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TRANSFORMATIONAL LEADERSHIP PRACTICE AMONG SECONDARY SCHOOL SCIENCE TEACHERS: IS THERE GENDER AND LEARNING OUTCOME DISPARITY?

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Abstract
The study investigated the impact of science teachers' use of transformational leadership style on secondary school students' achievement and attitude towards science. It also investigated whether the implementation of science teaching using a transformational leadership style is gender specific. Three hypotheses guided the study. Forty-five SS11 science students in two intact classes formed the sample for the study. Four biology teachers (two males and two females) were adjudged as transformative and non-transformative (Two each) after responding to a multifactor 12-item 4-point leadership questionnaire designed by Bass and Avolio (1992) and used by Balasubramanian and Krishnan (2012) were selected for the study. Each class was taught by either transformational or non-transformational teachers for six weeks. Prior to the classroom episodes, students responded to a 22-item 4-point likert scale test of attitude towards science (TAS) and a 20-item test of achievement in science (TATS) designed by the researchers and which was also re-administered as a posttest. One-way Analysis of variance was used to find the significance of the difference in means of the two groups. Results showed no significant difference in male and female teachers' use of leadership style the two groups of students differed significantly in their learning outcomes. The study recommended that pre-service and service teacher training should begin to focus on non-cognitive aspects of teachers' development in addition to their scientific knowledge as important aspects of their qualification for teaching science. Also, regular leadership training for teachers is advocated.

Introduction
The teacher performs diverse roles in the classroom, ranging from academic support, knowledge enhancement, personal-social guidance, and leadership. Studies (Bolkan and Goodboy, 2010; 2009 and Ponder, 2008) are of the opinion that teachers' leadership practices influence all other aspects of teachers' roles and culminate in determining the extent to which students achieve academically. Several leadership theories have directed attention to two basic leadership patterns-namely transactional and transformational leadership practices. Bolkan and Goodboy (2010) and Balasubramanian and Krishnan (2014) explained

transactional leadership as one in which the leader takes decisions about what should be done and directs the subordinates on what and how it should be done to achieve results. This pattern of leadership negates the intelligence and potential of the subordinates by placing more value on the leaders' personal rather than group achievement. On the contrary, transformational leadership according to Burns (1978) is a pattern of leadership in which there is a mutual motivation for success by both the leader and the followers toward the achievement of group goals thus transforming work patterns and achievement indices. Balasubramanian and Krishnan (2014) conceptualized leadership as the "ability to influence, motivate and enable others to contribute towards the effectiveness and success of the organizations to work they are members"(p. 45). In other words, leadership provides the leverage for organizations to work and function coherently to achieve success because organizations are made up of different individuals that are with diverse potentials, energies, and skills. It is the leader's duty to arouse the utility of these skills and the potential for the achievement of organizational goals. According to Bass (1985), this is only possible when the leader transforms the values, attitudes, and motives of subordinates to a plane where performance becomes routine and natural.

Leadership in the transactional sense is not only simplified but also reduced transfer of work allocation and remuneration but devoid of the essential communication ingredients necessary for interpersonal and team coherence and unity of purpose. In this light, the transactional style of leadership asserts the leaders' qualities and authority while the subordinates are obedient followers. In an effort to succinctly draw the contrast between transactional and transformational leadership practices, Burns (1978) in Balasubramanian and Krishnan (2014) conceptualized transformational leadership as a style in which "one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality, and results in a transforming effect on both leaders and followers". This according to them if achieved inspires, generates awareness and acceptance of organizational mission and purpose, as well as values, beliefs and needs of both followers and leader without necessarily relying on rewards.

In a study of transformational leadership in the classroom, Bolkan and Goodboy (2009) found a positive relationship between transformational leadership practice with students' cognitive learning, affective learning, motivation, students' communication, satisfaction, students' participation and perceived instructor credibility. These variables are found to relate strongly with the overall students' performances in school. On the question of characterizing transformational leadership, Bolkan and Goodboy (2009) also consolidated students' responses and identified teacher charisma (confirming students, being enthusiastic in class, using humour and showing caring for students); individualized consideration (being available to students and providing idiosyncratic feedback) and intellectual

stimulation (Using interactive teaching style, challenging students and encouraging independent thought). Bass (1998) had earlier identified these four factors as descriptive of transformational leadership. In Bass (1998),teacher charisma means providing vision and sense of mission and instilling pride, gaining respect and trust. Bass also sees inspirational motivation as communication high expectations, using symbols to focus efforts and expressing important purposes in simple ways while intellectual stimulation is seen as promoting intelligence, rationality and problem-solving. Teachers exhibit personal consideration when they give personal attention to students by giving advice and personal corrective feedback to students.

Studies on transformational leadership in organizational and classroom setting have made some interesting revelations that are instructive. Some of these are:

1. That transformational leadership inspires high task achievement, high task satisfaction, lower role conflict and ambiguity (Howell and Frost, 1989)
2. That in organizations with transformational leaders, mission and vision statements have positive effect on level of performance (Baum, Locke & Kirkpatrick, 1998); Kirkpatrick & Locke, 1996).
3. Transformational leadership relate positively with collective performances (Stewalt, 2006)
4, Transformative leadership impact is contextual (Garg & Krishnan, 2003).
5. Transformational leadership has a high affinity for emotional recognition and agreeableness (Rubin, Munz & Bommer, 2005).

The science classroom is one that is peculiar and unique because of the very notion of science as an investigative and dynamic field of study. The twenty-first Century science classrooms are constantly influenced by technology, scientific discoveries, a high increase in available knowledge, and new and modern methods of teaching and learning that support participation and interaction. In light of this, Bal-Tastan, Davoudi, Masalimova, Bersanov, Kurbanov, Bolarchuk, and Pavlushin (2018) in a study of the impact of teachers' efficiency and motivation on students' academic achievement in science in secondary schools found a significant impact of teacher's self-efficiency and motivation on academic achievement. Other studies whose findings link students’ achievement in science to teachers' characteristics include Anderson, Greene, and Loewen (1998), Alvares_Nunez (2012), and Abbasi, Moeini, Shahmar, Ebrahimi, and khoozani (2018). The teacher has remained the main single factor implicated in investigations about students' science learning (Erdal, Tuysuz, Tosun, and Ihan,2016). It means that teachers' characteristic leadership qualities have remarkable effect on the quality and the amount of science to be learned.

Gender, on the other hand, is a construct that refers to masculinity or femininity in a person in contrast to visible biological differences depicted by sex. Balasubramanian and Krishnan (2014), after a review of the literature on gender and transformational leadership, espoused certain differences between males and females in organizational settings. While women are found to be democratic, people-oriented, and exhibit a more transformational leadership style, men are more autocratic, task-oriented, and forceful in their desire for task performance.

Examining the impact of leadership style on the teaching and learning process in Imo State, Nigeria, Okoroji, Anyanwu and Ukpere (2014) identified leadership as a determinant of the performance of both teachers and learners in the achievement of goals. As classroom managers, administrators, and organizers, the teachers enjoy a high level of discretion, autonomy, and freedom in deciding and implementing certain patterns of leadership to drive the educational process and fast-track goal achievement. Studies have also revealed that classroom climate, ethos, and ambiance positively correlate with students' motivation and participation in learning generally and science in particular. It means that a teacher's leadership style; be it transactional or transformational, democratic or autocratic has ample influence on the behaviours and attitude of students study. It is also important to note that the teacher's duty transcends knowledge enhancement but also includes subtle and tacit aspects as mentors and role models, the influence of which are immeasurable in determining the development of attitude towards science learning and consequently the amount of learning achievable.

It is, therefore, necessary to understand if the adoption of transformational leadership in science classrooms is gender specific or otherwise and if that leadership style has a positive effect on student attitude toward science and the extent to which they can achieve in science.

Statement of the Problem/Rationale for the Study

This study is necessitated by the ever-increasing attrition found in many Nigerian science classrooms and the poor performance of students in science. This disheartening and continued underdevelopment of Nigeria as a consequence of poor science and technological development are the result of a poor attitude towards science learning by students and eventual poor science knowledge and achievement. Studies (Okoroji, Anyanwu, and Ukpere, 2014) have noted that the teachers' training, knowledge, skills, abilities and attitudes affect and determine what goes on in the classroom and how learners respond to learning tasks. Considered from Bass's (1985) perspective, an effective science teacher is one who is able to utilize his or her knowledge, training, and charisma to inspirationally motivate a high sense of academic vision and mission as well as stimulate intellectual activities that develop, sustain and increase rationality, problem-solving, investigative activities and participation in the world of science

through interpersonal and group classroom dynamics that play during learning. Most science classrooms in Nigeria are traditional. It becomes necessary to determine empirically if teachers' transformational leadership with its in-built democratic tenets and motivational and interpersonal communicative characteristics has an influence on the attitude and learning of science as well as improves the extent to which students learn science and if the teacher's gender impinges on the extent to which transformational leadership practices are implemented in the science classrooms in Nigeria. The study, therefore, asks: Does the teacher's gender influence the implementation of transformational leadership in science classrooms and will the implementation of transformational leadership have an effect on students' attitude toward science and the outcome of science learning in Nigerian secondary schools?

Research Questions

The following research questions are therefore raised for the study.

1. Does the teacher's gender significantly affect the utilization/implementation of transformative leadership?
2. Does the use of transformative leadership significantly affect the attitude of students toward science?
3. Does the use of transformative leadership significantly affect students' achievement in science?

Research hypotheses

This study raised the following null hypotheses to guide the study

1. There is no significant difference in the utilization/ implementation of transformative leadership due to gender
2. There is no significant difference in students' attitude towards science due to the teachers' use of transformative leadership style.
3. There is no significant difference in students' achievement in science due to the utilization/implementation of transformative leadership.

Method of the study

A quasi-experimental design adopting the non-equivalent groups was used for the study. Two intact SS11 classes (N=18, N=27) from a Delta state government-owned semi-urban secondary school were purposively selected for the study. Class A(N=18) was taught six concepts in Biology for two hours a week for a period of six weeks (12 hours) by two teachers(One male and one female) who were classified as non-transformational after responding to a multifactor leadership questionnaire (MLQ), a 12-item 4-point self. rating scale designed by Bass and Avolio (1992) and used by Balasubramanian and Krishnan (2012) to determine their leadership status across the four transformational leadership factors (charisma, inspirational motivation, intellectual stimulation and

individualized consideration). Class B(N=27)was also taught the same biology concepts for the same duration but by two teachers (one male and one female) adjudged to be transformational using the same MLQ responses.

Prior to the six weeks of teaching, a 22-item Test of Attitude towards Science (TATS) designed by the researchers and a 20-item Test of Achievement in Science (TAS) was administered as a pretest to both groups in the first week after a 2-hour orientation for both the students and the teachers. The reliability coefficient of TATS was found by KR 21 to be 0.66 while that of TAS was found by Crombach Alpha to be 0.70. The tests were repeated in the seventh week to generate post-test data for the study. Data generated were analyzed using the one-way Analysis of variance (one-way ANOVA) to determine the significance of the differences in means of the groups. ANOVA (parametric test) is adjudged suitable since there is a homogeneity of variance as indicated by the Levene test of equality of variance.

Results

The results are presented in tables below.

Table 1: ANOVA summary of the difference in teachers' leadership style by gender

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.288	1	.288	1.179	.284
Within Groups	10.512	43	.244		
Total	10.800	44			

Table 1 above shows an f-value of 1.179 (df=43,P<0.284) which is not significant at the 0.05 alpha level set for the study. This implies that the leadership style utilized by the teachers is not gender specific. Hypothesis 1 is therefore not accepted as there is not enough evidence statistically to do so even though (π=1.52, N=23 0.511 for males andπ=1.68, N=22, SD= 0.477 for females). It means that no one gender has a greater tendency or predisposition to utilize a particular leadership style.

Table 2: One-way ANOVA summary of the significance of the means of students' post-test scores on attitude towards science and achievement in science by leadership style

		Sum of Squares	df	Mean Square	F	Sig.
Students attitude towards science	Between Groups	967.115	1	967.115	6.967	.012
	Within Groups	5968.796	43	138.809		
	Total	6935.911	44			
Students achievement in science concepts	Between Groups	355.926	1	355.926	39.393	.000
	Within Groups	388.519	43	9.035		
	Total	744.444	44			

Table 2 above shows that students' attitude towards science learning (significant at P<0.012 by leadership style and as such significant at the 0.05 alpha level chosen for the study. This means that there is a significant difference in the attitude toward science learning of the students taught by teachers due to their leadership styles. This means that the leadership style utilized by the teacher influences students' attitude toward science significantly. Null hypothesis 2 which stated the contrary is therefore rejected since statistical evidence shows (π=50.28, N =18, SD = 8.166 for Non-transformational leaders) vary significantly in favour of transformational leaders (π = 59.74, N = 27, SD = 13.63) in terms of students attitude towards learning of science.

Also shown in table 2 is an F-value of 39.393 (df = 43; p < 0.00 for students achievement in science concepts. This is significant at the 0.05 alpha level for the study. This implies that there is a significant difference in the achievement of the learners in science concepts in the groups taught by non-transformational and transformational teachers. Null hypothesis 3 which hypothesizes no difference in this variable is thus rejected based on statistical evidence (π = 8.44; SD = 2.526, N = 18 for the Non-transformational group as against π = 14.19; SD = 3.282, N = 27 for the transformational group) available from the study.

Discussion of findings

The findings of this study with respect to gender utilization of leadership style is in disagreement with Balasubramanian and Krishnan (2014) who found that females are more transformative in approach than males who are more task-oriented, forceful, and transactional in approach. What the result suggests is that the utilization of transformative practice or otherwise is not gender related but could depend on the individual's personality traits. Thus, it is possible for both genders to be transformative of transactional in their approaches in the classroom.

Also to be noted is the fact that knowledge of the impact of a leadership style on the students' learning could influence the teachers' choice of leadership style.

In the area of the impact of the teachers' utilization of transformative leadership on students' attitude towards learning, the study corroborates the report by Howell and Frost (1989) who found that transformative leadership inspires positive attitude toward work and task performance.

In the area of the impact of transformational leadership on students' achievement in science, the findings of this study are in line with Stewart (2006), Baum, Locke & Kirkpatrick,(1998), and Kirkpatrick & Locke (1996) who reported a positive effect of transformative leadership style on performance generally. Okoroji, Anyanwu, and Ukpere (2014) have noted that the teachers' training, knowledge, skills, abilities and attitudes affect and determine what goes on in the classroom and how learners respond to learning tasks. Bal-Tastan, Davoudi, Masalimova, Bersanov, Kurbanov, Bolarchuk and Pavlushin (2018) found a positive impact of teachers' efficiency and motivation on students' academic achievement in science in secondary schools. Other results that are in line with the result of this study are Alvares_Nunez (2012), Abbasi, Moeini, Shahmar, Ebrahimi, and khoozani (2018), and Erdal, Tuysuz, Tosun, and Ihan (2016). The utilization of transformative leadership has an effect on students' learning and attitude.

Conclusion

This study investigated whether there exists disparity in the learning of science due to the utilization of transformational leadership and if this teachers' utilization of transformational leadership style in the classroom is gender-related. The result showed no gender attachment to a particular leadership style but revealed the positive impact of transformational leadership on students' attitude towards science and their achievement in science concepts it is thus concluded that teacher leadership characteristics have serious consequences for learning science.

Recommendations

It is therefore recommended that teachers see the science classroom as an attitude workshop where their personal characteristics and leadership style can influence their output and themselves, not just as knowledge givers but as influencers. To achieve this mindset, it is recommended that teacher preparation institutions focus attention on developing science teachers' non-cognitive characteristics as important aspects of teacher qualifications for teaching science. Employers of science teachers should also look into the personality traits of teachers before employing them by giving them psycho-social tests and also administering them from time to time to serve science teachers. This will help to ensure the stable social and psychological state of the teachers in schools. It is also important that teachers attend leadership trainings from time to time to update their knowledge

of leadership styles applicable in the science classrooms of the 21st Century as applicable globally.

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