

## Quality Curriculum Implementation and Improvement for Global Competitiveness: An Assessment of Science Teachers' Creative skills

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### Abstract

*Creativity, a part of the Nature of Science, plays a key role in scientific knowledge development. Scientific Knowledge and skills connote the heartbeat of science teaching. Creative strategies and activities are therefore essential for adequate science curriculum implementation. This study examined science teachers' creative thinking skills in Ondo state, Nigeria. It also investigated demographic variables influencing this skill. Five research questions were raised and answered. Descriptive research design of the survey type was employed. One hundred and seventy Science Teachers were randomly selected as sample. The "How creative are you" test was validated, and the reliability index yielded 0.83. Findings revealed that*

*Science teachers' creative thinking skills were fair and not satisfactory for global competitiveness. Gender, year of experience, qualification and teaching subject did not influence teachers' creative thinking. The findings imply that teachers with fair creative thinking skills in the science classroom may garnish their lessons with less creative strategies and activities that may prompt students' interest and possibly result in better performance. It was recommended that sensitization should be made on the relationship between creativity and science teaching and the need for science teachers to be more creative in their approach to teaching. Furthermore, Science teachers should be willing to try out innovative approaches regardless of their gender, year of experience, qualification and teaching subjects.*

**Key words:** Science Teachers, Creative thinking skill, Qualification, Year of Experience, Curriculum implementation.

### Introduction

Science Education in Nigeria has the production of scientists for national development as one of its goals. The program entails exposing learners to approaches and patterns that enable them to acquire the requisite knowledge, skills, and attitude in this wise. The 21<sup>st</sup>-century science education, however, transcends the acquisition of scientific facts and knowledge through rote learning (National Research Council, 2015) to development and utilisation of scientific skills which is needed to trigger scientific research using creative models and ideas. With the emergent of new shreds of evidence, scientists employ their creative abilities to invent an explanation for natural phenomenon (National Science Teachers Association, 2000; Lederman, Abd-El-Khalick, Bell & Schwartz, 2002). This is seen in multiple interpretations accorded to the same evidence and data. Although students do not view the nature of science, which purview creativity as playing a role in the development of scientific knowledge, as what teachers and students should know

(National Science Teachers Association, 2000), however, creativity and creative endeavour is part of science (Schmidt, 2011).

Students' success, development of scientific skills, attitudes, and knowledge, is associated with the quality of teachers (Harden, & Crosby, 2000) and the proposed curriculum. Babafemi and Adewumi (2018) identified teachers as vital resources in achieving educational objectives. The teacher, however, engages in rigorous activities, physically and mentally, in communicating curriculum contents to students while the proposed curriculum governs the content to which students are to be exposed. Science educators are expected to provide an environment that increases the possibilities for creativity to emerge and opportunities for divergent thinking among learners (Aruan, Okere & Wachanga, 2016). The ability to invent ideas, utilize ideas and employ different approaches connotes creative thinking and or ability. Teachers' creative thinking helps to reduce the monotony of employing one strategy and encourages the use of various techniques geared towards enhancing students' learning. Aside from the presence of a large number of students with different ability levels and learning styles, the typical Nigerian science classroom is not adequately equipped (Oyewole, Arogundade & Sadiku 2019), thereby shifting a tremendous burden to teachers in carrying out effective teaching.

To support the above, Khodabakhshzadeh, Hosseinnia, Moghadam and Ahmadi (2018) reported that teachers' creativity influenced the amount of their teaching effectiveness. Therefore, the teaching effectiveness may not be dissociated from improvising local materials for science practical, arousing and sustaining students' interest through creative methods and evaluating students using thought-provoking questions rather than information-seeking ones. To further enhance curriculum implementation and improvement, curriculum developers employ their creative abilities in selecting and organising content and activities and suggesting methods and approaches for teaching. With the identification of creativity been connected to science, it, therefore, suggest the need for creative teachers for effective curriculum implementation and improvement, especially in Nigeria, with inadequate and insufficient materials or resources for learning (Oyewole, Arogundade & Sadiku 2019).

The unsatisfying performance in science (WAEC result as reported in Badmus & Omosowo, 2018) and the quest for global competitiveness further suggest the need for divergent activities facilitated by a creative instructor in the learning process. Divergent activities have

shown to produce innovative products and originality which characterised the developed world. However, a creative teacher should be tolerant of ambiguities, critical of his/her practices and demonstrative of creative abilities (Fautley & Savage, 2007) that envisions and pursue possible opportunities. This study, therefore, examined the creative thinking skills of in-service science teachers in Ondo State, Nigeria, to determine if there is a need for curriculum delivery reformation.

Creative thinking skills entail a person's ability to react slightly different from the known situation while gender, qualification, and experience are person-related variables. Gender, the societal meaning assigned to male or female (Ezenwosu & Nworgu, 2013), has been reported to affect individual teachers' factors such as self-efficacy (Ahmed, Khan & Rehman, 2015) and performance (Agharuwhe & Ugborugbo, 2017). Alongside the above, this study investigated the influence of teachers' gender on their creative abilities. The teaching experience was also examined in relation to creative skills since experience sometimes affects teachers' effectiveness and academic performance (Akinsolu, 2010). It further identified qualification and subject teaching influence on science teachers' creative thinking skills. This is because teachers' qualification intends to prepare teachers for the teaching task and also increases the status of the teacher. Also, to further confirm the report of Clotfelter, Ladd and Vigdor (2007) that additional qualification is most times for salary increment and not necessarily for professional development, the study considered teachers' qualification influence on their creative abilities.

### **Literature Review on Teachers' creative skills**

The role of teachers, prominent personnel in school administration and curriculum implementation, continues to demand the usage of their creative abilities. These roles include but not limited to effective school and classroom management, day-in and day-out responsibilities, thinking creatively to produce novel and different ideas, and critically evaluating the produced ideas (Ozgenel, 2018). Creative thinking, higher-order thinking, was evaluated among 33 pre-service science teachers in a Turkish University, and findings revealed that pre-service teachers were sometimes uncertain about their creative thinking skills in a study conducted by Sibel (2015). Using Torrance Tests of Creative Thinking, Bakir and Oztekin (2014) determined the creative thinking level of pre-service science teachers in terms of different variables such as gender, year of study, the type of school graduated from and their parents' educational background. Results revealed that Creative thinking levels do not significantly different from the variables among 241 pre-service science teachers also in Turkey. With a study titled "The investigation of the creative

thinking tendency of prospective mathematics teachers in terms of different variables using Marmara Creative thinking tendency scale, Cenberci (2018) reported that prospective mathematics teachers were in the group consisting of the “good” range and that gender had a significant influence on creativity level. The gender influence as revealed by Cenberci (2018) contradicts the report of Isleyen and Kucuk (2013). This inconsistency in the gender report necessitated the assessment of the variable in this study. Also, the peculiarity of this present study is rooted in the area covered and the addition of some other variables not revealed in literature.

### **Statement of Problem**

The issue of unavailability, inadequacy of the required learning materials in schools coupled with the unsatisfying performance recorded among science students in Nigeria continues to be of great concern. Besides, the perceived gap between instruction and practice necessitated reformation in the curriculum implementation process. This reformation is not unrelated to the use of creative strategies in disseminating curriculum contents, hence calls for the need for creative teachers. This study investigated science teachers’ creative thinking skills as well as demographic variables that influenced this skill in Ondo State, Nigeria.

### **Research Questions**

The following questions were raised in this study;

1. What is the level of science teachers’ creative thinking skills?
2. Does science teachers differ in their creative thinking skills based on their teaching subject?
3. Will science teachers differ in their creative thinking skills based on their years of experience?
4. Does Science teachers’ gender differ with their creative thinking skills?
5. Is there a significant difference in science teachers’ creative thinking skills based on their qualifications?

### **Methodology**

The descriptive survey research design was employed in this study. The population comprises all Science Teachers in Ondo state, Nigeria, from which one hundred and seventy science teachers (Biology, chemistry, physics, and Basic science teachers respectively) were randomly selected as a sample from the eighteen local governments in the state. The instrument titled “How creative are you” test developed by Raudsepp and adapted by Sungur (1997) and Sibel (2015) was adapted and used. Forty-three items out of the initial fifty items of the scale were

validated, and the reliability index yielded 0.83, which made the instrument reliable for use. The administration of the instrument was done within eight weeks, which required the participants to complete the instrument in their respective offices. Completed questionnaires were subjected to statistical analysis. Frequency count, simple percentage, mean, t-test and Analysis of Variance were statistical tools used for analysis.

### Result and Analysis

**Research Question 1:** What is the level of Science teachers' creative thinking skills?

**Table 1:** Science teachers' creative thinking skills

Creative thinking skills	Frequency	Percentage
Low creative thinking skills	80	47.1%
High creative thinking skills	90	52.9%
Total	170	100.0

*\*Teachers who scored below the mean score on the scale were categorized as low while those above the mean score means high.*

The result in table 1 revealed that eighty out of the one hundred and seventy science teachers had low creative thinking skills (47.1%) while ninety had high creative thinking skills (52.9%). Although a slightly above average percentage was recorded for teachers with high creative thinking skills, the 47.1% teachers having low creative thinking skills is not a good stand point for lesson delivery. This therefore indicated that science teachers have fair creative thinking skills.

**Research Question 2:** Does Science teachers' differ on their creative thinking skills based on their teaching subject?

**Table 2:** ANOVA of Science Teachers' creative thinking skills based on their teaching subject

Source	Sum of square	df	Mean square	F	sig
Between groups	259.948	3	86.649	.923	.431
Within group	15575.940	166	93.831		
Total	15835.888	169			

The result in table 2 revealed that taking Science Teachers' teaching subject into consideration, their creative thinking skills is not influenced ( $F_{(3,166)} = .923$ ;  $p > 0.05$ ). This is observed in a closely ranged mean score in table 3 which indicated that biology teachers do not differ from physics teachers and same is recorded for chemistry and basic science teachers. This

result shows that teachers' teaching subject does not affect their creative thinking skills and no significant difference is observed.

**Table 3:** Mean scores of science teachers' creative thinking with respect to their teaching subject

Subject Taught	N	Mean	Std. Deviation
Biology	52	114.48	10.07
Basic Science	44	114.95	9.32
Chemistry	35	113.91	11.34
Physics	39	117.31	7.76
Total	170		

**Research Question 3:** Will Science teachers' differ in their creative thinking skills based on their year of experience?

**Table 4:** ANOVA of science teachers' creative thinking skills based on their year of Experience in service

Source	Sum of square	df	Mean square	F	sig
Between groups	150.520	4	37.630	.396	.811
Within group	15685.368	165	95.063		
Total	15835.888	169			

Table 4 showed that there is no significant difference in Science Teachers' Creative thinking skills based on their year of experience in service ( $F_{(4,165)} = .396$ ;  $p > 0.05$ ). This means that science teachers with different year of experience are on similar level as regard their creative thinking skills. This lack of difference is seen in the fairly close mean scores across the five groups in table 5.

**Table 5:** Mean scores of science teachers' creative thinking with respect to their year of experience

Subject Taught	N	Mean	Std. Deviation
1-5 years	38	115.74	10.96
6-10 years	30	115.37	7.08
11.15 years	36	114.92	9.38
16-20 years	37	116.03	7.20
21 years and above	29	113.24	13.14
Total	170		

**Research Question 4:** Does Science teachers' gender differ with their creative thinking skills?

**Table 6:** Independent t-test of Science teachers' creative thinking skills with respect to their gender

Variable	Gender	N	Mean	S.D	df	t	P
Science teachers' creative	Male	76	116.13	8.21	168	1.21	.229
Thinking skills	Female	94	114.33	10.70			

The result [ $t(168)=1.21$ ,  $p>0.05$ ] reveals that there is no significant difference in male science teachers and female science teachers' creative thinking skills. This means that male science teachers [ $M=116.13$ ;  $SD=8.21$ ] and female Science teachers [ $M=114.33$ ;  $SD=10.70$ ] are fairly similar on their creative thinking skills.

**Research Question 5:** Is there a significant difference in Science teachers' creative thinking skills based on their qualification?

**Table 7:** ANOVA of science teachers' creative thinking skills based on their qualification

Source	Sum of square	df	Mean square	F	sig
Between groups	42.275	2	21.138	.224	.800
Within group	15793.613	167	94.573		
Total	15835.888	169			

Table 7 showed that Science Teachers' Creative thinking skills does not differ in respect of their qualifications ( $F_{(2,167)} = .224$ ;  $p>0.05$ ). This means that science teachers with NCE, Bsc.Ed and M.Ed are similar on their creative thinking. Mean scores of science teachers' creative thinking with respect to their qualification is presented in table 8 below revealing a close range of score which is not significantly different.

**Table 8:** Mean scores of science teachers' creative thinking skills based on their qualification

Subject Taught	N	Mean	Std. Deviation
NCE	15	113.67	7.62
Bsc.Ed	143	115.22	10.18
M. Ed	12	116.00	4.86
Total	170		

### **Discussion of findings**

The purpose of the study was to assess the creative thinking skills of in-service science teachers. Findings revealed that in-service science teachers' creative thinking skills are fair but not a good stand point for a competitive science education globally. This finding is similar to Sibel (2015) who reported that pre-service science teachers were sometimes uncertain about their creative thinking skills and saw their creative thinking to be partially satisfactory. This outcome could be as a result of negligence by science teachers who are not self-informed of their creative abilities and do not also see a relationship between their science teaching and creativity.

Also, teachers' creative thinking skill does not differ in respect with their teaching subjects. This lack of difference is related to similar procedures employed in the different aspect of science despite the unnecessary compartmentalisation which further affect the interrelationship of the various branches. This result is contrary to the findings of Adu and Ade-Ajayi (2015) that revealed a significant difference in the effectiveness of teachers based on teaching subject. The result further revealed the absence of difference with respect to the year of experience and gender. This result is in line with no significant differences in creativity based on teaching experience revealed by Kitnai (2013) and lack of significant difference between male and female as pertaining to creative thinking by Isleyen and Kucuk (2013) and Aruan, Okere and Wachanga (2016). However, this work negates the norm that teachers with more experience perform better in lesson delivery. This could be because creative thinking is not actually tied to one's line of experience but how well one develops and utilise ideas as against Sawyer (2010) who intimately tied creative teaching to teachers' experience.

Finally, creative thinking skill is not connected to teachers' qualification indicating that teachers with National Certificate of Education, NCE, B.Sc(Ed) and M.Ed. are actually similar on their creative thinking. This result corroborates the work of Hanushek and Rivkin (2006) who concluded that, "there is little or no evidence that a master's degree raises the quality of teaching". This stand point seems related to teachers' intent of getting higher degrees to access higher salaries and promotion with less interest in knowledge and skill acquisition (Clotfelter, Ladd and Vigdor, 2007).

### **Conclusion and Recommendation**

The study concluded that Science Teachers in Ondo state, Nigeria are fair on their creative thinking skills. Meanwhile, teachers' teaching subject and Year of experience do not influence



their creative thinking skills and Teachers' gender and qualification do not influence their creative thinking skills. This study indicated that having teachers with fair creative thinking skills in science classrooms implies that lesson delivery process may be less garnished with creative strategies and activities which may prompt students' interest and possibly result in better performance. Also, teachers with different level of experience and qualification may also display their creative abilities without exhibiting reduced self-confidence in the presence of more experienced and qualified ones.

From the findings, recommendations had it that there should be awareness by educational bodies and training institute on the relationship between creativity and science teaching in the area of learning activities and evaluation techniques to science teacher. Science teachers should be sensitised on the need to be more creative in their approach to teaching as this may motivate them to optimize the benefits of creative teaching. Furthermore, Science teachers should be willing to try out innovative approach regardless of their sex, year of experience, qualification and teaching subject. The government must also create a platform for adequate interactions among the science teachers. Finally, Seminars and workshop that triggers creative thoughts should be organised by the government regularly to boost teachers' creative thinking.

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