

MOTIVATING SCIENCE AND TECHNOLOGY-BASED TEACHERS FOR EFFECTIVENESS AND EFFICIENCY IN THE EDUCATIONAL SYSTEM

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Preamble

The paper discussed the idea of motivating science and technology-based teachers for effectiveness and efficiency in the educational system. The impact of science and technology can be felt in almost all spheres of human endeavour. Teachers help to transmit knowledge, processes, methods and products of science and technology to the learners. Other agents in the educational system contribute in building and maintaining standard structure, but teacher quality is identified as one of the most significant factor. Motivation as one of the identified ways of raising and maintaining high teacher quality was discussed. Meaning of motivation was viewed from different authors' perspectives which is the driving force upon which all human activities are hinged. Science and technology teachers' motivation is influenced by some internal and external factors. Some of these factors of teacher motivation emanate principally either from biological make-up of individual or the environment in which the individual found him/herself. Importance of motivation and ways of motivating teachers were outlined. Motivating science and technology-based teachers to use experiments extensively and innovative teaching strategies that are learner - centred and problem - solving-based is emphasized. The aims and objectives of teachers' motivation are for effectiveness and efficiency of teachers which eventually will culminate into improved performance by the end product - students. Solutions to the numerous problems of humanity and society will be readily available. Some criteria used in measuring teachers' effectiveness were pointed out. Factors that affect teachers' effectiveness and efficiency were mentioned and some recommendations made. Responsibilities of the supervisory authority on one hand and that of the science and technology - based teachers on the other hand to ensure motivation all aimed towards effectiveness and efficiency in the educational system were highlighted.

Introduction

A nation's level of development is measured by her level of development in science and technology. Knowledge, skills, attitudes, methods, processes and products of science and technology are inculcated into learners through science and technology education. Supporting students to learn science and technology is the super-ordinate aim of science and technology education. The onerous responsibility and task of educating learners about science and technology lay with science and technology-based teachers. Apart from factors pertaining to students' cognitive, affective, psychomotor abilities and others, the teacher is one of the most important determinants of students' performance (Mahler, Grobschedi & Harms, 2018). Teacher factor have more impact than other factors such as school budget, class-size, students' motivation, educational reforms and practices. The revised National Policy on Education (2014) confirmed that "no educational system can rise above the quality of its teachers". Of all the factors that affect a nation's educational system, teacher quality has been identified as a key factor. This factor is instrumental to sustaining students' interests, learning outcome and teachers' psychological health and well-being towards effectiveness and efficiency. Teachers are the main determinants of quality education, be it at primary, secondary, tertiary or non-formal education level. Teachers are the drivers of educational policies and curriculum in the nation. They constitute the product of the philosophy contained in the national curriculum, and in turn, they are the ones who apply the provisions of the philosophy contained in the curriculum for national development. If there are loopholes in the educational processes and outcome, teachers tend to receive more blame for the shortcomings than other agents linked with educational activities.

One of the factors that can boost and sustain teachers' effectiveness and efficiency which will in turn promote high quality education is motivation. A motivated teacher often creates a successful classroom interaction. The highly needed skilled manpower which forms the bedrock of national development can be attained through motivated science and technology teachers. To be able to achieve quality education, which is goal 4 of the United Nations' Sustainable Development goal of transforming the world by 2030, teachers' motivation must not be toyed with.

Concept of motivation

Motivation is the inner urge, energy or effort made by individual or drive that moves people to achieve their target and satisfy individual's natural needs. It is the driving force upon which all human activities are hinged. Motivation is defined by Santrock in James and Ako (2019) as a process that energizes, directs and sustains behaviour. It is the process that initiates, guides and maintains goal-directed behaviour. The study of motivation in

Psychology according to Mukherjee (2002) has to do with what initiates, sustains, directs and terminates thinking and action in individuals. Motivation, according to Mahler, Grobschedi and Harms (2018) is important for choosing a profession, to remain in the profession as well as to succeed in the profession. Motivation can be in form of achievement, advancement, autonomy, personal growth and responsibility, improved remuneration, job satisfaction and job recognition (Babajide, 2013). It was posited by Han and Yin (2016) that motivation specifies the reason why people decide to do something, how long people are willing to sustain the activity and how hard and serious they are towards pursuing the activity. Motivation, according to Onuoha and Muazu (2014), can be viewed as a force that energizes and directs behaviour. Just as a force moves an object, motivation moves a person.

The teacher is firstly a human being who is made up and influenced by both biological (internal) and environmental (external) factors. These factors combine to affect the teachers' disposition to life generally and act as guide to their individual reaction and behaviour. Motivation from within is called intrinsic motivation and is based on internal factors such as self-determination, curiosity, personal interest in learning and teaching. Extrinsic motivation involves external incentives like rewards and punishment. Extrinsic motivation include praise, recognition, remarks, food and money (James & Ako, 2019)

Teachers' Motivation

Making teaching appealing and interesting to teachers by stimulating their active interests constitutes teachers' motivation. Motivation in teaching means stimulating thinking, stimulating desire or feeling, stimulating perception or attitude in such a way that there is a desire to communicate ideas effectively (Onuoha & Muazu, 2014). Successful teaching requires more than professional knowledge. A positive relationship exists between teachers' enthusiasm and students' performance (Mahler, Grobschedi & Harms, 2018). Concern of teachers' motivation can be in form of pre-service teachers' motivation to venture into teaching as occupation, take seriously the preparation arrangement at the teacher training institution and be keen to participate actively in the mandatory teaching practice scheme. It can also be in form of in-service teachers' motivation to remain in teaching and take every teaching period seriously. This concern comes amidst threats of attrition by teachers and that posed by old teachers who are soon retiring in large numbers globally. Teacher's motivation is defined by Sinclair in Han and Yin (2016) as something that determines what attracts individuals to teaching, retention and duration in their initial teacher education courses and concentration in the teaching profession.

Two dimensions of teacher motivation in accordance with conceptions of motivation by Han and Yin (2016) are namely: (a) the motivation to teach and (b) the motivation to remain in the profession. Four featured components of teachers' motivation from review of literature by Sinclair in Han and Yin (2016) include:

- i. Prominent intrinsic motivation which was closely related to inherent interest of teaching;
- ii. Social contextual influences relating to the impact of external conditions and constraints;
- iii. Temporal dimension with emphasis on lifelong commitment; and,
- iv. De-motivating factors emanating from negative influences.

Pre-service Teachers' Motivation to Teach

The major reasons accounting for the decision to teach as suggested by Han and Yin (2016) include intrinsic, altruistic and extrinsic motivations. These are necessary for satisfying and enduring career in the classroom within developed countries. The commonly researched variables based on research reviews of pre-service teacher motivation are: demographic and high – school background motivation to teach and career expectations, confidence and optimism or anxiety and concerns about teaching and perceptions of the roles and responsibilities of teachers. Satisfaction and good preparation for family life were top reasons for entering teaching. Working with children and service influenced their motivation. The latest challenge to the teachers' effectiveness and efficiency emanates from the following: rise in use and application of information technology, rapid innovation and changes in science and technology processes and products, need for deeper education and sustainability, rising insecurity in the society and climate change as it affects the environment (Bal-Tastan, Mousavi-Davoudi, Masalimova, Bersanov, Kurbanov, Boiarchuk & Pavlushin, 2018).

In – service Teachers' Motivation

Investigation by Organisation for Economic Co-operation and Development (OECD) researchers in Han and Yin (2016) found that a desire to work with children and adolescents, the potential for intellectual fulfillment and a means to make social contribution frequently topped the list of reasons for entering teaching. Such extrinsic motivations include salary, job security, pension, insurance and career status. These were valued as more important reasons for teaching in Brunei, Zimbabwe and Slovenia (Han & Yin, 2016). Some pre-service elementary school teachers were found more

child-centred in their motivation for teaching while pre-service secondary school teachers who were influenced by a former teacher were more subject-centred.

The strongest intrinsic motivation factors were working with children, intellectual stimulation and self-evaluation. The strongest extrinsic motivations included the nature of teaching work, working conditions and life-fit, authority and leadership, influence of others and career change. The influencing factors motivating and de-motivating in-service teachers include teachers' right to choose teaching materials programmes and teaching methods and right to determine classroom organization and discipline. Other factors identified include adequate professional relations and ties, professional input, teacher evaluation, leadership and teacher personal development, special values and norms. Other intrinsic and extrinsic motivation factors directly and indirectly include autonomy, working relationships, self-realization and institutional support.

The Significance of Motivating Teachers in the Educational System?

Motivating teachers has to do with motivating them to teach during their class contact period on one hand and motivating them to remain in the teaching profession on the other hand. Early teachers' attrition, teaching force ageing, imbalance of high demand with less reward, limited career opportunities, less job security and low prestige have been identified as discouraging factors (Han & Yin, 2016). There is a common discouraging presumption in the local setting that "teachers' rewards are in heaven", and often used to pacify teachers over the meager salary they are being paid. Research had shown that significant difference existed between students taught by teachers with high job satisfaction and those taught by teachers with low job satisfaction. Teachers with high job satisfaction create a successful classroom interaction which will result in students' high academic achievement and good retention capacity. Graduating students who were taught by these teachers will come out being relevant and functional to the society.

How to Motivate Science and Technology Teachers towards Effectiveness and Efficiency

Science and technology teachers today are buffeted by many challenges all of which jointly serve to dampen their morale and lower their motivation to perform effectively on the job (Nbina, 2011). They are faced with uncertainties and challenge of how to expose students to practical experience using the latest innovative teaching strategies, distraction occasioned by economic reasons and teachers' unpreparedness. Effectiveness and efficiency in science and technology education has to do with teachers' professional

competence to implement science and technology experiments, manipulate and fabricate tools and machines in technology workshops in teaching-learning of science and technology (Josef, 2012). Science experiment is the core tool in science education. Application of scientific products, manipulation of tools and machines for construction and industrial transformation are core to technology. Effectiveness and efficiency result when science teachers are adequately motivated to use experiments in teaching concepts of science. Science and technology teachers' skills using experiments in suitable ways in laboratories and technology workshops, during the teaching phase to be able to demonstrate and to improvise with the available local material and resources determine their effectiveness and efficiency. Teachers' experimental and manipulative skills play crucial role in students acquiring science and technology skills. Teachers' motivation and experience in the use of science experiment, according to Josef (2012) is an integral part of pedagogical content knowledge.

If science and technology teachers are provided with adequate incentives, their morale would be boosted towards offering the best, thereby translating into an enhanced academic performance on students' part (Oredein & Awodun, 2013). The positive motivation of science and technology teachers translates into ICT-based collaborative action, ability to inculcate problem-solving skills in learners using experiments and innovative teaching strategies e.g. sensory stimulation, inquiry, gaming and other approaches that supports the constructivists theory of teaching-learning. As acclaimed by Josef (2012), the science teachers' professional psycho-motor skills to use science experiments consist of three groups namely (a) skills to perform research science experiments (b) skills to perform school science experiments (c) skills to implement school science experiments in teaching-learning of science. Subject-areas of science and technology at secondary school level include Biology, Chemistry, Physics, Environmental science, Integrated Science, Basic technology, Physical and Health education, Agricultural science, Technical Drawing, ICT, Geography, Electrical Installation and Maintenance Work, etc.

Measure of Science and Technology-based Teachers' Effectiveness

Pre-requisite for effectiveness of a teacher according to Adejoh, Egbe-Okpenge and Goshwe (2019) include (a) teacher's training (b) mastery of subject-areas and (c) personal attributes and characteristics which culminate into the teacher's personality. Medley (1987) affirmed that teacher effectiveness can be assessed under three distinct criteria namely:

- i. Teacher behaviour criterion (determined by teacher's thought process)
- ii. Learning behaviour/ experience of students which teaching provides

iii. Outcome of the teaching in form of students' achievement

Three measures of science and technology –based teachers' effectiveness as identified by Burroughs, Gardner, Lee, Guo, Tuitou, Jansen and Schmidt (2019) include the following:

- (a) Teachers' experience measured by years of teaching,
- (b) Teachers' professional knowledge and self-reported preparation to teach science and technology – based subjects,
- (c) Teachers' provision of opportunity to learn measured by time on science and technology based contents coverage.

These measures may be associated with higher students' achievement. Teachers' effectiveness can be measured by the related parameters namely: measure of input by teachers and measure of output by the learners (students), as adduced by Sambo and Adejoh (2014). Input by teachers constitutes several interdependent attributes grouped under knowledge, practical skills and personal/character traits (Ikeobi, 2010). Skills of effectiveness which teachers need to possess include (a) skill of being sensitive to the learning tasks and needs of the learners, (b) skill of diagnostician to determine students' needs/ requirements and solutions to master the task, and (c) skill of expertise in choosing right teaching methods to produce desired result and skill of flexibility to vary plan as learning situation varies.

Teachers' experience is positively related to students' achievement in both science and technology–based subjects and had a cumulative effect on students' outcomes (Adejoh, Egbe-Okpenge & Goshwe, 2019). Teacher professional knowledge refers to their subject-matter knowledge, curricular knowledge and pedagogical knowledge. The professional knowledge is influenced by undergraduates' degrees earned by a teacher, the college attended, graduate studies undertaken and opportunity to engage on the job training (professional development). Other factors that promote teachers' experience include: availability of textbooks, teaching aids, equipment for practical and conducive classroom/ teaching-learning environment. Adejoh, Egbe-Okpenge and Goshwe (2019) identified some environmental factors that influence teachers' experience as including culture, race, socio-academic class, education, peer group, health condition and parental influence.

Enhancing Teachers' Effectiveness and Efficiency in Secondary Education

Effectiveness is the capacity to produce desired set results while efficiency is the capability to produce desired results using a minimum expenditure of energy, time, money or material resources. Teaching effectiveness is multidimensional because it measures

different aspects of teaching such as subject mastery, effective communication, lesson preparation and presentation etc (Akiri & Ugborugbo, 2009). Effective and efficient teachings are those teachings involving activities that bring about most productive and beneficial learning experiences for the learners' development (Etuk, 2019). Teacher's effectiveness is the teacher's ability to succeed in a teaching – related context by performing specific behavioural goal. Effectiveness refers to the capability of creatively producing desired result (Adejoh, Egbe-Okpenge & Goshwe, 2019). It is the degree to which objectives are achieved and the extent to which targeted problems are solved. Altaf (2013) perceived teacher's effectiveness as the combination of characteristics, competencies and behaviours of the teacher at all educational levels that enable students to reach desired outcomes. Ouyang (2013) saw an effective teacher as one who meets the community's expectations of an ideal good citizen, good parent and good employee. He/she is expected to demonstrate the qualities of being in-charge, being organized, disciplined, exemplary, insightful and dedicated.

Efficiency is defined by Selier (2006) as maximum performance for any given level of resources. Efficiency is an agent that helps in teaching – learning outcomes where the teachers have sound knowledge, skills and habits of mind that help their work (Nwosu in Sambo & Adejoh, 2014). Efficiency helps the instructors on what is expected of them by doing things properly and correctly. Efficiency is concerned with how something is done and with the best way of doing it. Effectiveness is concerned with why it is being done in the first place and whether or not it has been successfully accomplished. Effective teachers can fail because they are inefficient. On the other hand, no amount of efficiency will help an ineffective instructor to succeed. The ability to do the right thing is required.

For a teacher to be effective and efficient, he/she need to have strong commitment which stem from high personal standards. An effective teacher, not only teaches learners how to master their academic subjects, but teaches students how to think and reason logically. Effectiveness in teaching has to do with the achievement of set goals and objectives which can be achieved through determination of the thought process which is expectant of a favourable outcome.

Some personal characteristics/ attributes needed by a teacher in order to achieve set aims and objectives and good results in the discharge of his/her duties, according to Adejoh, Egbe-Okpenge and Goshwe (2019) include patience, strong personal standards, ability to control anger, being optimistic, being creative, resourceful, trustworthy and a high level of preparation and mastery of subject-area. Brief highlights on the attributes of a teacher that make for effectiveness and efficiency as pointed out by the authors are:

- i. Strong personal standards: Unflinching desire to achieve set goals and objectives in teaching. This motivates him/her to consider students' learning outcomes and show strong commitment to work.
- ii. Patience: Regulation of speech, movements in class and reactions to misbehaviour.
- iii. Control over anger emotion: Students lose confidence in a teacher with uncontrolled emotion of anger and could lead to inattentiveness, hatred of teacher and the subject.
- iv. Being Optimistic: Thought process (thinking and planning) makes a teacher not to see impossibility in students, particularly as it concerns discipline, comprehension and success.
- v. Ability to be trusted: Honesty breeds trust. Gain trust of students and parents by building good rapport with them and having good mastery of subject. Trust enables positive impartation and reception of knowledge in the classroom.
- vi. Modeling of respect: Consideration of learners' interest. Respect is modeled by speaking the language of respect when talking with students. Takes serious views of students' thoughts, feelings, difficulties and apprehension and takes steps to address them.
- vii. Conscientious ability: A conscientious teacher takes time to plan and articulate his lessons
- viii. Resourcefulness and creativity: Ability to think out other approaches, devise innovative strategies and methods in teaching a particular concept to sustain the interest of students.
- ix. High quality teacher preparation: Teacher's knowledge and understanding in the subject (s) to be taught and skill on how to impart the knowledge.

For the teacher to remain effective and efficient there must be continuous in-service training programme for him and the urge to expand his breadth of understanding. For the teacher to remain well informed on new developments, be able to make creative and critical judgments concerning the main trends in his field, his competence as an expert calls to bear. Teacher enthusiasm reflects the affective part of teachers' motivational orientation which comprises the excitement, enjoyment and pleasure associated with both a school subject and the activity of teaching.

Factors of concern that affect teachers' effectiveness, according to Mahler, Grobschedi and Harms (2018) include professional practice, coping with job stress, the interaction

with students, effective instructional strategies, openness to "demanding students", parents and colleagues as well as skill development on the job. High teacher – students ratio, inadequate facilities, equipment and materials can mar teachers' effectiveness and efficiency and consequently inconvenience the students. Un-conducive school climate can make teachers not to function effectively. The school climate entails the sum total of the values and the attitudes held by those in the school such as inter-personal relationship. If the teachers are behind time and obsolete in their area of discipline, their effectiveness becomes questionable. If teachers are inundated with the rigours of academic work and administrative work at the same time, there is the high tendency that they would decline both in efficiency and in effectiveness. When teachers are poorly motivated in terms of salary remuneration and welfare package, their effectiveness and efficiency are marred. Babajide (3013) investigated teacher's remuneration and its effect on quality of education in Nigeria. Significantly strong correlation was found between monthly earnings of teachers and students performance.

Conclusion

Effectiveness and efficiency of a teacher brings about high level of achievement in learning as academic performance of students cannot be absolutely separated from the teachers who impart them. An organised medley of the intrinsic and extrinsic factors of motivating science and technology teachers will result into effectiveness and efficiency in the educational system. This becomes evident in the optimum performance of students ascertained from formative and summative evaluation of the school system; and consequently a plus to national development of the nation at large. It is agreed by researchers that teachers are one of the most important school-based resources in determining students' future academic success and life-time outcomes. Students learning can be enhanced by improving teacher effectiveness. It was found that students taught by highly effective teachers were more likely to attend college, earn more, live in higher income neighbourhood and save more money for retirement. All hands must be on deck to ensure that science and technology –based teachers are well motivated in order to guarantee effectiveness and efficiency in the educational system.

Recommendations

Science and technology teachers should be encouraged through provision of conducive working environment. Job security must be guaranteed teachers and with good retirement

benefits. The necessary material resources (teaching aids) and well equipped laboratories cum technology workshops should be provided teachers for the sake of effectiveness and efficiency. Computer systems with internet facility should be in place. It is recommended also, that special allowance be given to science and technology teachers on regular basis to boost their morale with emphasis on consistent use of experiments and workshop practice in imparting concepts of science and technology. Granting them incentives will motivate them to be committed and dedicated. Improving on their remuneration is very important. Science and technology teachers need to be exposed to seminars/workshops and re-training courses as a refresher programme for improved delivery in classrooms. These teachers also deserve to be given study leave to enable them advance in their knowledge and skills and be acquainted with modern practices and innovative teaching-learning strategies that are more student – centred. Teaching should not be all-comers affairs as obtained presently in the nation. It should be strictly implemented that only teachers who are professionally trained should be allowed to practice the teaching profession. Research on teachers effectiveness and efficiency should be encouraged and sponsored by the agencies/ organizations in charge of education. These proposed solutions to motivate teachers towards effective and efficient performance are external in nature, meant to be adopted and implemented by education supervisory authority, policy makers and government departments/ agencies in charge of education. If these measures are put in place, the result is the drastic improvement in performance of students. The larger society benefits in the long run.

There are the internal motivating factors which lay with the teachers themselves. Science and technology teachers must adopt positive mindset and professional attributes to their job. Seek out and learn innovative teaching strategies/ approaches that will vary from being problem-solving to learner – centred and all aimed towards making teaching –learning pleasurable. Teachers must be computer literate and IT complaint to fit in to the new millennium demands. Teachers have to put in personal efforts to be abreast of innovations and new developments as it concerns his/her subject-matter and field of specialization. Teachers must develop interest in research work as it concerns the teaching profession and must show keen interest in any arrangement /seminar meant to widen his/her knowledge base and skill-acquisition horizon. Teachers must find contentment in the noble profession of teaching and stop looking for greener pastures elsewhere. Physical disposition of the teacher is of concern. Teachers must shun haggard appearance and shabby look. It will help restore public confidence in them as worthy role-model to emulate. So doing, the teacher is happy, the students are happy and the society at large is blessed over the outcome. They should strive to improve while on the job and be comforted by the noble nature of the teaching profession. Teachers should be proud to be grouped among the supporting

agents to the creator of the universe in the business of creation and re-creation of mankind and society for a better world.

References

- Adejoh, G. O., Egbe-Okpenge, E. G. & Goshwe, M (2019) The Centrality of Personality on Teachers' Effectiveness. In: M. J. Adejoh, A. D. E. Obinne and A. B. Wombo (Eds.) *Global perspectives on educational issues*. A publication of the College of Agricultural and Science Education, Federal University of Agriculture, Makurdi, Benue state
- Adejoh, M. J.; Obinne, A. D. E. Obinne, & Wombo, A.B. (Eds.) *Global perspectives on educational issues*. A publication of the College of Agricultural and Science Education, Federal University of Agriculture, Makurdi, Benue state.
- Akiri, A. A., & Ugborugbo, N. M. (2009) Teachers' Effectiveness and Students' Academic Performance in Public Secondary Schools in Delta State. *Nigeria studies home comm..science*. 3(2) 107 – 113 retrieved from <http://teachers'effectiveness.org> on 20/02/2020
- Altaf, D. (2013) *Teacher effective concept, principles and criteria*. Retrieved from daraltaf.blogspot.com/2013/10/teacher-effectiveness-concept on 26/02/2020
- Babajide, C. F. (2013) *Teachers' motivation and its effect on teachers performance in nigeria. A case study of jos north LGA of plateau state*. Downloaded on 29th February, 2020 from www.ncbi.nih.gov
- Bal-Tastan, Mousavi-Davoudi, Masalimova, Bersanov, Kurbanov, Boiarchuk & Pavlushin, (2018). *The impacts of teacher's efficacy and motivation on students' academic achievement in science education among secondary and high school students*. In J. Math & E. Tech (Eds.) *MODESTUM.EURASIA*. 14(6) 2353 – 2366. Downloaded from
- Burrough, N., Gardner, J., Lee, Y., Guo, S., Touitou, I., Jansen, K. & Schmidt, W. (2019), Teaching for Excellence and Equity. *IEA research for education book series*. 6(1) 7 – 17. Downloaded on 28th February, 2020 from springer.com
- Etuk, I. G. (2019), Analysis of Students' Rating of Male and Female Teachers' Teaching Effectiveness in Selected Secondary Schools in Uyo Education Zone of Akwalbom State. In: *The Nigerian teacher today, a journal of teacher education*. Published by National Commission for Colleges of Education, Abuja ISSN: 1116-2465, tntt1(16), 66-72
- Federal Republic of Nigeria (2014), *National policy on education, 6th Edition*. Abuja. Federal Ministry of Education and Nigeria Educational Research and Development Council

- Han, J. & Yin, H. (2016) *Teacher motivation: Definition, research development and implications for teachers*. In M. Boylan (Ed.) Downloaded on 28th February, 2020 from <https://www.tandfonline.com>
- Ikeobi, I. O., (2010), *Beyond the stereotype, thoughts and reflections on education*. Lagos. The CIBN Press Limited
- James, P. O. & Ako, J. A. (2019), *Enhancing Students Motivation towards Effective Learning* In:
- Josef, T. (2012) *How to motivate science teachers to use science experiment*. Faculty of Education, Masaryk University, Czech Republic, EU
- Mahler, D., Grobschedi, J. & Harms, U. (2018) *Does motivation matter? The relationship between teachers' self-efficacy and enthusiasm and students' performance*. Downloaded on 27th February, 2020 from <https://doi.org/10.1371/journal.pone.0207252> Waseda University, Japan
- Mukherjee, A (2002) *Educational psychology*: Zaria, Asekome Pub. Co.
- Nbina, J. B. (2011). Re-visiting Secondary School Science Teachers Motivation Strategies to face the Challenges of the 21st Century. In *Journal of emerging trends in educational research and policy studies*. Published by Sabinet. 2(6) 413 – 417. Downloaded on 29th February from <https://www.ingentaconnect.com>
- Oredein, A. & Awodun, A. (2013) Impact of Teacher's Motivational Indices on Science Students' Academic Performance in Nigerian Senior Secondary Schools. In *International education studies* 6(2) ISSN 1913-9020
- Onuoha, G. N. & Muazu, M. T. (2014) The Roles of Motivation and Interest in the Teaching/Learning Process. In P.A. Eniayeju and P. T. Ortese (Eds.) *Contemporary issues in education*. EDU NSUK, Publication of Faculty of Education, Nasarawa State University, keffi 96-105
- Ouyang, J. R. (2013) *Effective teaching*. Retrieved from htm.ksumail.kennesaw.edu/ouyang/teaching/definite
- Sambo, M. H. & Adejoh, M. J. (2014) The roles of Effectiveness and Efficiency in Improving Science Teaching in Schools. In P.A. Eniayeju and P. T. Ortese (Eds.) *Contemporary issues in education*. EDU NSUK, Publication of Faculty of Education, Nasarawa State University, keffi 238 - 246
- Selier, I. (2006) *Indicators of efficiency and effectiveness in elementary and secondary education spending*. Legislative Research Commission, the office of Education. Frankfort Kentucky