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Levels and Approaches of Problem-Solving Competence among Secondary School Students in Southwestern Nigeria

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ABSTRACT

The study ascertained the levels of problem-solving competence among secondary school students in Southwestern Nigeria and assessed students' approach to problem-solving competence among secondary school students, These were with a view to providing empirical information on the factors that could enhance problem-solving competence among the students. The study adopted the descriptive survey research design. The population of the study comprised 2,403,829 public secondary school students in Southwestern, Nigeria. A sample size of 2,160 students was selected from public senior secondary school students in the study zone. Multistage sampling procedure was used for selecting the sample. Simple random technique was used to select three states in Southwestern, Nigeria, two senatorial districts from each selected states. Furthermore, 18 LGAs and 54 public secondary schools were selected for the study. Lastly, systematic sampling technique was used to select 40 secondary school class II students (SSS II) from each school. One adapted instrument was used to elicit information from the respondents. Data collected using Questionnaire on Problem-Solving Competence (QPSC) were analyzed frequency counts, percentage and multiple regression analysis. The results showed that majority (72%) of public secondary school students in the study zone demonstrated a moderate level of problem-solving competence. Likewise, majority of the students' have moderate level of adaptive and maladaptive approach to problem-solving competence with PPO (57.3%), RPS (63.3%) and (NPO) 63.7%, (AS) 65.7%, (ICS) 65.7% respectively. The study concluded that majority of public secondary school students in the study zone demonstrated a moderate level of problem-solving competence. Likewise majority of the students' have mal-adaptive approach to problem-solving competence.

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KEYWORDS:

Life challenges problems, Problem-Solving Skills, Problem-solving Approaches, Cognitive Ability

I. INTRODUCTION

Life is full of challenges and problems of which every human-being has to face his/her own set of challenges. Some human-being seem to meet every challenge and problems with confidence, while others struggle to overcome them. Some people especially get a sense of satisfaction from facing challenges and problems ahead of them and this bring a sense of accomplishment which would make them to be very fulfilling. Learning how to overcome problems would make students' stay centered and remain calm under pressure. Problems are a regular part of life and human-being solve problems daily in all aspects of their life whether it is a relationship problem, a financial, social, academic or a work place problem and among others. Problem is something that is hard to understand or accomplish or deal with. It can be a task, a situation, or even a person. Students' could encountered problem in any of their school subjects' task which must be resolved using mathematical or subject concerned tools but for which there is no immediately obvious strategy. If the way forward is obvious, it is not a problem– it is a simple exercise. According to Thomas (2017), a problem can be defined as any situation in daily life to be responded to for adaptive and effective functioning. A situation can be defined as a problem for a person when he/she feels disturbed by it and when the problem hinders the person from achieving his/her goal (D'Zurilla, Maydeu-Olivares & Gallardo-Pujol, 2011).

According to Adegoke (2017), a problem happens when in any given situation, a goal or objective state needs to be

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fulfilled and there is no predictable or regular method of solution available. A problem is considered to occur when a living creature has a goal but does not know how to reach the goal. Gestalt Psychologists such as Wolfgang Köhler (1887–1967), Kurt Koffka (1886–1941), Kurt Lewin (1890-1947), Edward Tolman (1886-1959) and others often distinguish between well-structured and ill-structured problems. Well-structured problems (also called well-defined problems) have clear solution paths: the problem-solver is usually able to specify, with relative ease, all the steps that must be taken to reach a solution. The difficulty in such cases, if any, has to do with executing the steps. Most mathematics problems, for example, are well-structured, in the sense that determining what need to be done is easy, though carrying out the computations needed to reach the solution may be difficult. Ill-structured problems (also called ill-defined problems) do not have clear solution paths, and in such cases the problem-solver usually cannot specify the steps needed to reach a solution. The solution of ill-structured problems often requires insight, which is a distinctive and seemingly sudden understanding of a problem or strategy that contributes toward a solution. Often an insight involves conceptualizing a problem or a strategy in a totally new way. Although insights sometimes seem to arise suddenly, they are usually the necessary result of much prior thought and hard work. Sometimes, when one is attempting to gain an insight but is unsuccessful, the most effective approach is that of incubation which laying the problem aside for a while and processing it unconsciously.

Problems-solving span across all spheres of life. As noted by (Kaya, Izgiol & Kesan, 2014), problem-solving skill is a basic skill needed by individuals and is virtually applied in all areas of human endeavor. Problem-solving is one of the most prominent 21st-century skills in educational settings because it determines one's social and personal development, academic success, employment prospects, and overall contribution to society. The 21st century skills are skills that are considered important for being able to face current and future global challenges and challenges in work-life. The 21st century is about new challenges and problems which require a new set of skills. The world around human-being is evolving rapidly, and students' need to learn essential skills such as critical reasoning, problem-solving and critical thinking. Students' need to be educated with problem-solving skills from an early age in school and this can be facilitated through classroom problem-solving activities. Students' who are good problem-solvers are more likely to be successful in getting around obstacles and achieving their desired end result. The ability to think and reason is what separates competent problem-solver from novice problem-solver among students' in school or college.

Students' in an attempt to solve encountered problem have an innate need to utilize the information in their environment in order to combat the complex challenges or problems that they face. As students' acquired problem-solving skills in their various school subjects', they could advance or metamorphosed into hierarchy of competence. This hierarchy of competence could be referred to as levels of problem-solving competence. These levels of problem-solving competence could be classified or categorized according to students' level of cognitive development or ability. Problem-solving competence is when students' possess a combination of analytical, creative, critical thinking skills and a high level of attention to details which would make them rise to challenges in the learning tasks in order to quickly identify the problems and provide the most effective solutions (James & Adewale 2015). The term problem-solving competence sometimes has a neutral connotation; it is used to refer to the entire range of ability from poor to medium to good and sometimes refers only to those cognitive resources that allow good to excellent performance. From an operational point of view, Problem-solving competence is defined as skills, knowledge, attitudes and abilities that distinguish high performers among students. It could also be referred to as skills or knowledge that leads to superior performance in academic and social tasks. Competent students' in problem-solving could distinguish between solvable issues and problems that cannot be solved. Such students' are well prepared to face complex interpersonal and academic problems.

Statement of the Problem

The problems students encountered in and outside school life could not be solved by their own mere thinking process but by rational and scientific way of thinking. While there are many lessons to study in the school, they need to develop appropriate thinking process to handle their various problems in their studies or even in daily life. One of the most critical life skills that could be taught and exercised so that students are used to coping with challenges in the classroom and in daily life is problem-solving skill (Effendi, 2017). It has become evident that students are having problem-solving competence difficulties in understanding most of the concepts and topics being taught in the classrooms. This has continued to be a source of worry to stake holders in education sector and mostly secondary school teachers who have continued to remain at the receiving end of uncomplimentary accusations of inefficiency and gross incompetence. Ugwuozor, Ede and Ifelunni (2020) in their studies indicated that students' lack of problem-solving competence in answering most of the questions generally asked in their various school subjects in external examinations is responsible for low academic achievement among secondary school students. Various steps had been taken by government and educational planners in Nigeria in an attempt to improve the problem-solving competence of secondary school students to enhance their academic performance. For instance, the government has strengthened its policy on school supervision to make

teachers more committed to duty, motivated science teachers through science allowance and encouraged them to attend conferences and seminars and in-service courses. Unfortunately, the efforts have only yielded minimal results. The nature of problem-solving competence demands a high level of thinking and the world nowadays demands that learning goes beyond low-level thinking (such as rote memorization and traditional instruction method) as innovation and scientific improvements are dependent on higher-order thinking. It is believed that when students try to find answers to academic tasks and societal challenges without the appropriate skills, abilities and adequate understanding of the problems, they would not be able to perform to the expected level of problem-solving competence in this fast changing world. This is a problem because it shows that minimal learning is taking place in schools as teaching and learning still largely need to be improved.

Objectives of the Study

The general objective is to understand gender and subject specialization influence on problem-solving competence among secondary school students in Southwestern Nigeria:

The specific objectives of the study were to:

i ascertain the levels of problem-solving competence among secondary school students in Southwestern, Nigeria;

ii assess students' approach to problem-solving competence among secondary school students in southwestern, Nigeria.

Research Questions

i What is the levels of problem-solving competence among secondary school students' in Southwestern, Nigeria;

ii What are the students' approaches to problem-solving competence among secondary school students' in Southwestern, Nigeria.

THEORETICAL REVIEW

Gestalt Theory

The Gestalt psychologists were the first to challenge the behaviourists point of view. They criticized behaviourism for its reductionist tendencies and felt it was too dependent on external behaviours to explain learning on how problem encountered in and out of school could be solved. Gestalt psychologists argued that rather than problems being solved by trial and error (as the behaviourists argued), problem solvers gain "insight" into the problem at hand (Nwaodo, Samson Ikenna, Ariyo, Samson & Oluwatimilehin, 2020). The theory suggests that the best way of discovering how to find the solution to the problem is not by being taught a rule or algorithm, but by finding the underlying structure of the problem thereby solving the problem in a meaningful way (Duyilemi & Bolajoko, 2014). Gestalt psychologists view problem-solving as mentally reorganizing the elements of the problem so that they fit together in a new way. The types of problems that Gestalt psychologists used often were problems in which students must discover a crucial element and once this element is discovered all the other elements fall into place and the problem is solved (Peter, Abiodun, & Jonathan, 2010). In particular, in the process of thinking about a problem, individuals sometimes 'restructured' their representation of the problem, leading to a flash of insight that enabled them to reach a solution. With effective cognitive processes (Piaget and Vygotsky theories) through active participation, social interaction with physical environment and cognitive conflict of assimilation and accommodation, learning is easier and new information could be stored in the memory for a long time.

EMPIRICAL REVIEW

Problem-Solving Competence

Dauda, Gambo and Bala (2021) and Okafor (2018) in their different studies indicated that students displayed fair problem-solving skills in the overall result in the investigations conducted. This would not help students' to promote their problem-solving competence in and out of the classroom situation. Kareem and Adeleke (2020) and Rabacal (2016) carried out a study on problem-solving process skills application and higher order thinking skills among Biology students and reported that there was an average level of possession of basic and integrated process problem-solving skills. Kareem and Adeleke (2020) also affirmed in their study that there was a low level utilization of higher order thinking skills among the students' in the study area. Adigwe (2014) and Adigwe (2012) in his studies on problem-solving in quantitative chemistry indicated that students' failure to successfully solve problems was due to difficulties they experience in the crucial phases of problem-solving processes. Awopetu and Omoteso (2014) in their study investigated the level of cognitive self-reliance of senior secondary school students in Ekiti State, Nigeria. The results of the data analyses showed that the students demonstrated an average level of cognitive self-reliance. The ability to reason is indispensable when problem-solving skills are required. Adeyemi (2011) investigated students' academic performance in public examination in Secondary Schools in Ondo and Ekiti States, Nigeria. Result of the analysis revealed that the performance of students at both Junior Secondary Certificate (JSC) and Senior Secondary Certificate (SSC) examinations were low.

II METHODOLOGY

The study adopted the descriptive survey research design. This study involved the use of questionnaires to collect information to answer research question and to test hypotheses. The population of the study comprised all public secondary school students in Southwestern Nigeria. Total population of public secondary school students across Southwestern Nigeria in 2020/2021 academic session was

2,403,829. The sample size of 2,160 public senior secondary school students for the study was drawn from a total population of public senior secondary school students of 2,403,829. A multistage sampling procedure was used for selecting the sample. In all, 18 public secondary schools were selected in each state and a total of 54 public secondary schools were selected across Southwestern Nigeria. The fifth stage also involved the use of systematic sampling to select 40 public secondary school students in each school by using their class register, and in some schools, the seating arrangement was used.

A total of 2,160 senior secondary school two students were selected across Southwestern Nigeria for the study. One adapted instrument was used to elicit information from the respondents and this was Questionnaire on Problem-Solving Competence (QPSC). The researcher adapted and validated short version of the instrument. Questionnaire on Problem-Solving Competence (QPSC) was a 25 item questionnaire adapted from D'zurilla, Maydeu-Olivares & Gallardo-Pujol (2011). An average of all the five subscales provided a score for general Questionnaire on Problem-solving Competence (QPSC). The Questionnaire on Problem-Solving Competence (QPSC) assesses the two constructive dimensions found to be related to adaptive functioning, academic success and students' positive psychological well-being and the three dysfunctional dimensions are found to be associated with poor academic success, low problem-solving ability, maladaptive functioning, and psychological distress. The two constructive dimensions of Problem-solving competence are Positive Problem Orientation (PPO) and Rational Problem-Solving (RPS) and three dysfunctional dimensions are Negative Problem Orientation (NPO), Impulsive/ Careless Style (ICS) and Avoidance Style (AS). Each item is anchored on a 5-point rating scale with anchors of 0 ("not at all true of me"); 1 (Slightly true of me); 2 (Moderately true of me); 3 (Very true of me) and 4("extremely true of me"). Missing items are given a score of 2. The lowest and highest score options for each item was 0 and 4 respectively, and the score range for each item was 4. Higher scores on Positive Problem Orientation (PPO) and Rational Problem-Solving (RPS) indicate more adaptive classroom learning task/ problem-solving competence. The higher the students score close to PPO (25) and RPS (25), the more problem-solving competence level of student which is high problem-solving competence. Negative Problem Orientation (NPO), Impulsive/Careless Style (ICS) and Avoidance Style (AS) has the lowest and highest scores of 0 and 25 respectively. Higher scores on the NPO (25), ICS (25), and AS (25) reflect a more maladaptive approach, or a poor ability to problem-solving competence. The higher the students score on NPO, ICS and AS subscale in problem-solving competence, the lower the problem-solving competence. In sum, the higher the students' scores on PPO and RPS sub-scales, the higher problem-solving competence whereas higher scores on the NPO, ICS and AS reflect low problem-solving competence.

Procedures for Data Collection

The instrument for the study was administered to the respondents by the researcher and six trained research assistants in their natural classroom environment. A total of 2,160 copies of the questionnaire were originally designed for the data collection exercise. However, 2,131 (98.7%) copies of the questionnaire were retrieved and found to be useful by the researcher.

Data Analysis Techniques

The data generated from the information provided by the respondents were analyzed using descriptive and inferential statistics. To provide answer to the research questions in this study, data generated from the respondents were subjected to frequency counts and percentages.

III. RESULTS

Research Questions

Research Question 1: What are the levels of problem-solving competence among secondary school students in Southwestern Nigeria?

To answer this research question, students' responses to 25 items on the Questionnaire on Problem-Solving Competence (QPSC) were scored such that the response, Not all true of me was allotted 0, Slightly true of me, 1, Moderately true of me, 2, Very true of me, 3, and Extremely true of me was allotted 4. Also the responses to all the negatively worded items (i.e. items 1 through 15) were reversed in scoring and then cumulated. The minimum and maximum scores obtainable from this questionnaire were 0 and 100 respectively while the mean and standard deviation scores were 56.1 and 9.7. Since a high score indicates a high level of problem-solving competence, scores of 0 to 1SD below the mean score (0-46) were adjudged as low level of problem-solving competence, scores of 47 through 66 (47 to mean+1SD) as a moderate level of problem-solving competence while scores of 67 through 100 were adjudged as high level of problem-solving competence. The results are presented in Table 1

Table 1: ***Levels of Problem-Solving Competence among Secondary School Students in Southwestern Nigeria***

Level of Problem-solving Competence	Score range	Frequency (f)	Percentage (%)
Low	25-46	294	13.8
Moderate	47-66	1535	72.0
High	67-100	302	14.2
Total		2131	100.0

Mean= 56.1, SD=9.7

Table 1 shows the levels of problem-solving competence among public secondary school students in Southwestern Nigeria. The result shows that 13.8% of the secondary school students had a low level of competence in problem-solving, 72.0% had a moderate level of problem-solving competence, while 14.2% of the students had a high level of problem-solving competence. As shown in the result, it could be observed that the majority of secondary school students in Southwestern Nigeria had a moderate level of problem-solving competence.

Research Question 2: What are the students' approaches to problem-solving competence among secondary school students in southwestern, Nigeria.

Table 2. ***Students' Approach to Problem-Solving Competence among Secondary School Students in Southwestern Nigeria.***

Sub-Construct	Students' approach to Problem-Solving Competence	n	%
	Low Maladaptive Approach to Problem solving	123	5.8
	Moderate Maladaptive Approach to Problem Solving	651	30.5
NPO	High Maladaptive Approach to Problem Solving	1357	63.7
	Total	2131	100.0
	Low Maladaptive Approach to Problem Solving	148	6.9
AS	Moderate Maladaptive Approach to Problem Solving	582	27.3
	High Maladaptive Approach to Problem Solving	1401	65.7
	Total	2131	100.0
	Low Maladaptive Approach to Problem Solving	153	7.2
	Moderate Maladaptive Approach to Problem Solving	588	27.6
ICS	High Maladaptive Approach to Problem Solving	1390	65.2
	Total	2131	100.0
	Low Problem Solving Competence	138	6.5
	Moderate Problem Solving Competence	1221	57.3
PPO	Below Average Problem Solving Competence	772	36.2
	Total	2131	100.0
	Low Problem Solving Competence	124	5.8
	Moderate Problem Solving Competence	1349	63.3
RPS	Below Average Problem Solving Competence	658	30.9
	Total	2131	100.0

NPO=Negative Problem Orientation, AS= Avoidance Style, ICS= Impulsive/Careless Style, PPO= Positive Problem Orientation, RPS= Rational Problem Solving

Results in Table 2 shows students' maladaptive approach to problem-solving competence in which Negative Problem Orientation (NPO), 5.8% of the secondary school students exhibited low maladaptive approach to problem-solving competence, 63.7% exhibited high maladaptive approach to problem-solving competence while 30.5% of the students exhibited below average level of maladaptive approach to problem-solving competence. This implies that majority of the students' have negative approach or orientation to problem-solving competence. Also, in Avoidance Styles (AS), while 6.9% of students' displayed a low maladaptive approach to problem-solving competence, 65.7% of the secondary school students exhibited a high maladaptive approach to problem-solving competence, 27.3% exhibited below average maladaptive approach to problem-solving competence. This also implies that majority of the students have maladaptive functioning or approach to problem-solving competence. Similarly in Impulsive Careless Styles (ICS), 7.2 % exhibited a low level of maladaptive approach or high level approach to problem-solving competence, 65.2% exhibited high level of maladaptive approach to problem-solving competence while 27.6% of the students exhibited below average or moderate level of maladaptive approach to problem-solving competence. In all, large number of students' in three dysfunctional dimensions of NPO, AS, ICS in the study zone demonstrated maladaptive functioning or approach to problem-solving competence.

However in Positive Problem Orientation (PPO), while 6.5% of the secondary school students exhibited low adaptive approach to problem- solving competence, 57.3% exhibited a moderate level of adaptive approach or a little above average problem-solving competence and 36.2% exhibited below average adaptive approach or below average problem-solving competence. Furthermore, in Rational Problem Solving (RPS), 5.8% of the students' displayed low adaptive approach to problem-solving competence and 63.3% of the secondary school students exhibited moderate adaptive approach to problem-solving competence whereas, 30.9% of them exhibited below average adaptive approach to problem-solving competence. It implies that majority of the

students' on two constructive dimensions (PPO and RPS) which are found to be related to academic success and students' positive psychological well-being have moderate adaptive approach to problem-solving competence which are PPO (57.3%) and RPS (63.3%) respectively. Likewise majority of the students' with three dysfunctional dimensions NPO (63.7%), AS (65.7%) and ICS (65.2%) respectively have high mal-adaptive approach to problem-solving competence. These three dysfunctional dimensions are found to be associated with poor academic success, low problem-solving ability, maladaptive functioning, and psychological distress.

IV. DISCUSSION OF FINDINGS

The findings of this study are discussed as shown below

The finding of this study showed that the majority of secondary school students in South western Nigeria had a moderate level of problem-solving competence. Likewise, majority of the students' in the study zone demonstrated moderate adaptive approach to problem-solving competence. These could be one of the reasons why students' academic performance in the West African Examination Council (WAEC) and National Examination Council (NECO) has not been well encouraging in most results released by the bodies. In most external examinations, such as WAEC and NECO a lower percentage of the registered students made five credits including English Language and Mathematics which would have been due to students' low problem-solving competence in most of their various school subjects.

Dauda, Gambo and Bala (2021), Kareem and Adeleke (2020), Okafor (2018), Rabacal (2016) all have a semblance to the result findings, that students were given few opportunities to acquire the science process problem-solving skills and such opportunities were often for the acquisition of the low basic skills rather than the integrated science skills (higher-order), which could have help students' to promote their problem-solving competence in and out of classroom situation. The average level possession of basic process skills also affirmed in their studies that there was a low level utilization of higher order thinking skills among secondary school students'.

Awopetu and Omoteso (2014) in their study investigated the level of cognitive self-reliance of senior secondary school students in Ekiti State, Nigeria and the results of the data analyses showed that the students demonstrated an average level of cognitive self-reliance. This implies that the majority of secondary school students in the study zone had a moderate level of independent thinking towards their classroom academic tasks and this invariably could result in a low or moderate level of problem-solving competence. This finding was also in agreement with the work of (Adigwe, 2014 & Adigwe, 2012) in his studies on problem-solving which indicated that students' failure to successfully solve problems was due to difficulties they experience in the crucial phases of problem-solving processes, students' were found to lack conceptual skills of concerned science subjects and unable to work or reason within the problem restrictions and context. Students' lacking in skills of logical analysis and in ability to reason with data in solving problems can make students have a low or moderate level of problem-solving competence.

Adeyemi (2011) revealed that the problem-solving cognitive performance of students at both Junior Secondary Certificate (JSC) and Senior Secondary Certificate (SSC) examinations were below average performance.

V. CONCLUSION AND RECOMMENDATIONS

The study concluded that majority of secondary school students in Southwestern Nigeria had moderate level of problem-solving competence. Likewise, majority of the students' in the study zone have moderate maladaptive approach to problem solving competence and moderate adaptive approach to problem solving competence. This could have been responsible for an un-encouraging academic performance in internal and external examinations among the students.

During teaching/learning, the importance of building up students' problem-solving competence irrespective of class subjects' specialization should be emphasized. The study also recommended that student–centre classrooms should be encouraged in the secondary schools in the study zone so that the level of problem-solving competence of the students could be moved above a moderate level. Training in the acquisition of positive problem-solving skills should be part and parcel of the school orientation programme and such skills should be inculcated into the learners immediately they join the school. Secondary school teachers need to desist from covering the syllabus just for students to memorize subjects taught through rote learning and pass their examination, but they should undergo further training to update their skills in teaching effectively. With the help of educational psychologists, teaching at secondary school should be conducted in a manner that students would effectively understand and learn the concept they were taught instead of rote memorization. Giving students enough opportunities to do problem-solving exercises in their various school subjects would go a long way in assisting them to clarify a problem goal and increasing their reasoning skills. Forum for students should also be organized and emphasis should be made on personal studies as it helps in better understanding of what is taught.

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