Cognitive Engagement and Problem-Solving Competence among Public Secondary Students in Southwestern, Nigeria

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ABSTRACT	Published Online: December 15, 2025

The study investigated the level of cognitive engagement among secondary school students in Southwestern Nigeria. In addition it examined the relative contribution of cognitive engagement sub-construct of deep cognitive and shallow engagement, cognitive strategy and persistence on prediction of problems-solving competence among secondary school students in the study zone. The study investigated the predictive ability of cognitive engagement on problem-solving competence among the students in the study area. 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 2,403,822 public secondary school students in Southwestern, Nigeria. A sample size of 2,160 students was selected from the study zone using multistage sampling procedure. Three States were selected from Southwestern Nigeria, likewise from each State, two senatorial districts were selected using simple random sampling technique. Furthermore, 18 LGAs and 54 public secondary schools were selected for the study. Lastly, systematic sampling technique was used to select 40 students (SSS II) from each school. Two adapted instruments were used to elicit information from the respondents. They were Questionnaire on Problem-Solving Competence (QPSC) and Cognitive Engagement (QCE). Data collected were analyzed using weighted mean and multiple regression analysis. The result showed that the level of cognitive engagement among secondary school students is low. The results showed that cognitive engagement (t=14.046, β =.383) had better contribution in the prediction of problem-solving competence among the students. The study concluded that cognitive engagement contributed in the prediction of problem-solving competence among the secondary school students.

KEYWORDS: Cognitive Engagement, Deep and Shallow Approaches, Cognitive Strategy, Persistence and Problem-Solving Competence.

INTRODUCTION

It is common knowledge that today's society is characterized by an increasing rate of complex changes, uncertainties, challenges, and problems that require individuals to possess certain skills. In day-to-day interactions, people are faced with a myriad of challenges that requires them to act reasonably, logical and make consistent and effective decisions evolving from their understanding of the problems. Students in and out of secondary schools live in a world of problems–social, economic, political, ethnic, religious, education, science and technologically related problems to mention a few. It only takes a sound mind, a mind imbued with reflective thinking who can engage in deep analysis to come up with causes of the problem at hand and generate possible solutions or options to arrive at a decision; to solve a problem or get out of the problem. To live a comfortable life, the student's ability to identify, analyze and work out a solution to problems encountered is a valuable skill that is not only useful in the classroom, but also out of school life. The researcher's observation and experiences show that some secondary school students cannot spell or pronounce words and sentences correctly, some cannot answer simple questions or cope with academic work, relate well with fellow students, teachers and obey simple rules, regulations and constituted authorities.

When teachers are disseminating or imparting subject knowledge to their students' they should approach the teaching method in such a way that academic knowledge grasped would be transformed into solving problems in a real-life situation. It is imperative that as young adults earn

secondary school certificates and move on to tertiary institutions and the world of work, they should be equipped with skills that would make them competent in problem-solving which are essential for higher academic pursuits and to navigating a global society. Students need to gain more knowledge and acquire some crucial competencies in various school subjects being thought so as meet up with foundational skills for 21st-century success and survive in this fast economy which is driven by information and technology. According to Ataizi and Donmez (2014), the term 21st-century skills means an extensive set of knowledge, skills, work habits, and character traits that are most essential to live a perfect life in today's world, particularly in academic, social life and future careers. Problem-solving is an important 21st-century skill because it determines one's personal development, employment prospects, and overall contribution to society.

Students in this present world live in an information and technology-based society where they need to be able to think critically about complex issues, and analyze and think logically about new situations, devise unspecified solution procedures, and communicate their solution clearly and convincingly to others. Problem-solving skills are necessary to play various roles in life; thus, students in secondary schools must have basic understanding of life skills in order to solve their everyday problems. Problem-solving competence which is one of the 21st-century skills relates to all tasks, disciplines, topics and life challenges. Problem-solving competence is not a thinking skill that is solely for one discipline or subject area alone but it applies to all areas of life activities such as education, research, business, finance, medicine, management, politics, the legal profession and so on.

Problem-solving competence is necessary for all areas of life and classroom problem-solving activities could be a great way to get students prepared to solve ill-defined problems in real life and classroom scenarios. Whether in school, work or in students' social relationships, the ability to critically analyze a problem, map out all its elements and then prepare a workable solution is one of the most valuable competencies students can acquire in and outside of school life. Problem-solving competence seems to cover a broad range of higher-order skills and behaviours that represent student ability to deal with complex or ill-defined classroom learning tasks that could result in students' outstanding academic performance. It is noticeable and no more news that secondary school students do engage in series of unpleasant activities which could invariably affect their problem-solving competence in classroom learning tasks. Sakiyo and Badau (2015) observed that secondary school students paid more attention to social gathering, dancing, and drumming among others. It could also be observed that at the personal level, many students spend more of their spare time listening to music from their handsets, even during the classroom teaching-learning

process instead of engaging themselves in productive activities that could foster problem-solving competence.

The way students engage themselves toward their academic tasks could greatly determines their level of problem-solving competence. Today, engagement is a key concept in education, as it is critical for all students (Skinner & Pitzer, 2012); without engagement, there would be no meaningful learning. Student engagement could be seen as the glue that holds together all aspects of student learning and growth. Not only that student engagement make teaching itself more fun, engaging, and rewarding, but it has been shown to have critical impacts on students academic achievement. (García-Pérez, Fraile & Panadero, 2021; Romano, Angelini, Consiglio & Fiorilli, 2021; Gopal, Salim & Ayub, 2019). Low student engagement could be associated with a host of negative outcomes, such as delinquency, violence, substance abuse, and school dropout. Although these troubling outcomes tend to appear in adolescence, having poor engagement in elementary and middle school can set students on a negative trajectory. Thus, it is critical to promote student engagement across all grade levels.

Statement of the Problem

Teachers believe that a healthy classroom environment motivates students to learn, grow academically, and personally. Students' perceptions of their relationships with their teachers also impacts student engagement. When student report having a difficult relationship with a teacher, it is more likely that the student would also show signs of classroom disengagement. This is one of the reasons teachers have been encouraged to improve their level of affective or emotional engagement with students' as this could improve their learning outcome or problem-solving competence. Despite this effort, the level of problem-solving competence of secondary school students is still not encouraging as reflected in their academic achievement in internal and external examination. But little attention was paid to students' often having challenges such as low attention span and lack of interest toward their learning., Students could perform poorly in their academic work not because they do not possess the mental ability to do well but because they do not know how well to be cognitively engaged with classroom academics tasks.

This ultimately might result in students' low cognitive engagement with their academic learning tasks and this could make them to be engaged in various forms of examination malpractices in order to pass their examination, which invariably might not promote their problem-solving competence in their school subjects learning tasks.

Researches carried out by Adegoke (2013) and Chukwunenye and Adegoke (2014) showed that the traditional teaching method which is rote learning did not give enough opportunity for students to be actively or cognitively engaged in teaching and learning activities. As a result of inadequate

learning interactions of students due to traditional methods, the learning process does not support meaningful learning and the development of problem-solving competence needed in modern society. Students' thus acquire an unstable level of knowledge that is not transferrable to problem-solving situations (Olaniyan & Omosewo, 2015). Traditional teaching method might resulted in poor classroom engagement. Passive engagement in learning might not promote the understanding of scientific concepts and this could causes learners to be disengaged and unmotivated. 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 cognitive thinking. This a problem because students' need to be highly cognitive engaged for appropriate learming to take place rather than rote learning which could not promote or translate to high level of problem-solving competence.

Objectives of the Study

The general objective of the study was to investigate how cognitive engagement could predict problem-solving competence among public secondary school students in Southwestern Nigeria.

The specific objectives of the study were to:

(a)investigate the level of cognitive engagement among secondary school students in Southwestern Nigeria?

(b) assess the relative contribution of cognitive engagement sub-construct of cognitive strategy, deep cognitive, shallow engagement and persistence on prediction of problems-solving competence among secondary school students in the study zone

(c)examine the predictive ability of cognitive engagement on problem-solving competence among the students in the study area

Research Questions

(i) What is the level of cognitive engagement among secondary school students in Southwestern Nigeria?

(ii) What is the extent of relative contribution of cognitive engagement sub-construct of cognitive strategy, deep cognitive, shallow engagement and persistence on prediction of problems-solving competence among secondary school students in the study zone?

Research Hypotheses

(i) There is no significant predictive ability of cognitive engagement on problem-solving competence among the students in the study area

(ii) There is no significant joint contribution of cognitive engagement variables of cognitive strategy, deep cognitive, shallow and persistence in predicting problem-solving competence of the secondary school students in the study zone.

CONCEPTUAL REVIEW

Problem-solving Competence

The process of solving a problem is of the most complex human activities as it entails using high-order cognitive skills, as well as meta-cognitive skills (Bradshaw & Hazell, 2017). Greiff, Fischer, Stadler and Wustenberg (2015) define problem-solving as a form of mental process which closes the gap between a learner's existing mindset and solution to a problem. Bahar and Maker (2015) state that the concept of problem-solving is referred to as a high-level thinking process consisting of intellectual ability and major cognitive processes. Problem-solving is all about finding a rational solution to a problem by using a variety of cognitive skills and complex mental activities. Here, problem-solving would draw heavily on previous/existing knowledge of the learner which must be applied to handle the problem situation at hand. However, the ability to transfer the already information or existing mindset is not always simple to come by as this is determined by several factors or conditions existing at the time when the knowledge is formed and/ or is being recalled by the learner. Problem-solving is appraised to be a process that begin when students', adult or an individual first discover the problem and ends when the solution to the problem is arrived at in right and efficient information to the problem at hand.

Bradshaw and Hazell (2017) conceive problem-solving as the mental task of moving towards an objective state when the channel to the objective aimed to be achieved is not clear. Similarly, when a student has a challenge in solving a problem and the ways out of the problem is unclear, then a problem is known to exists. Nwaodo and Ogbonna (2019) state that problem-solving is the pathway of getting out of difficulty or finding a way out of an obstacles in order to arrive at appropriate solution to a problem.

From all the definitions given by different authorities, problem-solving can be seen as an achievement goal directed towards finding solution to social or academic problem at hand in order to close the limiting success gap between a present and a goal state. These definitions have three parts: First, problem-solving is cognitive because it occurs internally within the problem solver's mental system. It is a self-directed mental operation by which a problem-solver tries to find adaptive or effective solutions to specific problems of everyday life (Osuafor & Orji 2017).

Secondly, problem-solving is a mental steps which involves finding ways out of hidden or ambiguous goals in order to achieve clear or set target goals.. It is a process because it involves variables manipulation or performing cognitive operations on the problem solver's existing knowledge or mindset. Thirdly, problem-solving is goal-directed. This is because the problem solver is attempting to achieve some goal or is guided by the goals of the problem solver. In addition, it is a way to find a rational solution to a problem which appears to interfere with desired or planned objectives

of the problem-solver (D'Zurilla & Nezu, 2010). Problem-solving is finding a way out of a difficulty, a way around an obstacle, to attain an aim that was not immediately attainable. Problem-solving definitions as cited by different authors have been interestly found to be same or similar. One uniqueness within these definitions is the assessment of the difficulty of the problem task. Appraisal of different academic or social tasks as problems or difficulties is a matter of expertness or individual difference among learners.. Demands from students to approach a classroom task depend on students' prior knowledge of the problems and differences in their cognitive abilities (Sweller, 2010). A difficult situation encountered in life with no right approach for a way out of problem indicates the presence of a problem**.**

There are different kinds of problem-solving tasks which varies from clearly or explicitly defined problems, to unclear or not well defined problems that do not have a well explain solution guidelines or algorithm steps (Jonassen, 2011). Although problems that are straight forward to approach such as some schools subjects academics problems faced by students' can typically be solved by applying step-by-step procedures or appropriate cognitive strategies, basic rules, and information management strategies, problems are considered complex in terms of cognitive controls or steps to follow in order to complete a task within a certain amount of time (Bature, Atweh & Oreoluwa, 2020). Students' cognitive ability level also enables them to understand and transfer understanding from one situation to another. It means a student with high cognitive ability should also have a high level of problem-solving competence in academic tasks.

Students' with good problem-solving ability would certainly evaluate how effective their chosen strategies work in the course of finding solution to the problem at hand. Students with appropriate cognitive ability would exhibit high problem-solving skills of which they   could transfer knowledge gain in one specific task situation to solve problem in new encounter situation. From an operational point of view, problem-solving competence seems to cover a broad range of higher-order skills and behaviours that represent the ability to deal with complex academic tasks and unpredictable situations. Problem-solving competence could be understood as the ability of the individual student to mobilize knowledge, skills and personal experience in detecting problems, finding solutions and implementing problem-solving effectively (Kyllonen, 2012).

Isaksen, Kaufmann and Bakken (2016) define problem-solving competence as student's capability to use approximate mixture of knowledge, personal experience, bundle of skills and attitude in arriving at desired results or outcomes while finding a solution to the problem faced in and out of school. Problem-solving competence is ordering set of skills such as higher-order cognitive skills, logical thinking, self–control, resilience, time management and effort regulation which are necessary to find ways out of a complex

problems (Julius, Abdullah. & Suhairom, 2018b; Fischer & Neubert, 2015). Problem-solving competence means students' possession of a range of abilities or skills to solve difficult classroom learning tasks. 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 by student in academic tasks, moreso it could also means skills and standard of performance reached by student.

Cognitive Engagement

Student engagement is when learners feel more excited to learn, participate in learning and establish a positive attitude. Generally, in education, student engagement denotes the inquisitiveness, interest, hopefulness, and passion that students display when they are learning or being educated (Abbing, 2013; Dogan, 2015). Robb (2014) state that engagement draws on the idea of investment which is the extent to which students are engaged in their learning and moving towards being independent; and willingness to exert the effort necessary to comprehend complex ideas and master difficult skills. Students' engagement has been widely accepted as having three dimensions that include behavioural engagement (the act of doing or time on task), affective engagement (feeling, interest and value) and cognitive engagement which is an act of thinking, self-regulation and learning (Fredricks & McCloskey, 2012). According to Wang and Eccles (2013), cognitive engagement refers to the amount and type of strategies that learners employ to achieve academically. Cognitive engagement aims to increase student learning outcomes by providing students with lessons and activities that are interesting and meaningful to them. Cognitive engagement is the level in which students could do more than expected without giving up on the content of the learning activity. Cognitively engaged students would like to invest effort in their learning task, such students would seek to go beyond the requirements, and would like to relish the challenge.

One of the ways that cognitive engagement could also be defined is the untiring effort of students towards their academic tasks (such as doing extra work toward their academic tasks. According to Vivek, Beatty, Dalela, and Morgan (2014) cognitive engagement in the classroom could be characterized as a psychological state in which students put in a lot of effort to truly understand a topic and in which students persist studying over a long time. Anderman and Patrick (2012) classified that students could approach their learning task using two types of cognitive engagement namely deep and shallow engagement. Deep cognitive engagement is when students' are intrinsically motivated to learn and complete work with high level of active engagement. At the highest level of cognitive engagement or deep processing, teacher centeredness is rare and they act

more like coaches and support independent-collaborative learning of students'. Deep cognitive engagement is a committed approach to learning where the learner uses higher-order cognitive skills to master academic content, work collaboratively, think and interact critically and actively with the content being learned (Wara, Alok\a & Odongo, 2018)..

Shallow cognitive engagement is totally opposite of the deep approach, with students focusing on reproducing only those parts of the content required to complete assessments with little or no personal interest in the subject matter. Shallow cognitive engagement is doing the minimum work to meet requirements and not deeply cognitive engaged (Li & Lajoie, 2021; Xie, Heddy, & Greene, 2019). Shallow cognitive engagement, as the name suggests, is a rather passive approach to learning where the students tend to learn only what is required and nothing more in which such classrooms are almost exclusively teacher centre approach to learning. Bachman and Palmer (2010) define cognitive strategies as the mental processes directly related to information processing to obtain, store, retrieve, or use information in a learning or assessment setting. Cognitive strategies enable learners to link new and already known information to facilitate the mental restructuring of information. Cognitive engagement strategies consist of mostly rehearsal (memorizing the subject by repeating words by oneself or repeating information to remember such as going over lecture notes); Elaboration (capability to link previous knowledge with new information, so as to remember new content); and critical thinking (transferring previously learned knowledge to new situations (Andrews & Xenofontos, 2015). In the face of challenge, students' who are persistence in classroom cognitive engagement set goals, plan steps, monitor progress, solve problems along the way, and reflect on their learning (Ghristenson, Rescgly Wylie, 2012)

THEORETICAL REVIEW
Cognitive Constructivism (Piaget Theory)
Constructivism is based on the idea that students' actively construct or make their own knowledge, and that reality is determined by their experiences as a learner. Basically, learners use their previous knowledge as a foundation and build on it with new things that they learn. The focus shifted from how did students reproduce knowledge, to how did they construct it? This led to the growth of constructivism, according to how knowledge is constructed by the learner. Constructivism transforms the student from a passive recipient of information to an active participant in the learning process. Constructivism is a teaching strategy that holds the view that learners construct knowledge by themselves based on their previous or past knowledge or experiences. Each learner individually (and socially) constructs meaning as he or she learns (Omoteso, 2014).

Central to the cognitive approach is the understanding that individuals must participate actively in the learning process rather than just responding to classroom or environmental stimuli. Piaget was influenced by a wider theoretical notion called constructivism. It derives from the idea that knowledge is not something fixed and stable, but rather it is constructed step by step and it is frequently changed, as individuals and groups continually try to make sense of the complex world around them. Piaget's theory is guided by assumptions that a constructivist classroom emphasizes active learning, collaboration, viewing a concept or problem from multiple perspectives, reflection, student-centeredness, and authentic assessment to promote meaningful learning and help students construct their own understanding of the world. For Piaget, supporting the spontaneous research of the child gives opportunities for interacting with the physical world and can lead to self discovery learning (Olatubosun, 2015).

Piaget states that child's cognitive development is not just about acquiring knowledge, but the child has to develop or construct a mental model of the world. He emphasized that cognitive development is a progressive reorganization of mental processes as a result of biological maturation and environmental experience. In a Piagetian classroom, students are encouraged to discover themselves through spontaneous interaction with the environment rather than the presentation of ready-made knowledge. Jean Piaget (1964) formulated theories concerning the mental process individuals' use in dealing with the problem situation and this mental process is referred to as reasoning ability. His theory focused on development of a child's cognition through these different stages and states that cognitive development of children is chronological and sequential. Stages of cognitive development determine the learner's ability to understand abstract and complex concepts.

Generally, Piaget theory is rooted into three parts namely; schemas which is the building block of knowledge, adaptation processes that enable the transition from one stage to another (equilibrium, assimilation and accommodation) and stages of cognitive development which are sensor motor, preoperational, concrete operational and formal operational. This means that, for Piaget, the potential for cognitive development depends on the stage at which the student is. Piaget suggests that cognitive development in students takes place through these series of stages of maturation and experience.

Schema or prior knowledge which is the first part in Piaget theory is described as the existing knowledge of the learners to receive new knowledge. Schema is the cognitive map an individual possesses about a particular topic, content, or event. It is in connection with what an individual knows or thinks about what he knows. Schema theory states that when students reconstruct information, they match it to the information already in their minds (Widmayer, 2011). Essentially, when children encounter new experiences, their

existing schemas have to adjust. This creates a state of disequilibrium or cognitive conflict which acts as a motivation to learn until a state of equilibrium is restored, so it could make meaning of the new experience that leads to new learning. The major assumption of schema theory is that every act of problem-solving is dependent on one's knowledge of the world (Busselle, 2017). In every learning situation, the learners utilize their schema and mental processes to attain the desired learning outcomes. Effective problem-solving according to schema theory rightly depends on the student's ability to make use of his/her schemata.Widmayer (2011) explained that information that does not fit into schema may not be comprehended, or may not be comprehended correctly. This explains the reason why students have a difficult time comprehending a classroom problem-solving task on a subject they are not familiar with even if the person comprehends the meaning of the individual words in the academic tasks (Widmayer, 2011). Students actively construct their knowledge as they connect existing ideas to new ideas based on the experiences provided to them and this could promote their level of problem-solving competence. Students' with not well developed schema and inappropriate mental model, who are terms as novice learners are faced with the challenge of transforming themselves from a state of incompetence to state of problem-solving competence which involves building and refining their own mental schemas. Experts and novices have different problem schemas. Novices do not possess well-developed problem schemas and are not able to recognize problem types.

The second stage which is the adaptation processes in Piaget's theory is that children acquire new knowledge with accommodation and assimilation of existing knowledge. Piaget also believes that cognitive development in students' begins with conflict. Piaget adaptation processes that enable the transition from one stage to another are (assimilation-which is using an existing schema to deal with a new object or situation), (accommodation-this happens when the existing schema (knowledge) does not work and needs to be changed to deal with a new object or situation) and equilibrium occurs when a child's schemas could deal with most new information through assimilation. However, an unpleasant state of disequilibrium occurs when new information cannot be fitted into existing schemas (accommodation).

Understanding the delicate balance between assimilation and accommodation, one could gain a deeper appreciation for the ever-evolving mental structures that shape students' perceptions, experiences, and interactions with the world around them. Assimilation is the cognitive process of making new information fit in with student existing understanding of the world. Essentially, when student encounter something new, they process and make sense of it by relating it to things that they already know (Busselle, 2017). In assimilation, children make sense of the world by applying what they already know. It involves fitting reality and what they

experience into their current cognitive structure. Accommodation, on the other hand, is reframing the world and new experiences into the mental capacity already present. Individuals conceive a particular fashion in which the world operates. When things do not operate within that context, they must accommodate and reframing the expectations with the outcomes. (Di Paolo, Barandiaran, Beaton & Buhrmann, 2014). Students' learn through assimilation and accommodation and complex cognitive development occurs through the interaction with physical and social environments, which is the key for cognitive development. This is process that allows learning to take place in students and promotes their problem-solving vompetence

The third part of Piaget theory involves cognitive developmental stages. Piaget identified four different stages of intellectual development which reflect the increasing sophistication of children's thought, namely: Sensorimotor, pre-operational, concrete operational, and formal operational stages (Moreno, 2010). Each operational stage has major cognitive characteristics and each of these stages correlates with age and thinking abilities. He created the concept of stages of intellectual development in relation to the reasoning ability an individual employs in solving problems. Piaget's theory of cognitive development distinguishes four primary cognitive structures that correspond to four stages of development qualitatively (Sigelman & Rider, 2012). These stages are in turn divided into distinct sub-stages during which specific cognitive abilities emerge. These include the sensorimotor stage (0-2years) which corresponds to nursery and primary years. The sensorimotor stage is characterised by using sensor activity, rudimentary perceptual abilities, reflexive movements, inability to mentally represent unseen objects, non-random movements in responses to sensations (Peter, Abiodun & Oke, 2010). The preoperational stage (2-7years) still corresponds to nursery and primary. This stage is marked by the acquisition of language, among other things.

They remain highly focused on the present and concrete physical situations and have difficulty in dealing with abstract concepts. According to Piaget's theory, the limitation of the preoperational stage is egocentrism (Santrock, 2011). Children's thinking is very egocentric and this predominates at this stage. Egocentrism refers to the child's inability to differentiate between their perspective and others (Kesselring & Müller, 2011). A child at this age often assumes that other people see situations from his or her viewpoint (Bremner, 2010).

In Piaget's idea, children, during the preoperational stage also have conservational difficulty (Kesselring & Müller, 2011). Conservation refers to the ability to recognize that something remains the same amount even if its shape changes (Franzoi, 2011). Children who do not have conservation ability have a limited mental capacity to understand the change of shapes (Franzoi, 2011). Concrete operational (7-12 yrs) corresponds

to primary and junior secondary school years (Akintunde, 2011, Franzoi, 2011).

The major preoccupation at this stage is improvement in the ability to think logically. New abilities include the use of reversible operations. This is characterized by mastery of the conservation concepts, the ability to perform operations on concrete ideas and objects. However, abstract thinking is not possible at this stage in most children except for the specially gifted (Feldman, 2013). Mental operations on abstract or hypothetical elements and understanding of relationships among relationships are difficult concepts for children at this stage. At this stage, children also acquire a certain capacity for abstraction but it is still only the exceptional child who could solve problems with multiple variables by breaking them down systematically (Amineh & Hanieh, 2015). Thinking is decentred and problem-solving is less restricted by egocentrism or egocentric thought diminishes (Bjorklund, 2012). Having absorbed more and more experience of the world, students are now able to imagine events that occur outside their own lives. They also begin to conceptualize and create sequences of logical reasoning, though this reasoning still depends on a direct relationship with concrete things. Operational thinking develops (mental actions that are reversible). Students' attain the cognitive ability of reversal that as student learns, some things that have been changed can be returned to their original state and inductive reasoning which is when children draw general conclusions from personal experiences and specific facts and formal operational (12 years to adulthood) corresponds to senior secondary school years as obtainable in the Nigerian educational system. At the formal operational stage, individuals are able to perform all the cognitive abilities described in the previous stages and they can reason in abstraction, and accumulate knowledge and skills with the mastery of learning tasks (Feldman, 2013). While children tend to think very concretely and specifically in the earlier stages, The children develop an understanding of abstract ideas, and they start reasoning before taking action.

At this period of formal operations, the student's thought processes are logical, well-integrated and in abstraction. The students at the formal operational stage understand and transfer their understanding from one situation to another in solving problems (Cacioppo & Freberg, 2013). They show the ability to systematically solve a problem logically and methodologically (Gillani, 2013). When applying formal thought, an individual reasons without referring to concrete objects or directly observable properties. He or she uses logical and mathematical relationships rather than relying primarily on familiarity and experiences. According to Piaget, after the expiry of the formal operational stage (about 15 years), the child may reach the full intellectual potential to discover problems through the mental manipulation of symbols by adopting a logical and systematic procedure. Secondary school students need to attain the formal operational level of Piaget's intellectual development to be able to formulate hypotheses and systematically test the hypotheses to arrive at a valid answer.

In earlier stages of (sensorimotor, pre-operational and concrete operational) children used trial-and-error to solve problems. During the final stage of Jean Piaget's theory of cognitive development (formal operational), the ability to systematically solve a problem logically and methodically emerges. At this point in development, the formal operation is the stage where students could solve the problem independently, they are capable of thinking systematically where thinking becomes much more sophisticated and advanced.

Students at the formal operational stage of cognitive development are often able to plan quickly an organized approach to solving a problem. The students' thought process becomes quite systematic and reasonably well integrated (Bada & Olusegun, 2015). The child reasons (or thinks) formally, logically and understands from one situation to another. This implies that reasoning at this level is in higher order. The formal operations stage is the highest and last attained by individuals in the process of acquiring cognitive abilities that enables them to deal with their environment. This implies that a formal operations individual is equipped to understand all the school subjects he/she is taught in the senior secondary school and is capable of solving all problems therein. It implies that students at the senior secondary level are mature enough to display problem-solving ability where they have reached the formal stage of cognitive development.

It could be deduced that problem-solving competence takes place when a student is at the formal operational stage and a student who has not reached the formal operational stage would not be competent at problem-solving.

EMPIRICAL REVIEW
Forms of Cognitive Engagement and Problem-solving Competence
Research studies in Nigerian mathematics classrooms suggest a consistent picture of widespread low-level and shallow cognitive engagement of students in mathematics classrooms. This sometimes degenerates into students' disruptive behaviours which are not just noise-making during classroom instruction, but surprisingly, a number of these students become quietly disengaged towards classroom problem-solving tasks (Bature & Atweh, 2019, Acharya, 2017). Students need to be cognitively engaged to solve increasingly complex modern life problems (Mohammad, Hossein & Abbas, 2018).

Deep cognitive engagement in classroom learning tasks is essential because it enables students to understand the problems they face in life and leads them to problem-solving abilities (Aritia & Suyanto, 2019). Deep cognitively engaged students fully concentrate on their studies, receive better

grades, are enthusiastic in academic learning, and persist when encountering obstacles and challenges while students with shallow engagement run the risk of lower grades and increased absenteeism, and eventually dropping out of school (Alrashidi, Phan & Ngu, 2016). Besides, deep cognitive engagement are predicted to demonstrate higher learning academic performance compared to those who use shallow cognitive engagement approaches (Casimiro, 2016; Sedaghat, Abedin, Hejazi & Hassanabadi, 2011). Shallow cognitive engagement learners understand the learning task clearly but are unable to realize relationships between concepts which learners with deep processing cognitive engagement could do (Abubakar & Che-Horaini 2016).

Research studies indicated that a positive relationship exists between the deep cognitive engagement approach and academic performance and a negative relationship between the shallow cognitive engagement approach and academic performance (Cetin, 2016; Herrmann, McCune & Bager-Elsborg, 2017). A student who adopts shallow cognitive engagement strategies is identified with; the intention to reproduce, take a narrow view and concentrate on detail, stick closely to the course requirement, extrinsic motivation and literal memorization. To Teoh, Abdullah, Roslan and Daud (2014), a student that adopts cognitive strategy approach to problem-solving tasks is identified with; intention to understand, intrinsic motivation, use of evidence, critical thinking and relating ideas to already known concepts and principles.

This leads to understanding and long term retention of concepts so that they could be used for problem-solving in unfamiliar contexts. A highly persistence engaged student would be far beyond providing materials that encourage simple recall or the use of algorithms (Seah & Andersson, 2015) or the memorization of symbols and formulas. Rather, they display higher-order thinking skills which promote problem-solving tasks (Bature & Igwe 2010).

Cognitive Engagement and Problem-solving Competence
A recent study by Bayoumy and Alsayed (2021) showed that there was a relationship between students' engagement with significant effect on academic performance. As mentioned in a study by (Nagadeepa, 2021), students' cognitive engagement is signified as a significant influence on the student's academic performance in an online environment. Glapaththi, Dissanayake, Welgama, Somachandra, Weerarathna and Pathirana (2019) study which focussed on student engagement indicated that there was a positive relationship between student engagement and their academic performance. Wara, Aloka and Odongo (2018) in their study noted that student cognitive engagement had a direct positive influence on the student academic achievement. Cognitive engagement was also found to be a significant positive predictor for academic performance (Wara, Aloka & Odongo, 2018; Dogan, 2015). Likewise, Wara, Aloka and Odongo

(2018); Valle, Regueiro, Núñez, Rodríguez, Piñeiro & Rosário (2016) and Al-Alwan (2014) had similarly uncovered a positive relationship between cognitive engagement and students' academic performance.

Also, Robb (2014) and Gunuc (2014), in their studies found strong positive correlation between cognitive engagement and academic achievement. Sunday (2013) in his study reported that students' science task engagement was found to have a significant positive relationship with academic achievement in chemistry. Adeyemo (2010) carried out a study on students' ability level and their competence in problem-solving tasks in physics. The result of the analysis of data showed that students' engagement in problem-solving tasks in physics, determined to a greater extent students ability in physics.

METHODOLOGY
The study adopted the descriptive survey research design. This study involved the use of questionnaires to collect information to answer research questions and to test the hypotheses stated. The population of the study comprised all public secondary school students in Southwestern Nigeria. A sample size of 2,160 public secondary school students' was selected using a multistage sampling technique. Three states were selected from the six Southwestern States using a simple random sampling. From each state, two senatorial districts were selected using simple random sampling. Six Local Government Areas (LGAs) from two senatorial districts were selected using a simple random sampling technique which was 18 LGAs across the States. Also, three secondary schools from each LGA were selected using a simple random sampling technique. Thereafter, 40 senior secondary school II students were selected in each school using a simple random sampling technique. In each of the 54 public secondary schools across the three selected state, senior secondary school students two were considered for the study. Two instruments were used to elicit information from the respondents. They are Questionnaire on Problem-Solving Competence (QPSC) adapted from D'zurilla, Maydeu-Olivares and Gallardo-Pujol (2011) and Questionnaire on Cognitive Engagement (QCE) adapted from Nathan (2018).

Questionnaire on Problem-Solving Competence (QPSC)
Questionnaire on Problem-solving Competence (QPSC) was a 25 item questionnaire adapted from D'zurilla, Maydeu-Olivares & Gallardo-Pujol (2011). The original instrument comprised 45-items named Social Problem-Solving Inventory-Revised (SPSI-R). QPSC is a 5-point Likert item with (score range of 0 to 4). The lowest and highest score options for each item was 0 and 4 respectively, and the score range for each item was 4. 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. In sum, the higher the students' scores on

the instrument the higher problem-solving competence whereas lower scores reflect low problem-solving competence.

Questionnaire on Cognitive Engagement (QCE)
Cognitive Engagement Scale was a standardized instrument developed by (Greene and Miller's, 1996) but adapted from the work of (Nathan, 2018). The original scale consist of 36 items with four sub-scales in (Nathan, 2018) and was used to measure students' cognitive engagement. The four sub-scales are cognitive strategy with ten items, deep processing with 11 items, shallow processing with seven items and persistence with eight items. The four sub-scales from (Nathan, 2018) were adapted for the study. The adapted sub-scales are cognitive strategies with five items; deep cognitive processing with six items, shallow cognitive processing with four items and persistence with five items. Questionnaire on Cognitive Engagement (QCE) for this study consist of 20 items adapted from (Nathan, 2018). The response format used for the instrument is a 5-point Likert's scale with option ranging from: (1)= Never; (2)= Rarely; (3)= Sometimes; (4)= Often; (5)= Always. This means, a respondent can score a maximum of 100 (20 x 5) and a minimum of 20 (1 x 20), that is a maximum of score 25 (5 x 5) on cognitive strategies, 30 (6 x 5) for deep cognitive processing, 20 (4x5) for shallow cognitive processing and 25 (5x5) for persistence. The minimum points therefore would be five, six, four and five respectively

Reliability of the Instruments
Reliability was necessary to ascertain whether the two adapted instruments were capable of reproducing consistent or similar results after a number of repeated administrations. The researcher adopted the test-retest method of establishing reliability to determine the instruments reliability. The Pearson Product Correlation Coefficient (r) was applied to correlate responses from the two separate instruments'

administration. Pilot study was carried out to determine the reliability of the instruments. The final version of the instruments were administered to one hundred and twenty public secondary school students in Kwara state which is outside the study zone. These students completed the copies of the instruments (QPSC and QCE) and the researcher retrieved the completed copies from them. After four weeks interval, the same test was re-administered to the same set of students or sample subjects after a gap of one month. Administered students responses were collated and the scores were calculated using Cronbach Alpha to test the reliability of QPSC and QCE. The reliability coefficient of the test was computed using the two sets of scores obtained from the respondents. The consistency coefficient was calculated for the test and re-test scores using the person's product-moment correlation technique. Cronbach Alpha calculated yielded a coefficient of 0.77 and 0.81 for QPSCI and QCE respectively. It means these two instruments were highly reliable which refers that it had high internal consistency.

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 question in this study, data generated from the respondents were subjected to weighted mean. Multiple regression analysis was used to analyze the predictive ability of independent variable on dependent measures in hypotheses 1, and 2

RESULTS
Research Questions
Research Question 1: What is the level of cognitive engagement among secondary school students in Southwestern Nigeria?
Table 1 Level of Cognitive Engagement among Secondary School Students in Southwestern   Nigeria

Cognitive Engagement	M	SD
Cognitive strategy	2.54	1.07
Shallow engagemrnt	2.36	0.93
Deep engagement	2.40	0.93
Persistence	2.38	0.87
Weighted Mean	**2.42**	**Low**

Key: 1.00-2.50=Low, 2.60-3.50= Average/Moderate, 3.60-5.00= High

Result in Table 1 showed the level of cognitive engagement among secondary school students in Southwestern Nigeria. As shown in Table 1, the overall weighted mean of 2.42 is obtained and this implies that the level of cognitive

engagement among secondary school students in Southwestern Nigeria is low.
Research Question 2: To what extent is the relative contribution of cognitive engagement sub-construct of cognitive strategy, deep engagement, shallow and persistence

on prediction of problems-solving competence among secondary school students in the study zone?

Table 2. *Summary of Regression Analyses on Relative Contribution of Cognitive Engagement Variable in Predicting Problem-Solving Competence (N=2131)*

Predictor Variables	B	SEB	β	t	p
(Constant)	2.077	.026		80.560	.000
Cognitive strategy	.092	.012	.254	7.668	.000
Shallow engagement	-.038	.013	-.092	-3.005	.003
Deep engagement	.043	.014	.103	3.044	.002
Persistence	-.035	.014	-.078	-2.496	.013

Result in Table 2 showed that cognitive strategy and shallow cognitive engagement had t-values of 7.668 and -3.005 respectively. Also, the values of the beta weights for the two variables are .254 and -.092. While deep cognitive engagement and persistence had t-values of 3.044 and -2.496 respectively, their beta weights are .103 and -.078. From the values of beta weights and t-values for these variables, it shows that cognitive strategy ($β$ = .254, $p<.05$) sub-construct of cognitive engagement had the highest relative significant contribution in predicting student problem solving competence. This is followed by deep engagement ($β$ = .103,

$p<.05$), shallow engagement ($β$ = -.092, $p<.05$) while persistence ($β$ = -.078, $p<.05$) had the least relative predictive ability in predicting student problem solving competence. Shallow and persistence sub-construct are also found to be negatively correlated with student problem solving competence.

Hypotheses
Hypothesis one: There is no significant predictive ability of cognitive engagement on problem-solving competence among the students in the zone.

Table 3: *Regression Analysis of the Cognitive Engagement on Problem-Solving Competence among Secondary School Students in Southwestern Nigeria*

R= 0.377 R^2= 0.142 Adj. R^2= 0.141 F= 351.735*	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
(Constant)	42.587	.744		57.233	.000
Cognitive Engagement	.283	.015	.377	18.755	.000

Dependent Variable: Problem-Solving Competence Predictors: (Constant), Cognitive Engagement

From the result of the regression analysis as shown in Table 3, the statement of hypothesis one is rejected for there is no significant predictive ability of cognitive engagement on problem-solving competence among the students in the study zone. This implies that cognitive engagement significantly predicts problem-solving competence among public secondary school students in the study zone. It shows that the predictive ability of cognitive engagement on problem-solving competence among secondary school students in Southwestern Nigeria yields a multiple regression coefficient (R) of .377 and a correlation square (R^2) of .142. These values are statistically significant at 0.05 probability level (R=.377,

R^2=.142, F=351.735). The cognitive engagement variable accounted for 14.2% of the observed variance in problem-solving competence among secondary school students. Therefore, it could be concluded that there was a significant predictive ability of cognitive engagement on problem-solving competence among secondary school students in Southwestern Nigeria(R=.377, R^2=.142, F=351.735, $p<.05$).
Hypothesis two: There is no significant joint contribution of cognitive engagement variables of cognitive strategy, deep engagement, shallow and persistence in predicting problem-solving competence of the secondary school students in Southwestern Nigeria.

Table 4: *Summary of Regression Analyses on Joint Contribution of Cognitive Engagement in Predicting Problem-Solving Competence (N=2123)*

Predictor Variables	B	SEB	β	t	p
(Constant)	2.077	.026		80.560	.000
Cognitive strategy	.092	.012	.254	7.668	.000
Shallow Processing	-.038	.013	-.092	-3.005	.003

Deep processing	.043	.014	.103	3.044	.002	*p <
Persistence	-.035	.014	-.078	-2.496	.013	
R		.240				
R^2		.058				
Adj. R^2		.056				
F		32.599*				

.05.Dependent Variable: Problem-Solving Competence

Result in Table 4 shows that the four sub-construct cognitive engagement variables jointly yield a coefficient of a multiple correlation (R) and square (R^2) of .240 and .058 respectively in predicting problem-solving competence. These values are statistically significant at 0.05 probability level. The four sub-construct of cognitive engagement variables could jointly account for 5.8% of the observed variance in problem-solving competence of the students. Therefore, the stated null hypothesis is rejected. This implies that there was a significant joint contribution of cognitive engagement variables of cognitive strategy, deep engagement, shallow engagement and persistence in predicting problem-solving competence of the secondary school students in Southwestern Nigeria.

DISCUSSION OF FINDINGS

The result of research question one shows that the level of cognitive engagement among secondary school students in Southwestern Nigeria is low. For there to be an acceptable level of academic achievement (performance), there is need to be meaningful learning and for meaningful learning to take place, the students have to be fully engaged. Major finding in this present study was that majority of secondary school students in the study zone become quietly disengaged towards classroom problem-solving tasks. This authenticate the studies of (Bature & Atweh, 2019, Acharya, 2017) that there is consistent picture of widespread low-level and shallow cognitive engagement of students in mathematics classrooms. The result also authenticated the position of (Bature & Atweh, 2019, Acharya, 2017) when they found that low-level and passive engagement of students in mathematics classrooms could result in students' disengagement from classroom problem-solving tasks. This sometimes degenerates into students' disruptive behaviours which are not just noise-making during classroom instruction, but surprisingly, a number of these students become quietly disengaged towards classroom problem-solving tasks (Acharya, 2017, Bature & Igwe, 2010). Students need to be cognitively engaged to solve increasingly complex modern life problems (Mohammad, Hossein & Abbas, 2018). Almarghani and Mijatovic (2017) rightly pointed out that the passive role of students in their learning and education and absence of engagement are quite common in many higher education institutions in developing countries including Nigeria. Student engagement in classrooms has been associated with desired outcomes, including brilliant academic performance, improved problem-solving skills, retention, and graduation with excellence performance (Ayub, Yunus, Mahmud, Salim & Sulaiman, 2017).

The finding from research question two that each of the cognitive engagement sub-constructs made a significant contribution to the prediction of students' problem-solving competence. It has shown from the result that cognitive strategy had the highest contribution to the prediction of problem-solving competence among secondary school students. This is followed by deep cognitive engagement. Likewise shallow cognitive engagement and persistence sub-construct had the least contribution in the prediction of the dependent variable.

To Teoh, Abdullah, Roslan and Daud (2014), a student that adopts cognitive strategy approach to problem-solving tasks is identified with; intention to understand, intrinsic motivation, use of evidence, critical thinking and relating ideas to already known concepts and principles. This leads to understanding and long term retention of concepts so that they could be used for problem-solving in unfamiliar contexts.

The result authenticated the position of (Aritia & Suyanto, 2019) that deep cognitive engagement in classroom learning tasks is essential because it enables students to understand the problems they face in life and leads them to problem-solving abilities. Deep cognitively engaged students fully concentrate on their studies, receive better grades, are enthusiastic in academic learning, and persist when encountering obstacles and challenges while students with shallow engagement run the risk of lower grades and increased absenteeism, and eventually dropping out of school (Alrashidi, Phan & Ngu, 2016). Deep cognitive engagement are predicted to demonstrate higher learning academic performance compared to those who use shallow cognitive engagement approaches (Casimiro, 2016; Sedaghat, Abedin, Hejazi & Hassanabadi, 2011).

Research studies indicated that a positive relationship exists between the deep cognitive engagement approach and academic performance and a negative relationship between the shallow cognitive engagement approach and academic performance (Cetin, 2016; Herrmann, McCune & Bager-Elsborg, 2017). Shallow cognitive engagement learners understand the learning task clearly but are unable to realize relationships between concepts which learners with deep

processing cognitive engagement could do effectively (Abubakar & Che-Horaini 2016). A student who adopts shallow cognitive engagement strategies is identified with; the intention to reproduce, take a narrow view and concentrate on detail, stick closely to the course requirement, extrinsic motivation and literal memorization. A highly persistence engaged student would be far beyond providing materials that encourage simple recall or the use of algorithms (Seah & Andersson, 2015) or the memorization of symbols and formulas. Rather, they display higher-order thinking skills which promote problem-solving tasks (Bature & Igwe 2010). In the face of challenge, students' who are persistence in classroom cognitive engagement set goals, plan steps, monitor progress, solve problems along the way, and reflect on their learning (Ghristenson,Rescgly Wylie, 2012)

The result from hypothesis one revealed that there was a significant predictive ability of cognitive engagement on problem-solving competence among public secondary school students in Southwestern Nigeria. Students need to be cognitively engaged in their classroom learning tasks because it would help them to gain a critical or higher-order understanding of the subject matter and solve challenging problems. The inability of students to engage actively in their learning process could tend to cause them to constant rote learning and memorization of subjects concepts to pass their internal or external examinations. Also, poor cognitive engagement of secondary school students toward their classroom academic tasks could make them engage in examination malpractices. This ultimately would result in low problem-solving competence among the students which has been manifesting in their poor academic performance in internal and external examinations. This result corroborated with (Bayoumy & Alsayed, 2021; Nagadeepa, 2021; Rajabalee, Santally & Rennie, 2020; Glapaththi, Dissanayake, Welgama, Somachandra, Weerarathna & Pathirana, 2019; Wara, Aloka & Odongo, 2018; Valle, Regueiro, Núñez, Rodríguez, Piñeiro & Rosário, 2016; & Al-Alwan, 2014), in their various studies have all reported and similarly uncovered positive relationship between cognitive engagement and students' academic performance. They all agreed that there was a very strong positive correlation between engagement and overall academic performances of students. Students' need to be cognitively engaged in problem-solving exercise so as to build their innate abilities. It is counter-productive to present ideas to learners without fully engaging them in the learning process. This is to say that students' who prioritized to be cognitively engaged would be more absorbed in learning process than those who are less cognitively engaged. Being cognitively engaged in the learning action would show in students' better academic achievement which resulted in achieving meaningful learning and promotes skills of critical thinking, problem-solving as well as more cognitive aptitudes. It implies that lack of

cognitive engagement could lead to unfavourable outcomes such as poor academic achievement and increases the risk of academic failure and attrition among students'

This result also corroborated with result findings of (Alrashidi, Phan & Ngu, 2016; Robb, 2014; Gunuc, 2014; Sunday, 2013; Adeyemo, 2010) that students' school subjects' task engagement was found to have significant positive relationship with academic achievement and this also predict their competence in school subjects' problem-solving tasks. This uncovered that students who failed to embrace problem-solving or with low cognitive engagement would in most times resulted in meaningless or reproductive exercise when classroom academic problems is encountered to be solved.Highly engaged students receive better grades, persist when encountering obstacles and challenges and students with low engagement run the risk of lower grades and increased absenteeism, and might eventually drop out of school. This implies that lack of cognitive engagement could lead to unfavourable academic outcomes such as poor academic achievement, and increases the risk of academic failure and attrition.

The finding from hypothesis two has shown that cognitive engagement of cognitive strategy, deep engagement, shallow and persistence could predict problem-solving competence among secondary school students. It had also been shown in the result that each of the cognitive engagement sub-constructs made a significant contribution to the prediction of students' problem-solving competence. It has shown from the result that cognitive strategy had the highest contribution to the prediction of problem-solving competence among secondary school students. This is followed by deep cognitive engagement. Likewise shallow engagement and persistence sub-construct had the least contribution in the prediction of the dependent variable.

The result conforms with findings of Cetin (2016); Herrmann, McCune and Bager-Elsborg, (2017) in their research studies which indicated that a positive relationship existed between cognitive strategy and academic performance and a negative relationship between shallow cognitive engagement and academic performance. Hence, students who use cognitive strategies like elaboration(associating new learning with previous knowledge or applying prior knowledge to carefully arrange new information), organizational strategies (organization skill is used to organize information by grouping or grouping the subject hierarchically), and critical thinking(transferring previously learned knowledge to new situations) were expected to show better academic performance compared to the students who use superficial or shallow strategies like a rehearsal.

Highly engaged students received better grades, and students with low engagement run the risk of lower grades and increased absenteeism and might eventually drop out of

school (Finn & Zimmer 2012). Scholars had suggested that adopting deep cognitive engagement approaches to learning resulted in positive feelings for students that included enjoying the process, devoting themselves to studying, and looking forward to studying (Okoza, Aluede & Owen-Sogolo, 2013). The findings from the result also buttressed the studies carried out by Ohamobi and Ezeaku (2013) that students who regarded learning as the construction of knowledge and who adopted a deep cognitive engagement instead of shallow engagement approach reported a greater development of cognitive skills and greater academic change. They also found that students who adopted a shallow approach reported negative development of cognitive skills, mathematical skills, academic change, and social skills.

Students with shallow engagement indicated that they accept information about their school subjects and memorize it solely for two reasons. The first is to pass the examination, which was mostly the primary motive of many students nowadays. The second was to gain recognition in the class by giving answers whenever teacher asks during classroom lesson. Students who were engaged in shallow engagement lack long-term retention and understanding of knowledge and information about their various school subjects.

Shallow cognitive engagement relies more on rote learning to pass a given subject without going beyond the requirement of academic subject task. Learners with shallow engagement always make little effort and less contribution to a learning process and their main concern is to avoid failure (Abubakar & Che-Horaini 2016). The findings indicated that students displayed both deep and shallow engagements which are consistent with the findings of (Cetin, 2016; Herrmann, McCune & Bager-Elsborg, 2017) that an individual might display both deep and shallow cognitive engagement at a time. Both levels of engagement relate strongly to motivation. Shallow engagement correlates with extrinsic motivation while deep engagement is associated with intrinsic motivation.

CONCLUSION

The study concluded that cognitive engagement had a significant predictive ability on problem-solving competence among secondary school students in the study area. It implies that students who are cognitively engaged in classroom academic exercise would be competent at solving a problem more than those who are not paying keen attention to academic tasks.

The study also concluded that cognitive engagement of cognitive strategy, deep engagement, shallow and persistence could predict problem-solving competence among secondary school students. Cognitive engagement sub construct of cognitive strategy had the highest contribution in the prediction of problem-solving competence among secondary school students. Likewise deep cognitive engagement also shows reasonable prediction. Shallow engagement shows moderate prediction while persistence sub-construct had the least contribution in the prediction of the dependent variable.

RECOMMENDATIONS

Techniques of teaching that promote high level of cognitive engagement should be adopted by school teachers to motivate students' towards classroon learning tasks. 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 problem-solving 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. 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 taught as this could assist in their competence in problem-solving.

Educational psychologists and school-based teacher counsellors should utilize cognitive behavioural therapy techniques during counselling sessions with students in school to enhance their cognitive engagement.

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