East African Scholars Journal of Engineering and Computer Sciences
Abbreviated Key Title: East African Scholars J Eng Comput Sci
ISSN 2617-4480 (Print) | ISSN 2663-0346 (Online) |
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-2 | Issue-9 | Sept-2019 | DOI:10.36349/EASJECS.2019.v02i09.001

Research Article

Influence of Cognitive Learning Styles on Achievement of Science and Technical College Students in Nasarawa State, Nigeria

AGU, Ashlame Peter[1*] and SAMUEL, Iwanger Ruth[1]

[1]Department of Science, Technology and Mathematics Education, Faculty of Education, Nasarawa State University, Keffi, Nigeria

*Corresponding Author
AGU, Ashlame Peter

Abstract: This study investigated the influence of cognitive learning styles on achievement of Science and Technical College students in Nasarawa State. The study was a descriptive survey research design. The population consisted of 1,237 Science and Technical College students in the three Science and Technical Colleges in Nasarawa State, Nigeria. The sample of the study comprised 262 Science and Technical College students randomly sampled from the three schools. Two instruments were employed for data collection. Cognitive Style Checklist (CSC) and Science and Technology Achievement Test (STAT). The reliability of CSC was determined through test-retest and the reliability coefficient of 0.77 was obtained. The reliability of STAT was determined using Kuder-Richardson formula 20 (KR_{20}) and the reliability coefficient of 0.83 was obtained. Descriptive statistics of mean and standard deviation were used to answer the research questions while Z-test was used to test the hypotheses at 0.05 level of significance. The findings of this study revealed that Science and Technical students in the Field Independence (FI) group achieved better than Field Dependence (FD) group. Also, the study revealed that there was no significant difference in the achievement of male and female Science and Technical students in both FI and FD Cognitive learning groups. Based on the findings of this study, the following recommendation was made; that seminars and workshops should be organized to adequately equip Science and Technical teachers with the needed skills to create an environment where students with different cognitive learning styles can experience meaningful learning.

Keywords: Influence, Achievement, Cognitive Learning Styles, Science and Technical Colleges.

INTRODUCTION

The role of Science and Technology in the development of a nation cannot be disputed. It is evident that, the current development in science and technology has greatly affected the life of every human being so much that to be ignorant of the basic knowledge of this development is to live an empty, meaningless and probably unrealistic life. It will also be difficult for a nation with a scientifically illiterate citizenry to make any reasonable technically-based political decision on issues of everyday life such as the environment, agriculture, health, transportation, communication or population growth. This is so because such a nation would lack the rudimentary tools to grasp the various arguments that are necessary for taking such decisions. Science therefore, has a privileged function of exerting a domineering, if not a decisive influence, on the development of a nation (Kabutu, Oloyede & Bandele, 2015).

The vital role played by science in contemporary society is indispensable to the healthy existence of any nation. In recognition of the important role of science for national development, the Federal Government of Nigeria in the National Policy on Education (FRN, 2014) gave a special place to science, technology and mathematics education in a bid to promote scientific literacy of her citizenry. In addition, the government has put in place some reforms and measures aimed at harnessing the human and material resources in the country. Prominent among the reforms is the National Policy on Science and Technology that spelt out objectives and direction of science and technology education in Nigeria. Among the objectives is Human Resource Development in Science, Technology and Innovation. The rationale is stated in sub-section 3.2 of National Policy on Science and Technology (FRN, 2012) that the imperatives of self-sufficiency and global competitiveness require

Quick Response Code

Journal homepage:
http://www.easpublisher.com/easjecs/

Article History
Received: 03.09.2019
Accepted: 12.09.2019
Published: 26.09.2019

development of national capability in Science, Technology and Innovation to stimulate inventions and generate innovations for sustainable development. The objective is to develop capacity in Science, Technology and Innovation for competitiveness in the production of technological goods and services with the following strategies:

- Producing world class scientists, engineers, and technologists who are well grounded in theory, practice of basic science and the needs of entrepreneurship.
- Providing adequate support for continuous training of academic staff in tertiary and research institutions.
- Strengthening the curriculum in technological entrepreneurship and management of technology for science and engineering students.
- Mainstreaming students' arts and social sciences to appreciate the relevance of science, technology and invention (STI) to profitability in business as well as natural development.
- Encouraging and providing opportunities for the products of informal training schemes in STI for further formal training.
- Strengthen capacity building institutions within the military, public and private sectors of economy.
- Facilitate on-the-job standardized training for professionals in science, technology and invention (STI) organization.
- Promoting academic industry exchange programs to enhance knowledge sharing (pp. 33-34).

The foundation necessary to develop science and technology in the country is obviously education (elementary, secondary, and tertiary education). Science and technology have to be taught and studied systematically and purposefully at all levels of education (Osokoya, 2013; Bukunola & Idowu, 2012). It is evident that Science and Technological transfer and development are solely dependent on science and technology education in the country, for scientists and technologists are definitely required in the economic infrastructure of the society before any Scientific and Technological development, and industrialization can occur (FRN, 2014). Even if students do not further their study of science and technology in tertiary institutions and as a result do not go on to become professional scientists, engineers, and technologists, their experience of Science and Technology gained from the elementary and secondary levels and first year of their tertiary education will be sufficiently rich and relevant. Such scientific literacy will equip them to contribute to the country's development in an increasingly competitive and rapidly changing world (Oni, 2014 & Oludipe, 2012).

Despite the relevance of Science and Technology to national development, security, economy, manpower and government's efforts to improve science and technical instruction in schools, students' achievement in its subjects is below average. This has become a great concern for Science and Mathematics educators especially at the foundational level. Researchers such as Bukunola & Idowu, (2012) Osokoya, (2013) Alabi, (2014) Oni, (2014) Kabutu, Oloyede & Bandele, (2015) Samuel, (2017) Nwadinigu & Azuka-Obieke, (2012) Igoegwu & Okonkwo, (2012) Amoo, (2013) Kola & Taiwo, (2013) opined that underachievement in science and mathematics among secondary school students could be attributed to several factors such as poor teaching, psychological factors, unpreparedness on the part of the students, poor learning environment, school location, gender stereotyping, dearth of qualified teachers among others. As a result of the decline in science and mathematics students' achievement, stakeholders in the sector agree that the huge investment in science and technology education is not yielding the desired dividend.

Gender remains an important factor to be considered in the determination of students' academic achievement. Gender has been identified as a major factor that affects students' achievement in Science, Technology and Mathematics examinations (Omiko, 2017). Oni (2014) posited that in Nigeria, women are marginalized while men are given greater opportunities to advance based on their science background. In the Nigerian setting, this factor has been found to offer males an unfair advantage over their female counterparts. Alabi (2014) reported that women are hindered from progressing through discrimination on the basis of gender, early marriage and child bearing and as a result, they are deprived of sound education, job opportunities and generally rendered passive in the society. Researchers such as Oludipe, (2012) Kola and Taiwo, (2013) in their various studies observed that there is no significant difference between male and female achievement while on the other hand, Onuekusi and Ogomaka (2013), Amoo (2013), Igoegwu and Okonkwo (2012) found out that a significant difference did exist between the achievement of male and female students in favour of the male students. Nevertheless, there is no specific study on the influence of cognitive learning styles and gender on achievement of science and technical students in Nasarawa State.

Cognitive learning style is a psychological construct which is concerned with how an individual learns, thinks, solve problems, remembers and relates to others. It represents the individual differences in the various subcomponents of an information-processing model of three main cognitive processes: perception, memory and thought. Cognitive learning style is considered to be personality dimension that influences attitudes, values and social interaction. It is an individual characteristic mode of perceiving and processing information in the environment (Hall, 2000). An individual is either Field-independent (FI) or Field-dependent (FD). A Field-independent (FI) cognitive

learner is described as analytic, competitive, individualistic, task-oriented, internally referent, intrinsically motivated (self-study), self-structuring, detail oriented and visually perceptive, prefers individual project work and has poor social skills; while Field-dependent (FD) cognitive learner is described as global (holistic), group-oriented, sensitive to social interactions and criticisms, externally motivated, externally referential, not visually perceptive, a non-verbal and passive learner who prefers external information and group projects (Hall, 2000; Calcaterra, Antonetti & Underwood, 2005; Guisande, Paramo, Tinajero & Almedida, 2007). A summary of the differences between the two dimensions of cognitive learning styles (Field Dependence and Field Independence) is shown in Table 1.

Table.1 Differences Between Field Dependence and Field Independence Cognitive Learning Styles

Field Dependence (FD) (non-analytic)	Field Independence (FI) (analytic)
Have comprehensive perception	Excellent at analytical thinking
Perceive objects as a whole and approach a task more holistically	Focus on individual parts of the object and tend to be more serial in their approach to learning
Rely on external references	Rely more on internal references
More influenced by format-structure	Less affected by format structure
More reliant on salient cues in learning	Tend to sample more cues inherent in the field and are able to extract the relevant cues necessary for the completion of a task
Likely to use active cognitive strategies	Likely to use passive cognitive strategies
Adopt a hypothesis-testing role in learning	Adopt a spectator role in learning
Likely to benefit from a self-directed emphasis	Tend to prefer more structured learning environments
Self-view is derived from others	Has sense of separate identity
Not well-skilled in social/interpersonal relationships	Highly skilled in interpersonal/social relationships

Source: Wyss (2002), Chen and McCredie, (2004)

Cognitive process styles affect how one stores knowledge and retrieves it when the need arises (Tinajero & Paramo, 2000). The student's cognitive learning style may hinder or facilitate his/her acquisition of knowledge in Science, Technology and Mathematics (Okwo & Otuba, 2007). The achievement of students with different cognitive learning styles in a given task will determine how effective the teacher is in delivering instruction that are related to the tasks and whether the objectives of the learning is achieved. Studies by Musa and Samuel, (2019), Idika, (2017), Okoye, (2016) Agboghoroma, (2015), Owoduni, Sanni, Nwokolo and Igwe, (2016), Ezeugwu, Nji, Anyaugbunam, Enyi and Eneja, (2016), Bassey, Umoren and Udida, (2013) have reported that there is a difference between the mean achievement of Science and Mathematics students with analytical (FI) cognitive learning style and those with relational and inferential (FD) cognitive learning style while Ndirika (2013) opined that ability levels have no significant effect on the achievement of students. Also, Okereke (2011) Anidoh and Eze (2014) reported that cognitive learning styles and gender have influence of students' achievement. Nevertheless, there is no known study on the influence of cognitive styles and gender on science and technical students in Nasarawa State, hence the need for this study.

Purpose of the Study

The study investigated the influence of cognitive learning styles on achievement of Science and Technical College Students in Nasarawa State. Specifically, this study set out to determine the influence of:

- Field-Independent (FI) and Field-Dependent (FD) cognitive learning styles on achievement of Science and Technical students in Nasarawa State.
- Field-Independent (FI) cognitive learning style on achievement of male and female Science and Technical students in Nasarawa State.
- Field-Dependent (FD) cognitive learning style on achievement of male and female Science and Technical students.

Research Questions

The following research questions guided the study;

- What are the mean achievement scores of Science and Technical students with Field-Independent (FI) and Field-Dependent (FD) cognitive learning styles?
- What are the mean achievement scores of male and female Science and Technical students with Field-Independent (FI) cognitive learning styles?
- What are the mean achievement scores of male and female Science and Technical students with Field-Dependent (FD) cognitive learning styles?

Hypotheses

The following hypotheses were tested at 0.05 α level.

Ho_1: Field-Independent (FI) and Field-Dependent (FD) cognitive learning styles have no significant influence on the mean achievement scores of Science and Technical students.

Ho_2: Field-Independent (FI) cognitive learning style have no significant influence on the mean achievement scores of male and female Science and Technical students.

Ho_3: Field-Dependent (FD) cognitive learning style have no significant influence on the mean achievement scores of male and female Science and Technical students.

METHODOLOGY

The study was a descriptive survey research design. The population consisted of 1,237 (675 males and 562 females) Science and Technical College students in the three Science and Technical Colleges in Nasarawa State, Nigeria, viz Assakio, Agwada and Mada station. The sample of the study comprised 262 Science and Technical College students randomly sampled from the three schools. Two instruments were employed for data collection namely Cognitive Style Checklist (CSC) and Science and Technology Achievement Test (STAT). The CSC was adapted from Robert Wyss (2002). It consists of 10 simple statements from which subjects in the research were to indicate the ones applicable to them. The checklist was used to categorize students based on their cognitive learning styles. It was divided into two sub-statements. Sub-statement A represents the characteristics of the Field Independent (FI) while sub-statement B represents those of Field Dependent (FD). The instrument was subjected to construct and face validity by two experts in Measurement and Evaluation from Nasarawa State University, Keffi. Its reliability was determined through test-retest and the reliability coefficient of 0.77 was obtained. The STAT is a 30 multiple choice achievement test with 4-options A-D designed to measure students' achievement in some selected topics in Science and Technology. The instrument was subjected to content and face validity by two experts in the Department of Science Education from Nasarawa State University, Keffi. The reliability of STAT was determined using Kuder-Richardson formula 20 (KR_{20}) and this yielded a reliability coefficient of 0.83. The two instruments were administered on two separate days. On the first day, the CSC was administered and on the second day, STAT was administered with the help of research assistants who were seasoned teachers in the sampled schools. Descriptive statistics of mean and standard deviation were used to answer the research questions while Z-test was used to test the hypotheses at 0.05 level of significance.

RESULTS

Research Question One

What are the mean achievement scores of Science and Technical students with Field-Independent (FI) and Field-Dependent (FD) cognitive learning styles?

The data used to answer this research question is presented in Table 2.

Table.2 Mean and Standard Deviation Scores of Science and Technical Students' Achievement in FI and FD Cognitive Styles

Cognitive Styles	N	Mean	SD
FI	125	48.71	8.01
FD	137	39.05	8.74
Total	**262**		

Table 2 shows that the mean achievement scores of Science and Technical students in the FI group stood at 48.71 with SD of 8.01 while that of Science and Technical students in the FD group stood at 39.05 with SD of 8.74.

Hypothesis One

Field-Independent (FI) and Field-Dependent (FD) cognitive learning styles have no significant influence on mean achievement scores of Science and Technical students.

The data used to test this hypothesis is presented in Table 3.

Table.3 Result of Z-test of Science and Technical Students' Achievement in FI and FD Cognitive Learning Styles

Cognitive Styles	N	Mean	SD	Df	Z-cal	Z-crit.	Decision
FI	125	48.71	8.01	260	52.30	1.96	Reject H_O
FD	137	39.05	8.74				
Total	**262**						

From Table 3, Z-calculated = 52.30 and with df = 260 at $\alpha = 0.05$, Z-critical = 1.96. Since Z-calculated > Z-critical, the null hypothesis is rejected. This indicates that there is significant difference in the mean achievement scores of Science and Technical students with FI and FD Cognitive styles. Hence, students in FI group achieved higher than those in the FD group.

Research Question Two

What are the mean achievement scores of male and female Science and Technical students with Field-Independent (FI) cognitive learning styles?

The data used to answer this research question is presented in Table 4.

Table.4 Mean and Standard Deviation Scores of Male and Female Science and Technical Students' Achievement in FI Cognitive Learning Style

Cognitive learning Styles	Gender	N	Mean	SD	Df
FI	Male	66	39.87	7.67	
	Female	59	37.79	7.78	591
Total		**125**			

Table 4 shows that the mean achievement scores of male Science and Technical students in the FI group stood at 39.87 with SD of 7.67 while that of their female counterparts is 37.79 with SD 7.78.

Hypothesis Two

Field-Independent (FI) cognitive learning style has no significant influence on mean achievement scores of male and female Science and Technical students.

The data used to test this hypothesis is presented in Table 5.

Table.5 Result of Z-test of Male and Female Science and Technical Students' Achievement in FI Cognitive Learning Style

Cognitive Learning Styles	Gender	N	Mean	SD	Df	Z-cal	Z-crit.	Decision
FI	Male	66	39.87	7.67	123	0.76	1.96	Do not Reject H_O
	Female	59	37.79	7.78				
Total		**125**						

From Table 5, Z-calculated = 0.76 and with df = 123 at $\alpha = 0.05$, Z-critical = 1.96. Since Z-calculated < Z-critical, the null hypothesis is not rejected. This indicates that there is no significant difference in the mean achievement scores of male and female students with FI Cognitive learning styles. Hence, male and female students in FI achieved evenly.

Research Question Three

What are the mean achievement scores of male and female Science and Technical students with Field-Dependent (FD) cognitive learning styles?

The data used to test this hypothesis is presented in Table 6.

Table.6 Mean and Standard Deviation Scores of Male and Female Science and Technical Students' Achievement in FD Cognitive Learning Styles

Cognitive Learning Styles	Gender	N	Mean	SD
FD	Male	72	42.73	9.77
	Female	65	40.92	9.63
Total		**137**		

Table 6 shows that the mean achievement scores of male Science and Technical students in the FD group stood at 42.73 with SD of 9.77. The mean achievement scores of their female counterparts is 40.92 with SD 9.63.

Hypothesis Three

Field-Dependent (FD) cognitive learning style have no significant influence on mean achievement scores of male and female Science and Technical students.

The data used to test this hypothesis is presented in Table 7.

Table.7 Result of Z-test of Male and Female Science and Technical Students' Achievement in FD Cognitive Learning Styles

Cognitive Learning Styles	Gender	N	Mean	SD	Df	Z-cal	Z-crit.	Decision
FD	Male	72	42.73	9.77	135	0.45	1.96	Do not Reject H_O
	Female	65	40.92	9.63				
Total		**137**						

From Table 7, Z-calculated = 0.45 and with df = 135 at $\alpha = 0.05$, Z-critical = 1.96. Since Z-calculated < Z-critical, the null hypothesis is not rejected. This indicates that there is no significant difference in the mean achievement scores of male and female Science and Technical students with FD Cognitive learning

styles. Hence, both male and female Science and technical students in FD achieved evenly.

DISCUSSION

The findings of this study revealed that Science and Technical students in the Field Independence (FI) group achieved better than Field Dependence (FD) group. This finding is in agreement with that of Musa and Samuel (2019), Idika, (2017), Okoye, (2016), Agboghoroma, (2015), Owoduni, Sanni, Nwokolo and Igwe (2016), Ezeugwu, Nji, Anyaugbunam, Enyi and Eneja (2016), Bassey, Umoren and Udid (2013) and Okereke (2011) who reported that there is a difference between the mean achievement of students with analytical (FI) cognitive learning styles and those with relational and inferential (FD) cognitive style, but in contrast with the findings of Maghsudi (2007), Guisande, Paramo, Tinajero and Almeida (2007) who reported that cognitive styles are not affected by intelligence and that Field Dependence/Independence focuses on the process of learning rather than ability.

Also, the study revealed that there was no significant difference in the achievement of male and female Science and Technical students in both FI and FD Cognitive groups. This is in contradiction with the findings of Musa and Samuel (2019), Ndirika (2013) Aniodoh and Eze (2014) who reported that cognitive learning styles and gender have significant influence on students' achievement in Science, Mathematics and other related subjects.

Learning science and technological subjects involves critical and deep thinking as well as display of initiatives and creativity. The reason for the high achievement of students with Field Independence level of cognitive learning style in science and technical subjects could be because, Field Independence individuals are excellent analytical thinkers who view things from serial and detailed manner. The more Field Independent students are, the more likely they may achieve in their learning.

CONCLUSION

The findings of this study revealed that Science and Technical students in the Field Independence (FI) group achieved better than Field Dependence (FD) group. Also, the study revealed that there was no significant difference in the achievement of male and female Science and Technical students in both FI and FD cognitive learning groups.

RECOMMENDATION

Based on the following findings of this study, the following recommendation was made:

Seminars and workshops should be organized to equip Science and Technical teachers with the needed skills to create enabling environments where students (both male and female) with different cognitive learning styles can experience meaningful learning in the classroom.

REFERENCES

1. Agboghoroma, T. E. (2015). Interaction effects of cognitive style and instructional mode on students' knowledge of Integrated Science. *European Journal of Research and Reflection in Educational Sciences,* 3(1), 47-54.
2. Agu, P. A., & Samuel, R. I. (2018). Effect of reversed jigsaw, tai cooperative and guided discovery learning strategies on basic science and technology students' interest and achievement. *International Journal of Innovative Education Research,* 6(2), 19-26.
3. Alabi, O.A. (2014). Effect of activity based teaching strategy on students' achievement on secondary school students in Chemistry. *Journal of Education and Policy Review*; 6(2), 119-128.
4. Amoo, S. A. (2013). Gender, cultural issues and achievement in secondary school mathematics: Implication for female Education. In A. O. U. Onuka (Ed), *Learning* (156-165). Ibadan: SPARE.
5. Anidoh, H. C. O., & Eze, G. N. (2014). Enhancing girls' participation in Science through feminist pedagogical techniques: A panacea for gender gap in Science and Technology classrooms. *STAN 55th Annual Conference Proceedings*, 292-296.
6. Bassey, S. W., Umoren, G., & Udida, L. A. (2013). Cognitive styles, secondary school students' attitude and performance in Chemistry in Akwa Ibom State-Nigeria. www.hbcse. tifr.res.in/bassey.
7. Bukunola, B.A.J., & Idowu, O.D. (2012). Effectiveness of cooperative learning strategies on Nigerian junior secondary students' academic achievement in Basic Science. *British Journal of Education, Society and Behavioural Science,* 2(3), 307-325.
8. Calcateria, A., Antonetti, A., & Underwood, J. (2005). Cognitive style, hypermedia navigation and learning. *Journal of Computer and Education*, 44, 441-457.
9. Chen, S. Y., & McCredie, R. D. (2004). Cognitive modelling of students learning in web-based instructional programmes. *International Journal of Human-Computer Interaction,* 17 (3), 375-402.
10. De-Ture, M. (2004). Cognitive style and self-efficacy. *The American Journal of Distance Education*, 18 (1), 21-38.
11. Eriba, J. O., & Samuel, R. I. (2018). Effect of stad and jigsaw iv cooperative learning strategies on students' interest and achievement in basic science. *Case Study International Journal,* 7(4), 6-14.
12. Ezeugwu, J. O., Nji, G. C., Anyaegbunam, N. J., Enyi, C., & Eneja, R. U. (2016). Influence of cognitive ability, gender and school location on students' achievement in senior secondary school Financial Accounting. *European Journal of Economics, Finance and Administrative Sciences,* 89, 1-21.

13. Federal Government of Nigeria. (2014). National policy on education, NERDC, Press Lagos.
14. Guisande, M. A., Paramo, M. F., Tinajero, k., & Almedia, S. A. (2007). Field dependence-
15. independence (FDI) cognitive style. An analysis of Attention Functioning Psicothema, 19(4), 572-577.
16. Hall, J. K. (2000). Field dependence-independence and computer-based instruction in Geography. Doctoral Dissertation, Virginia: Polytechnic Institute and State University.
17. Idika, M. I. (2017). Influence of cognitive styles and gender on secondary school students' achievement in and attitude to Chemistry. *Advances in Social Sciences Research Journal*. 4(1), 129-139.
18. Igboegwu, E. N., & Okonkwo, I. G. A. (2012). Influence of gender and location of school on students' achievement in chemistry. *Journal of Research in Education*, 1(1), 1-14.
19. Kabutu, F.R., Oloyede, O.I. & Bandele, M. F. (2015). An investigation into the achievement of junior secondary school students taught integrate science using the cooperative learning strategy in Nigeria. *European Journal of Physics and Chemistry*, 7(2), 63-73.
20. Kola, A. J., & Taiwo, A. K. (2013). Analysis of gender performance in physics in Colleges of Education, Nigeria. *Journal of Education and Practices*, 4(6), 1-5.
21. Maghsudi, M. (2007). The interaction between field dependent/independent learning styles and learners' linguality in third language acquisition. *Language in India*, 7, 1-16.
22. Musa, D. C., & Samuel, I. R. (2019). Influence of cognitive and gender on upper basic III Mathematics students' achievement in Keffi, Nasarawa State, Nigeria. *International Journal of Scientific and Research Publications (IJSRP)*, 9(8), 566-576.
23. Ndirika, M. C. (2013). Investigating gender disparity in Science enrolment and achievement in Abia State: Towards achieving the MDG's goals. *STAN 5th Annual conference Proceedings*, 292-296.
24. Nwadinigwe, I. P., & Azuka-Obieke, U. (2012). The impact of emotional intelligence on academic achievement of senior secondary school students in Lagos, Nigeria. *Journal of Emerging Trends in Educational Research and Policies Studies (JETERAPS)*, 3(4), 395-401.
25. Okereke, C. (2011). Influence of gender, school location and the use of play simulation on school achievement in Chemistry. *Journal of Innovation and Development*, 9(1), 25-29
26. Okoye, P. O. (2016). Influence of gender and cognitive styles on students' achievement in Biology. *International Journal of Science and Technology*, 5(1), 59-65.
27. Oludipe, D. I. (2012). Gender difference in Nigerian junior secondary students' academic achievement in basic science. *Journal of Educational and Social Research*, 2(1), 93-99.
28. Omiko, A. (2017). Effect of guided discovery method of instruction and students' achievement in chemistry at the secondary school level in Nigeria. *International Journal of Scientific Research and Education*: 5(2), 6226-6234.
29. Oni, J.O. (2014). Teacher method of teaching and student academic achievement in Basic Science and Technology in junior secondary schools in South-West, Nigeria. *Journal of Education and Social Research*, 4(3), 397-402.
30. Onuekwusi, C. N., & Ogoamaka, P. M. C. (2013). Gender and school location as factors in human capital development of chemistry students in secondary schools. *Nigerian Journal of Educational Research and Evaluation*, 12(1), 80-85.
31. Okwo, F. A., & Otuba, S. (2007). Infuence of gender and cognitive style on students' achievement in Physics essay test. *Journal of Science Techers Association of Nigeria*, 41(2), 94-97.
32. Osokoya, M.M. (2013). Teaching methodology in basic science and technology classes in South-West Nigeria. *Asian Journal of Education*, 1(4), 206-214.
33. Owodunni, A. S., Sanni, T. A., Nwokolo-Ojo, J., & Igwe, C. O. (2016). Influence of cognitive styles on Technical Drawing students' achievement in senior secondary schools in federal capital territory, Abuja. *International Journal of Design and Technology Education*, 6, 104-115
34. Riding, R. J., & Sadler-Smith, E. (1997). Cognitive style and learning strategies: Some implications per training design. *International Journal of Training and Development*, 3, 199-208.
35. Samuel, I. R. (2017). Assessment of basic science teachers' pedagogical practice and students' achievement in Keffi Educational Zone, Nasarawa State, Nigeria. *An Unpublished Masters Dissertation, Nasarawa State University, Keffi.*
36. Tinajero, C., & Paramo, M. F. (2000). Field dependence-independence cognitive style and academic achievement; A review of research and theory. *European Journal of Psychology of Education*, 13, 227-251.
37. Wyss, R. (2002). Field independent and dependent learning styles and L2 acquisition. The weekly column.