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## Assessment of Intrinsic and Extrinsic Motivation level in Learning Mathematics using Manipulatives among Early Childhood Care Education Pre-Service Teachers

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### Abstract

*The study assesses Intrinsic and Extrinsic Motivation level in Learning Mathematics using Manipulatives among Early Childhood Care Education Pre-Service Teachers. Based on the objectives, two research questions guided the study. Descriptive research design was adopted. The population comprises all the 603 Early childhood care education pre-service teachers at Alvan Ikoku Federal College of Education in Owerri Municipal Council of Imo state. A sample of 90 ECCE pre-service teachers participated in the study comprising of 35 male and 56 females using simple random sampling technique in selecting ECCE pre-service teachers. The instrument used for data collection was motivational orientations Questionnaire scale (MOQS). The MOQS was adopted by the researchers and validated by two expert's judges from measurement and evaluation department. The instrument has reliability of 0.79 and 0.83 Cronbach alpha and split-half (Spearman-Brown) respectively which was considered very adequate. The data generated was analyzed using mean and standard deviation for the research questions. The results showed that that early child hood care education pre-service teachers have a high level of intrinsic motivation. The high level of intrinsic motivation displayed by the students indicates that learners engage in an activity in order to experience stimulating sensations and give them the sense of pure enjoyment and satisfaction. Based on the finding, it was recommended that Workshops and seminars should be organized to educate teachers about the benefits of utilizing manipulatives in motivating students to learn.*

**Keywords:** Assessment, Intrinsic Motivation, Extrinsic Motivation, Manipulatives and Mathematics

## Introduction

Mathematics is one important and core school subject taught at all levels of education in many countries including Nigeria. To Bahago and Attah (2014), it permeates every fabric of the society and its role in solving societies' problems is undebatable. According to Hornby in Unamba, Onyekwere & Ugochukwu (2017), Mathematics is a science of size and of numbers of which arithmetic, algebra, trigonometry and geometry are branches. Mathematics as a school subject is recognized as the foundation of science and technology without which as stated by Iweka, Onwuka and Moseri in Unamba, Okwara-Kalu & Ibe (2020) a nation cannot become prosperous and economically independent. Mathematics methods are no longer the prerogative of only scientists, engineers and technologists; it is increasingly being used to analyze individual behaviour, to study attitudes and trends in opinion within the society as a whole. This shows that there is no way a society or individual can develop without the knowledge and principle applications of mathematics which as a discipline is indispensable to scientific progress and national development. To take this further, Charles-Ogan, (2015) affirmed that application of mathematics on the national economy will definitely result in rapid national development. Hence, mathematics is an important subject as knowledge of it enhances a person's reasoning, problem-solving skills, and in general, the ability to think critically.

Despite the importance accord to mathematics there are important factors that influence students learning which include; learners' attitude, background, teachers' knowledge of the subject matter, study and learning skills, amount of time learners spends on learning, their emotional readiness to learn and others. In Nigeria, there has been a nationwide cry on the fallen standards of education and various factors have been identified for low academic achievement among students and these include poor study habit, laziness, ineffective classroom instructions and inadequate provision of needs among others (Akpan, 2018). It has been noticed that some students in the classroom do not pay attention to what the teacher is doing as they are easily caught engaged in other activities. Jones (2008) observes that it is easy to see students slouched in their chairs and not listening to the teacher or participating in the classroom discussion which portrays lack of engagement. The major task of every mathematics teacher is how to make the subject meaningful to learners. Hence, psychologists and mathematics educators are of the view that, mathematics should not be taught in a teacher dominant lesson, but instead, lessons must focus on learners' knowledge construction and hence should be placed at the center of the teaching and learning process to enable them explore and interact with materials to improve knowledge acquisition. Also, the National Council of teacher of Mathematics' (NCTM) Principles and Standards promotes the use of multiple representations (e.g., pictorial, manipulatives, graphical, numerical) in mathematics classroom to assist students in exploring mathematical concepts (NCTM, 2003). This use could be one potential way to overcome abstract mathematical ideas for students (Shulman, 1986). Meanwhile, Cramer, Post, & delMas (2020) believed that the representational models teachers utilized in classrooms could engage and facilitate students' learning and knowledge construction.

There have been numerous definitions of manipulatives by several authors. Kennedy (2020) defines manipulative as "objects that appeal to several senses and that can be touched, moved about, rearranged, and otherwise handled by learners. Smith (2009) defines manipulatives as physical objects that are used as teaching tool to engage students in hand-on learning of mathematics. Thus, manipulatives are materials from our own environment that learners can use to learn or form mathematical concepts. In other word, any material or object that helps learner to understand mathematics. Such materials help to reduce the abstract

nature of mathematics as perceived by many students. Manipulatives can come in a variety of forms and they are often defined as physical objects that are used as teaching tools to engage students in the hands-on learning of mathematics (manipulatives, 2009). Manipulatives can be purchased at a store, brought from home, or teacher and student made. The manipulatives can range from dried beans and bottle caps to Unifix cubes and base-ten blocks. They are used to introduce, practice, or remediate a mathematical concept. A good manipulative bridges the gap between informal mathematics and formal mathematics. Manipulatives can be used in teaching a wide variety of topics in mathematics, including the objectives from the five NCTM standards: problem solving, communicating, reasoning, connections, and estimation. The materials should foster learner's concepts of numbers and operations, patterns, geometry, measurement, data analysis, problem solving, reasoning, connections, and representations (Seefeldt & Wasik, 2006). Teachers could use counters, place-value mats, base-ten blocks, and fraction strips while teaching from the numbers and operations standard. The counters could be used to teach one-on-one correspondence, ordinal numbers, and basic addition and subtraction. The fraction strips could be used to add and subtract fractions or to show equivalent fractions. Pattern blocks, attribute blocks and scales could be used to assist students in the learning basic algebra. Student could use geoboards when trying to identify simple geometric shapes. They could also use geometric solid models when learning about spatial reasoning. Teachers could use standard and non-standard rulers and measuring cups to represent length or volume in measurement lessons. The students could also use tiles when trying to find the area or perimeter of an object. When it comes to data analysis and probability, students could use spinners to find the probability of landing on a designated area. They could also use number cases or dice to find the probability of rolling a certain number or combination of numbers (manipulatives, 2009).

Manipulatives can be extremely helpful to students, but they must be used correctly. Learners must understand the mathematical concept being taught rather than simply moving the manipulatives around. Smith (2009) stated that there are probably as many wrong ways to teach with manipulatives as there are to teach without them. The mathematical manipulatives should be appropriate for the students and chosen to meet the specific goals and objectives of the mathematical program. The complexity of the materials provided will increase as children's thinking and understanding of mathematical concepts increase (Seefeldt & Wasik, 2006). It is also important for teachers to allow their students to have free time to play with the manipulatives.

After the students have explored the manipulatives, the materials cease to be toys and assume their rightful place in the curriculum (Smith, 2009). He further explains that teachers should provide learners with opportunities to work with materials with open-ended objectives that have no specific preset goals. These opportunities allow the students the chance to explore their own questions and generate a variety of answers. These experiences help students think about their world in alternative ways and help them understand that there are multiple ways to solve problems. Generating multiple solutions to problems is an essential strategy in mathematics (Seefeldt & Wasik, 2006). The use of manipulatives is recommended by the NCTM because it is supported by both learning theory and educational research in the classroom. Manipulatives help students learn by allowing them to move from concrete experiences to abstract reasoning (Research on the n.d.). When students manipulate objects, they are taking the first steps toward understanding mathematical processes and procedures. The effective use of manipulatives can help students connect ideas and integrate their knowledge so that they gain a deep understanding of mathematical concepts (Research on the, n.d.). Over the past few decades, researchers have studied the use of manipulatives in

several different grade levels and in several different countries. The majority of the studies indicate that mathematics achievement increases when manipulatives are put to good use. Many studies also suggest that manipulatives improve children's long-term and short-term retention of mathematics. Ukaegbu, Anulobi & Unamba (2018) research indicates that using manipulatives helps improve the environment in mathematical classrooms. When students work with manipulatives and then are given a chance to reflect on their experiences, not only is mathematical learning enhanced, but mathematics anxiety is also greatly reduced. Kenneth-Chang (2008) examined the work of research scientist Jennifer Kaminski and he found that children better understand mathematics when they use concrete examples. Catherine Kelly, a member of the Montana Council of Teachers of Mathematics, stated that teachers need to know when, why, and how to use manipulatives effectively in the classroom as well as opportunities to observe, first-hand, the impact of allowing learning through exploration with concrete objects (Kelly, 2006). Additional studies have shown that students who use manipulatives in specific mathematical subjects are more likely to achieve success than students who don't have the opportunity to work with manipulatives ("Research on the, n.d.). Some learners need to use manipulatives to learn to count, while other students' understanding of place value increases with the use of manipulatives. Research also indicates that using manipulatives is especially useful for teaching low-achievers, students with learning disabilities and learners are motivated.

Motivation is a strong force in achievement. Moula (2010) observes that motivation is one of the factors that contribute to academic success; that parents and educators should strive to understand the importance of promoting and encouraging academic motivation early in life. Feldman (2005) refers to motivation as factors that direct and energize the behaviour of humans and other organisms, while Wood (2002) sees motivation as a process that initiates, directs, and sustains behaviours to satisfy physiological or psychological needs. Motivation is also seen as what gets one going, keeps one going, and determines where one is going (Slarin, 2006). The concept of motivation is closely related to other constructs in education and psychology.

They include attention, needs, goals and interests which all focus on stimulating individual learners and rising their interest and attention towards engaging in an action or behaviours and the accomplishment of such actions or goals Krause, Bochner, and Duchesne (2003). The concept of motivation is functional when an individual is thrilled to satisfy some need or desire. The individual will involve in or be attracted toward actions that are perceived as having the possibility to meet this need or desire Tan, Parsons, Hinson, & Sardo-Brown (2003). Educational psychologists are of the view that students' motivation is an indispensable requirement for efficient learning to take place Biehler and Snowmnan in Auwalu, Norsuhaily, Sadiq & Kabara (2021). Fontana (2014) believed that, in the event of insufficient motivation to learn, the outcome of such learning will be unsatisfactory. The concept of motivation has been defined differently. However, all centered on what induce a learner to perform a given action. Denhardt, Denhardt & Aristigueta (2008) views motivation as what causes people to behave as they do. To them, motivation sketches the achievement and pursuit of goals. According to Lawler in Biehler and Snowmnan in Auwalu, Norsuhaily, Sadiq & Kabara (2021) motivation is goal directed. That is individuals perform an action due to the goal they want to achieve. Pettinger (2008) take a different view in defining motivation to him, motivation is environmentally dependent. That is learners action is tailored by environmental influences. Campbell and Pritchard (2009) sees motivation as series of psychological procedures that cause the initiation, direction, intensity and the persistence of actions Denhardt et al. (2008) stressed that motivation is not observe directly. They pointed out that motivation is an inner feeling that made learner act in a particular way to achieve a

given goal and purposes. Denhardt et al. (2008) further argued that motivation cannot be controlled directly. They maintain that motivation occurs within learner's minds and hearts and should not be regarded as something that people do to others. In view of the importance attached to student's motivation. Motivation is considered as a potential to direct behaviour. According to the definition, students' motivation may be manifested in cognition, emotion and/or behaviour. For example, a student's motivation to get a good grade in mathematics may be manifested in happiness (emotion) if he or she scores high on a test. It may also be manifested in studying for a test (behaviour) and in new conceptual learning (cognition) when studying for the test. Needs are specified instances of the potential to direct behaviour (Hannula, 2004). I have chosen to define motivation as a potential to direct behaviour. According to Self-determination theory (Ryan & Deci, 2000) there are two types of motivation i.e. extrinsic motivation and intrinsic motivation.

Extrinsic motivation can be defined as; it pertains to a wide variety of behaviours that are engaged in as a means to an end and not for their own sake (Deci in Nadia, 2017). Extrinsic motivation refers to rewards that are obtained not from the activity, but as a consequence of the activity (Morris & Maisto, 2002). Extrinsic motivation arises from the use of external rewards or bribes such as food, praise, free time, money or points toward an activity (Morris & Maisto, 2002), applies where the incentives are all external, in that they are separate from the individual and the task. Louw and Edwards in Nadia (2017) defined extrinsic motivation as motivation that occurs when behaviour is motivated by factors like tangible rewards, meeting obligations, passing tests or the need to impress other people. Farrant in Nadia (2017) defined extrinsic motivation as motivation that occurs when a person is forced by another person or by the situation to act in a particular way while Ryan & Deci (2000) define extrinsic motivation as a force that causes the doing of something because it has a separable outcome. Farrant said that this externally imposed motivation includes fear and reward where a person is forced to work in order to avoid punishment, to get good marks, to obtain a certificate, or simply to be top of the class. Extrinsic motivators include parental expectations, expectations of other trusted role models, earning potential to enroll in a course later and good grades. According to Benabou and Tirole (2003), extrinsic motivation promotes effort and performance with rewards serving as positive reinforces for the desired behavior. Extrinsic motivation typically produces immediate results and requires less effort in comparison to intrinsic motivation (Ryan & Deci, 2000). The down side of it is that extrinsic motivators can often distract students from true independent learning. Another problem with extrinsic motivators is that they typically do not work over the long term. Once, the rewards are removed, students lose their motivation (DeLong & Winter, 2002). As extrinsically motivated, students tend to focus on earning higher grades and obtaining rewards, Biehler and Snowman in Chows & Bob (2013) believed that extrinsic motivational factors can diminish students' intrinsic motivation. Such observation has also been reported by Bain in Onyekwere, Okoro & Eugene (2018) who concluded that extrinsic rewards have negative impacts on intrinsic motivation.

Intrinsic motivation refers to being in an activity for itself, and the pleasure and satisfaction derived from participation (Deci in Nadia, 2017). Generally, intrinsic motivation refers to engagement in behavior that is inherently satisfying or enjoyable (Legault, 2016). It occurs when someone is internally motivated to do something because it gives them the sense of pure enjoyment and satisfaction. In other words, someone who is intrinsically motivated does something due to one's self satisfaction and interest not for achieving something other than that. Academic intrinsic motivation plays significant role in achievement, competency and academic learning. Deci and Ryan in Nadia (2017) posit that intrinsic motivation stems from the innate psychological needs of competence and self-



determination. Other researchers suggest that individuals interact with the environment in order to feel competent, and to create unique accomplishments (Nadia, 2017). Intrinsic motivation takes place when someone engages in an activity in order to experience stimulating sensations (e.g., aesthetic experiences, sensory pleasure, with fun and excitement) derived from one's engagement in the activity. Research on the dynamic and holistic sensation of flow, on feelings of excitement in intrinsic motivation, on aesthetic stimulating experiences, and peak experiences is representative of this form of intrinsic motivation. On the other hand, intrinsic motivation according to Morris & Maisto (2002) arises from internal factors, i.e., it is as a result of rewards provided by an activity itself. According to Krause et al (2003), intrinsic motivation arises from internal factors such as a natural feeling of curiosity, exigent, confidence and satisfaction when performing a task. The above is in line with the assertion by White (2017) who posited that intrinsic motivation is directly related to the task being performed where a person feels instinctive pleasure when he/she learns something new or succeeds in a challenging task. This is supported by Legault (2016) who argued that intrinsic motivation is more effective than extrinsic motivation in promoting learning and achievement because it creates feelings of confidence and mastery that self-reinforce. Csikszentmihalyi and Nakamura (2021) stated that intrinsically motivated individuals possess the following characteristics: They engage in both mental and physical activities holistically, they remain highly focused throughout these activities with clearly defined goals, they are self-critical, they self-reflect on their own actions realistically, and they are usually relaxed and not afraid to fail during learning. A research study done by Stipek (2021) concluded that intrinsically motivated students learn independently and always choose to do challenging tasks. They persevere to complete the tasks they have undertaken. They integrate the knowledge acquired in school with their experiences gained from outside school. They often ask questions to broaden their knowledge and learn regardless of any external push factors or help from teachers, and they take pride in their work and express positive emotions during the learning process. Highly intrinsically motivated students are able to learn new concepts successfully and show better understanding of the subject matter (Stipek, 2021). Unlike intrinsic motivation; extrinsic motivation drives students to engage in academic tasks for external reasons.

Gender differences in the motivation to learn science has attracted much attention during the last decade (Eccles & Blumenfeld, Greene & DeBacker, Greenfield, Morrell & Lederman in Onyekwere, Okoro & Eugene (2018). Evidence accumulated thus far on gender differences in motivation is inconclusive. While many studies (Nadia, 2017) reported that there are gender differences in extrinsic and intrinsic motivation between male and female students, studies by Rusillo and Arias (2004) and Glynn et al. (2009) reported otherwise. Whereas on academic performance Schiefele, (2009) strongly suggests that male students' performance accords their interest level more than is the case for female students". In particular, female students' academic performance is less associated with their interests than male students' academic performance" (Schiefele, 2009).

Numerous studies suggested that from childhood through adolescence, across varied populations, those with higher academic intrinsic motivation have been found to be more competent in school, generally evidencing significantly greater academic achievement, more positive perceptions of their academic competency, lower academic anxiety, and less extrinsic motivation (Gottfried, Cook, & Morris, 2015). Broussard and Garrison (2004), Skaalvik and Skaalvik (2006), and Sandra (2002) found significant relationship between academic performance and motivation. Similarly, Johnson (2013) found that academic achievement is highly correlated with student's motivation. However, Bank and Finlapon (1980) found that successful students were found to have significantly higher motivation for

achievement than unsuccessful students did. In the light of above studies, the main objective of the present study was to assess the Intrinsic and extrinsic motivation level in learning mathematics using manipulatives among early childhood care education pre-Service teachers. Furthermore, this study explores gender difference on the variable of extrinsic motivations, and intrinsic motivation.

### **Purpose of the study**

The main purpose of this study was to assess Intrinsic and Extrinsic Motivation level in Learning Mathematics using manipulatives among Early Childhood Care Education Pre-Service Teachers. Specifically, the study sought to;

- i. Assess the level of Intrinsic and Extrinsic Motivation in Learning Mathematics using manipulatives among Early Childhood Care Education Pre-Service Teachers.
- ii. Assess the level of Intrinsic and Extrinsic Motivation in Learning Mathematics using manipulatives among male and female Early Childhood Care Education Pre-Service Teachers.

### **Research Questions**

1. What is the level of Intrinsic and Extrinsic Motivation in Learning Mathematics using manipulatives among Early Childhood Care Education Pre-Service Teachers?
2. What is the level of Intrinsic and Extrinsic Motivation in Learning Mathematics using manipulatives among male and female Early Childhood Care Education Pre-Service Teachers?

### **Method**

The descriptive survey research was used for the study. According to Maduakonam (2004), a descriptive survey research seeks to collect detailed factual information that describes the nature of existing conditions. It assesses the characteristics of the whole population and usually study sample drawn from the population of the study. The population of the study consisted of all 603 early childhood care education pre-service teachers at Alvan Ikoku Federal College of Education. The sample was made up of 90 pre-service teachers comprising of 35 males and 55 females using simple random sampling technique. The instrument used for data collection is structured questionnaire. The first section of the instrument was designed to obtain the demographic profiles of students, such as participants' age and gender. The second section contained a questionnaire adapted from Glynn et al. (2009) and it consisted of 30 self-assessment items measured on a 5-point Likert type scale ranging from five for always, four for usually, three for sometimes, and two for rarely to one for never. The items were categorized into five motivational scales, namely, intrinsic motivation, extrinsic motivation, personal relevance, self-efficacy and self-determination. The researchers only adopted the two areas of interest (intrinsic and extrinsic motivation). The description of each scale and an example of the test item are given in. Face and content validity of the instrument were established by lecturers who were experts in psychology and measurement and evaluation. They scrutinized the contents of the questionnaire, offered useful corrections and suggestions, which led to some modifications. Based on such corrections and modifications, the instrument was considered adequate and the final draft of the questionnaire was produced. The reliability of the instrument was established when it was administered to 50 students selected from two schools, which are similar with the people used in the main study. The instrument has reliability of 0.79 and 0.83 Cronbach alpha and split-half (Spearman-Brown) respectively. The reliability coefficients were considered high

enough and suitable for use in this study. Mean and standard deviation were used to analyze the data for the research questions while t-test was used to test the null hypothesis at 0.05 level of confidence.

## Results

**Research Question one:** What is the level of Intrinsic and Extrinsic Motivation in Learning Mathematics using manipulatives among Early Childhood Care Education Pre-Service Teachers.

**Table 1: mean and standard deviation on level of Intrinsic and Extrinsic Motivation in Learning Mathematics**

Variables	Mean	SD	Level	Rank
Intrinsic motivation	35.67	4,12	High level	1
Extrinsic motivation	20.23	1.49	Low level	2

Result in table 1 shows a mean score of 35.67 in terms of intrinsic motivation, the students responded that they enjoy learning; they find learning very interesting and not challenging for them while extrinsic motivation mean score is 20.23 indicating no use of external rewards during the learning process.

**Research Question two:** What is the level of Intrinsic and Extrinsic Motivation in Learning Mathematics using Manipulatives among male and female Early Childhood Care Education Pre-Service Teachers?

**Table 2: Gender analysis on level of Intrinsic and Extrinsic Motivation in Learning Mathematics using Manipulatives**

variables	Male (35)		Female (55)	
	Mean	SD	mean	SD
Intrinsic motivation	15.16	3.54	14.23	3.10
Extrinsic motivation	10.13	3.47	09.54	3.51

Gender differences were analyzed and the results are presented in Table 2. As the means indicate, both male and female have high levels of intrinsic motivation and low level of intrinsic motivation in learning

## Discussion

The findings of the study reveal that early child hood care education pre-service teachers have a high level of intrinsic motivation. The high level of intrinsic motivation displayed by the students indicates that learners engage in an activity in order to experience stimulating sensations and give them the sense of pure enjoyment and satisfaction. McKinney (2011) suggested teachers should create a conducive learning environment that is challenging, stimulating and relevant to boost students' interest and motivation, for instance, promoting cohesiveness among students using small group cooperative learning strategies.

In terms of gender, no significant difference was found between male and female in motivational orientations and was comparable between the two groups. (Anderman & Anderman, 1999; Ayub, 2010; Lai, Chan, & Wong, 2006; Meece & Holt, 1993) reported that there are gender differences in extrinsic and intrinsic motivation between male and female students, studies by Rusillo and Arias (2004) and Glynn et al. (2009) reported otherwise.



## **Conclusion**

The present study provides teachers and educators valuable information on pre –service teachers intrinsic and extrinsic motivation to learn. Understanding of how each of the motivations influences learning will place teachers and educators in a better position to help and support the students. The study concludes that students have a high level of extrinsic motivation, intrinsic motivation irrespective of gender.

## **Recommendations**

The following recommendations are hereby made to increase the level of motivation in students for learning.

1. Works and seminars should be organized for teacher educators to know proper innovative technologies that will enhance student’s motivation in learning
2. Teacher educators should inculcate the desire by providing adequately for their student’s needs, as well as encouraging them both intrinsically and extrinsically to achieve their goals.
3. Teacher Educators as well as policy formulators must re-examine grading policies both at the school wide and classroom level to ensure that the reward system provides a situation in which students are encouraged to work hard

## References

- Akpan, I. D. (2018). Single Parenting and Social Adjustment of Adolescent Students. *University of Uyo Journal of Women Academics (UJOWACS)*, 1(1), 164 – 125.
- Auwalu S., M, Norsuhaily A., B., Sadiq I., M & Kabara A., H (2021). Impact of Motivation On Students' Academic Performance: A Case Study Of University Sultan Zainal Abidin Students.
- Bahago, B., A. & Attah, B., G. (2014). Secondary school students' perception of the influence of motivation on achievement in mathematics. *International journal of research in science, technology and mathematics education*, 2 (2), 24-34.
- Benabou, R., & Tirole, J. (2003). Intrinsic and extrinsic motivation. *Review of Economic Studies*, 70, 489-520.
- Broussard, S. C. & Garrison, M.E. (2004). The relationship between classroom motivation and academic achievement in elementary school-aged children. *Family Consumer Science Research Journal*, 33(2), 106-120.
- Campbell, JP, and Pritchard R., D. (2009) Motivation theory in industrial and organizational In M. D.Dunnette (Ed.), *Handbook of industrial and organizational psychology*. Chicago: Rand McNally. ( 63-130).
- Charles-Ogan, G. (2015). Mathematics as a tool for achieving the vision20:2020 goal of national transformation *International Journal of and Education, Learning Development*, 3 (8), 57-61.
- Chow S, J.& Bob C., Y. (2013). Secondary School Students' Motivation and Achievement in Combined Science. *US-China Education Review B*, 3(4),213-228
- Cramer, K. A., Post, T. R., & del Mas, R. C. (2002). Initial Fraction Learning by Fourth- and Fifth-Grade Students: A Comparison of the Effects of Using Commercial Curricula with the Effects of Using the Rational Number Project Curriculum. *Journal for Research in Mathematics Education*, 33, 111-144. <http://dx.doi.org/10.2307/749646>
- Csikszentmihalyi, M., & Nakamura, J. (2021). The dynamics of intrinsic motivation: A study of adolescents. In C. Ames, & R. Ames (Eds.), *Research on motivation in education: Goals and cognitions* (Vol. 3, pp. 45-72). San Diego: Academic Press.
- DeLong, M., & Winter, D. (2002). Strategies for motivating students. *Learning to teach and teaching to learn mathematics: Resources for professional development* (pp.159-168). Washington, D. C.: Mathematical Association of America.
- Denhardt, R. B., Denhardt, J. V., and Aristigueta, M. P.(2008) *Managing Human Behavior in Public and Nonprofit Organizations*. Sage Publications, Inc. *Journal of Personality and Social Psychology*; 47, 944- 952. Available on: <https://us.sagepub.com/en-us/nam/managing-human-behavior-inpublic-and-nonprofit-organizations/book234553>.
- Feldman, R. S. (2005). *Understanding Psychology 7th E*. New York: McGraw Hill Higher Education.
- Fontana, D. (2014). *Psychology for Teachers*. London: Macmillan Press Ltd.
- Glynn, S. M., Taasobshirazi, G., & Brickman, P. (2009). Science motivation questionnaire: Construct validation with nonscience majors. *Journal of Research in Science Teaching*, 46(2), 127-146.
- Gottfried, A.W., Gottfried, A.E., Cook, C., & Morris, P. (2005). Educational characteristics of adolescents with gifted academic intrinsic motivation: A longitudinal study from school entry through early adulthood. *Gifted Child Quarterly*, 49, 172–186.
- Hannula, S., (2004). *Manual for A Scale of Intrinsic versus Extrinsic Orientation in the Classroom*. Denver, CO: University of Denver.

- Iweka, S., Onwuka, P. I. & Moseri, P. O. (2010). Improving teaching of mathematics in the secondary schools for the attainment of the seven-point agenda. Proceedings of the 2010 September annual national conference of the mathematics association of Nigeria, 15th -20<sup>th</sup>.
- Johnson, J. O. (1996). Child Psychology. Wusen Press Limited. Calabar, Nigeria.
- Jones, R. D. (2008). Strengthening Student Engagement. International Center for Leadership in Education.
- Kelly, E. (2006). Teacher Motivation in Low-Income Context: An Actionable Framework for Intervention, [www.google.com](http://www.google.com).
- Kennedy, L. M. (2013). A rationale. Arithmetic Teacher, 33(6), 6-7.
- Kenneth-Chang, B. (2008). Teachers' professionalism and ten month training: Distance education. Bhaktapur: Distance Education Centre. p. 206
- Krause, K. L., Bochner, S., and Duchesne, S(2003). Educational psychology for learning and teaching. Australia:Thomson.2003 Availableon: [http://www.cengagebrain.co.nz/content/krause81812\\_0170181812\\_02.01\\_chapter01.pdf](http://www.cengagebrain.co.nz/content/krause81812_0170181812_02.01_chapter01.pdf)
- Lagault, L. (2016). Intrinsic and Extrinsic motivation. Potsdam, NY, USA: Clarkson University.
- Lawler EE. Motivation in Work Organizations (Jossey-Bass Business and Management Series). Jossey-Bass Inc Pub. 1994. Available on: <http://www.amazon.com/Motivation-Organizations-Jossey-Business-Management/dp/1555426611>.
- Manipulatives (2009).Research on benefits of manipulatives. Retrieved December 9, 2009, from: [http://www.etacuisenaire.com/pdf/benefits\\_of\\_manipulatives.pdf](http://www.etacuisenaire.com/pdf/benefits_of_manipulatives.pdf)
- Morris, C., G. & A.A. Maisto, A., A (2002). Psychology: An introduction. 11th ed. New Jersey: Prentice Hall. Moru, E.K., 1995. Developing the quality of pupil learning. Southern Africa Mathematical Sciences Association Conference. 28 August to 1 September, 540-550.
- Muola, J. M. (2010). A Study of the Relationship between Academic Achievement Motivation and Home Environment among Standard Eight Pupils. Educational Research and Reviews, 5(5), 213-217.
- Nadia A. (2017). Effect of Intrinsic and Extrinsic Motivation on Academic Performance. <https://www.researchgate.net/publication/255712855>
- NCTM. (2003). Principles and Standards for School Management. Retrieved from <https://www.nctm.org/standards/>.
- Onyekwere, A, N, Okoro, P. Eugene, C. U (2018). Influence of Extrinsic and Intrinsic Motivation on Pupils Academic Performance in Mathematics SJME (Supremum Journal of Mathematics Education) Vol.2, No.2, July 2018, pp. 52-59
- Pettinger R. An Introduction to Organizational Behaviour (Macmillan business). Palgrave Macmillan. 1996.
- Rusillo, A. J., & Arias, H. J. (2004). A process model of mathematics achievement and attitude. Journal for Research in Mathematics Education, 23, 306-328.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary Educational Psychology, 25, 54-67.
- Sandra, D. (2002). Mathematics and science achievement: effects of motivation, interest and academic engagement. Journal of Educational Research, 95(6), 323-332.
- Schiefele, U. (2009). Interest, learning and motivation. Educational Psychologist, 26(3&4), 299-323.
- Seefeldt, C., & Wasik, B.A. (2006). Early education: three-, four-, and five-year-olds go to School (2nd ed.). Upper Saddle River: Pearson Education.

- Skaalvik, E. M., Skaalvik, S. (2006). Self-concept and self-efficacy in Mathematics: Relation with Mathematics motivation and achievement. Proceedings of the International Conference on Learning Sciences, Bloomington, Indiana.
- Slarin, R. (2014). Exploring Japanese University EFL Teacher Motivation, Journal of Pan-Pacific Association of Applied Linguistics. [www.google.com](http://www.google.com).
- Slavin, D. (2006). The Educational Psychology: Theory into Practice. Eaglewood Cliff, N. J.: Prentice Hall.
- Smith, S. S. (2009). Early childhood mathematics (4th ed.). Boston: Pearson Education Using Manipulatives. Retrieved October 20, 2010, from [http://www.teachervision.fen.com/prodev/teaching\\_methods/48934.html](http://www.teachervision.fen.com/prodev/teaching_methods/48934.html)
- Stipek, D. J. (1988). Motivation to learn: From theory to practice (2nd ed.). Massachusetts: Allyn and Bacon.
- Tan O.S., Parsons, R.D., Hinson, S.L., & Sardo-Brown, D. Educational psychology: A practitioner-researcher approach. Australia: Thomson 2003.
- Ukaegbu, M.N., Anulobi, A. & Unamba, E.C. (2018). Effect of Virtual manipulations on pupil's academic achievement and attitude in Mathematics. A case for sustainable development. *Journal of Education Media and Technology*, 22(1) 31-40
- Unamba E.C , Okwara-Kalu C. & Ibe G. (2020). Comparative Study of Levels of Academic Self Esteem and Academic Achievement in Mathematics among Pupils of Two and Single Parent Families. *Malikussaleh Journal of Mathematics Learning (MJML)* Vol. 3, No. 2, October 2020, pp.70-75 ISSN 2620-6315 (print), 2620-6323 (online)
- White, R. W., (2017). Motivation reconsidered: The concept of competence. *Psychological Review*, 66: 297– 333.
- Wood, W. (2002). Sunday Guide for the World of Psychology 4th ed. Boston: Allyn and Bacon.