Chapter 9
Collaborative Learning Strategy and Students' Academic Performance in Mathematics and Computer Programming

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ABSTRACT

Humans are facing complex problems such as learning how to solve computational problems and academic failures. This research focused on the impact assessment of collaborative learning strategy on solving computational problems among students in Nigeria. A mixed research design was used and the population was 1600 senior secondary school students. A stratified random sampling method was used to select 240 SS III students for the study. The mathematics and computer programming performance tests instrument for data collection were validated by experts in educational measurement and evaluation. A reliability coefficient of 0.79 was obtained for the test instrument. The data collected were analysed using mean, standard deviations and multivariate analysis of covariance (MANCOVA) statistical tools. Findings revealed that the use of collaborative learning strategy was effective on student's academic performance in solving mathematical and programmatically based problems. Recommendations on students' learning activities were suggested for the enhancement of students' learning experiences.

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INTRODUCTION

The significant effects of knowledge in human capital development and national growth cannot be underrated. Every stakeholder across various parastatals in the world requires relevant knowledge and skills in decision-making and stimulation of innovativeness for higher productivities. There are recommended courses or subjects at different levels of education to train students for specific knowledge and skills. The extent at which the knowledge and skills are acquired is determined by prescribed examinations. This implies that students are to be examined in the recommended courses to find out if the stated educational objectives have been achieved before the award of the certificate.

Knowledge can be acquired through various platforms such as intuition, research (asking questions), authority (teacher), collaboration, learning, reading, practice, experiment, listening, and observation to mention but a few. Students are future leaders that would occupy various positions in public and private organisations. It is very important to focus on students' learning approaches towards making recommendations that would enhance students' attitude towards knowledge and skills acquisition, general academic performance, collective intelligence and creativity of the diverse individual (Hajo, Rink, Jasperina, & Jan-Willem, 2020). Academic performance is the outcome of learning that shows the extent to which a learner (student), lecturer, teacher, instructor or institution has accomplished a pre-defined set of educational goals. The students' academic performance is rated base on specific rules and conditions. The academic performance is a derivative of the level of students' attainment of pre-defined objectives in a given subject area of study. One of the learning methods is a collaborative strategy. Basically, a collaborative learning strategy is an educational approach where two or more people learn together and relies on the resources of others towards achieving a common goal. In a collaborative learning strategy, each participant relies fundamentally on the capabilities and resources of other(s) to acquire relevant knowledge and skills towards achieving a common goal. Ideas are shared among the participants towards the realization of a common goal in a collaborative learning strategy. Chiu (2008) stated that everyone in collaborative learning capitalizes on the skills of others for questions, ideas, solutions, evaluation, and results. In addition, collaborative learning engagements include debates, group projects, group study, joint problem solving, and collaborative writing. In this modern age, the advantages of collaborative learning method include the promotion of student's interaction, enhancement of learners' retention capability, mental development, exposure to diverse perspectives on techniques of solving problems and training for real-life responsibilities (Center for Teaching Innovation, 2020).

The question is if collaborative learning strategy is an educational method that brings students together to actively and collectively participate in providing solutions to problems, then, what is the effectiveness of this unique learning strategy on solving computational problems among senior secondary school students in Nigeria? Computational problems are problems in science and technology-related courses that require high reasoning, intelligence and creativities to provide solutions to the problems. According to Menderes (2017), essential teaching methods that could be adopted by Mathematics teachers included Question, Demo and Practice, Answer, Putting Rule, Problem Solve, Discover, Lecture Games, Cooperate, Describe, Scenario, and Case study. France, Samuel and Johnson (2019) highlighted basic learning techniques in Computer Science. The learning techniques included Puzzle-based, Problem-based, Pair programming (collaborative), Game-themed programming, and Pre-recorded lectures.

Mathematics and Computer Programming courses were used as experimental tools since these courses require high reasoning, intelligence and innovations. Excellent academic performance in Mathematics and Computer Programming courses could guarantee a satisfactory achievement in other courses (Temmy,