalizing behaviour and language skills on the academic skills of students with emotional disturbance. The study sampled one hundred and sixty-six (166) students that involves 136 male and 30 female students receiving special education services for emotional disturbance in a medium sized urban school. The Woodcock-Johnson III tests of achievement (WJIII), math fluency, reading fluency and writing fluency subtests were used to measure the participants' academic processing speed with the reliability index of 0.90, 0.90, and 0.88 respectively using test-retest methods. Multiple linear regression was used to analyze the result and the study established that academic processing speed mediated the influence of both language ability and externalizing behavior on academic skills.

The study of Daniels et al. (2020) on digital assessment of working memory and processing speed in everyday Life, feasibility, validation, and lessons-learned however revealed a different outcome. Snow ball sampling technique using media advertisement was used to select samples. Fifty-one (51) participants were provided written consent informed form. The momentary Visuo-spatial working memory task and momentary digit symbol substitution task were used to determine the processing speed ability of the participants. The instruments were administered to the students eight (8) times a day over six (6) consecutive days. The result of the study revealed participants high processing speed.

Cavallo et al. (2021) worked on analytical framework for assessing cognitive capacity and processing speed of operators in industry. The study sampled 14 2019/2020 industrial system, master's degree, Ph.D. students and engineers of Polytechnic University of Bari (LISE). Fifteen (15) minutes N-back test was used to access the participants. Descriptive statistics (Mean, Variance and Standard Deviation) and coefficient of variance were used to analyze the data collected. The result of this study shows that operators have cognitive ability for the maximum number of information each participants processed in a specific given time. Wood et al. (2021) explores the contribution of non-verbal cognitive skill on biological children's grammatical performance and the influence of exposure, task type and language of

assessment. The study also worked on children on non-verbal working memory and processing speed. Participants for the study comprises of 307 Spanish-English bilingual in kindergarten, second and fourth grade involving 163 girls and 144 boys. Narrative language task instrument was used to predict the samples processing speed. The data collected was analyzed using bivariate correlation. The study revealed that processing speed has mean value of 16.22 and S.D. of 8.08. Findings from the study revealed the inability of the children of perform non-verbal working memory in good time.

Statement of the Problem

Academic tasks accomplishment within a specified period of time is a barrier that has been experienced by all categories of student when confronted with either examination or academic tasks that involves time management. Processing speed is used to determine to students' success on how to get things done in a given period of time. It is a real time measurement coupled with extensive assessment of student' speed rate which have revealed significant result in improving students' performance. Therefore, this research work determine relationship between processing speed and performance of pre-service teachers. Influence of gender on relationship between processing speed and performance of pre-service teachers was also variable of interest in the study.

Scope of the Study

This study was carried out in state college of education, North Central, Kwara State, Nigeria, with penultimate year students as the main focus. Two (2) research instruments (Processing Speed Items adapted from Randy Kulman and researchers designed Physics Performance Test, PPT) were adapted for this study, and gender was the mediating variables.

Purpose of the Study

The main purpose of this study was to determine the influence of processing speed on the performance of pre-service teachers in physics. Specifically, the study determines:

1. The influence of processing speed on the performance of pre-service teachers in physics;
2. The influence of gender on processing speed and the performance of pre-service teachers in physics.

Research Question

1. What is the influence of processing speed on the performance of pre-service teachers in physics?
2. What is the influence of gender on processing speed and the performance of pre-service teachers in physics?

Research Hypotheses

H0₁: Processing speed have no significant influence on students' performance in physics;

H0₂: Gender did not have significant influence on processing speed and students' performance in physics.

Methodology

This study adopted descriptive research type of ex-post facto. This method was found appropriate because it helped the researchers to collect and collate numeric data and the use of

correlations among existing variables. Students' gender occurs at two-levels (male and female). The population for this study comprised of all colleges of education penultimate year students in Kwara State. Penultimate year students from one of the state colleges of education that offers physics as minor course constitute the target population while one hundred and seven (107) responded to the Google form prepared test and inventory shared via WhatsApp social media platform that the students used for their class lesson.

Two instruments adapted for this study namely;

1. 24 items academic processing speed adapted from Randy Kulman's academic processing speed inventory (2017); and
2. 10 items researchers' designed multiple choice questions.

The face and construct validities of the instruments were carried out by two experienced lecturers and non- participating pre-service teachers that offer physics as a major course. The data were analyzed using factor analysis to determine each items factor loading. All the items factor loadings exceed the suggested bench mark Of 0.7.

Table 1

Analysis of Instrument Validation

	C.A	CRa	CRb	AVE
Physics Performance	0.611	0.676	0.727	0.239
Processing Speed	0.801	0.838	0.834	0.194

Findings

The main purpose of this present study was to determine if academic processing speed related to the pre-service teachers' performance in elementary physics course. In addition, the study also determines by extensions, the influence of gender on relationship between academic processing speed and pre-service teachers' performance in elementary physics questions.

Table 2

Analysis of Path Coefficient, T-value and P-value table

Path	Path	Coeff.	STDEV	T	P
	Coeff.	Mean		Value	Value
Gender -> Physics Performance	-0.132	-0.122	0.101	1.310	0.190
Processing Speed -> Gender	0.059	0.054	0.058	1.004	0.315
Processing Speed -> Physics Performance	0.938	0.948	0.011	82.281	0.000

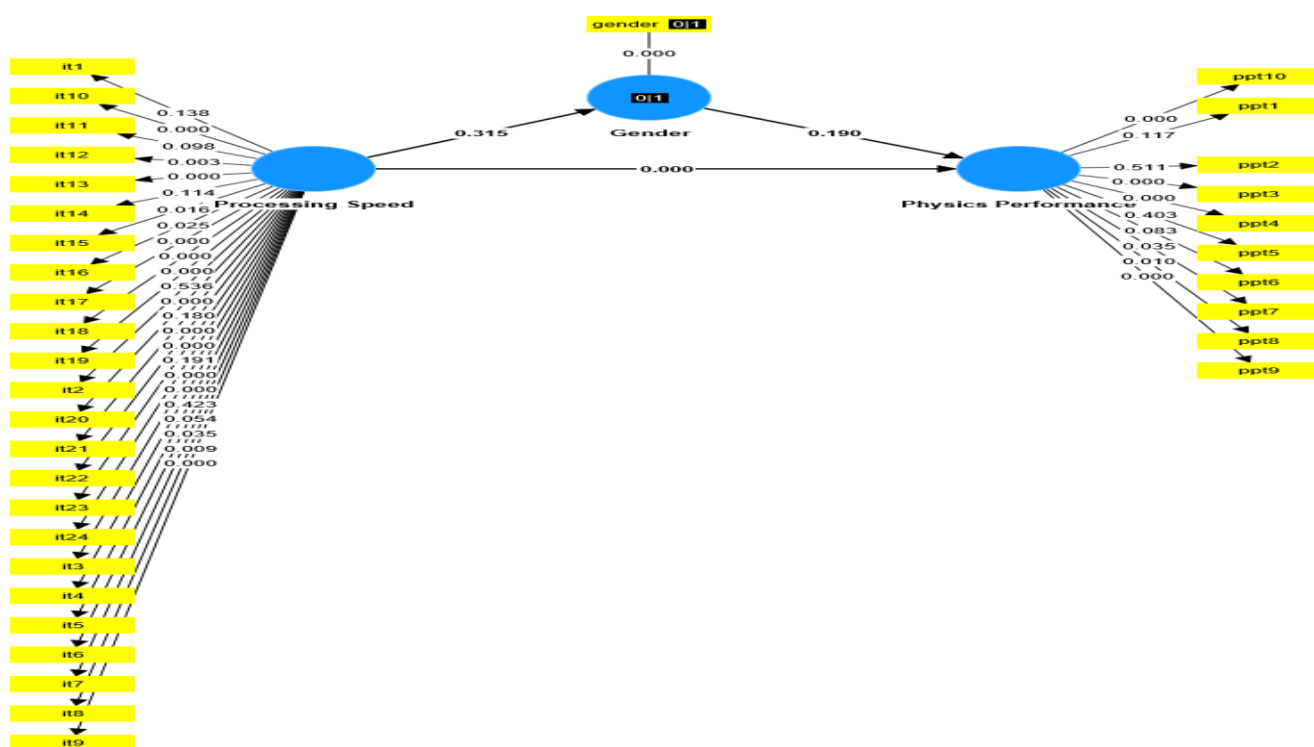


Figure 1

A diagrammatic representation of Path Coefficient, T-value and P-value table

The table 1 describes the direct and indirect influence of academic processing speed, performance in physics and gender. The relationship ($\beta=0.059$, T-value=1.004, $P>0.05$) indicated that mediate role of gender does not influence the academic performance and academic processing speed though it has weak relationship. The relationship ($\beta=0.938$, T-value=82.281, $P<0.05$) indicated that significant relationship existed between academic processing speed and performance in physics.

Discussion

Academic processing speed in the study determines to a greater extent the outcome of every student's performance both in planned and unplanned academic activities. The students' level of academic processing speed revealed that majority of college student's fits into the low academic processing speed. The implication is that most of the students cannot complete an academic activity in a given specified period. This in line with the findings of Rindermann et al. (2004) but in contrast to the study of Daniels et al. (2020) and Bennet et al. (2008). Since every academic activity is designed to take place in a specified period/time. These activities could include classroom lesson, timed classroom work, practical activities, assessment time and examination. These students from the college requested for more time to complete the task assigned to them either during classroom activities or assessment period. The student's inability to complete their work at assigned time corroborate with the findings of Wood et al. (2021).

Conclusion

The study concludes that every student academic processing speed should be detected in order to recognize and understand each students learning deficiencies. Furthermore, the study concludes on the inferences to the timed academic skills or activities on both cognitive

and psychomotor skills of students on academic processing speed are as a tool toward improving pre-service physics teachers' performance in the act of teaching and learning when on field in colleges of education.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Academic processing speed helps in categorizing students into their class of doing academic activities in timed academic skills.
2. The educators at all level need to work on the students' academic processing speed in other to predict the outcome of each student capacity to carried out tasks under timed situations as it's been recognized as one of the cognitive functions that aid students' performance and knowledge acquisition.
3. The stakeholders in the field of education especially curriculum planner should have subjects/courses curriculum that will cater for the different levels of student' academic processing speed.

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