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CHAPTER SEVEN

QUALITY CHEMISTRY TEACHING: IMPLICATIONS FOR ACADEMIC LEADERSHIP DEVELOPMENT IN NIGERIA IN THE 21ST CENTURY.

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ABSTRACT

Leading innovations in Education in this 21st century view chemistry education as a potent tool for developing, not only knowledge, skills and attitude but academic leadership qualities in students that would lead and sustain the future society. This calls for strong reflection on the quality of chemistry teaching that would lead to achieving desired academic leadership in education. This paper expounds quality chemistry teaching; quality teaching for quality academic leadership in education; academic leadership development; implications of quality chemistry teaching for academic leadership development in Nigeria and concludes that chemistry teachers should utilize quality instructional strategies to accommodate the academic, social and emotional needs of the students for effective academic leadership development. This paper emphasizes the need for quality chemistry teaching that would enhance elaborating and linking of science skills like observing, experimenting, analyzing, problem-solving, reporting, hypothesizing, classifying, and reasoning and evaluating involved in inquiry based chemistry class to leadership development. It is recommended among others that radical change in teaching and learning styles should be the focus of chemistry teachers to match with the 21st century world of best practices to promote, mentor and inspire students as leaders for the future. This would lead to connecting scientific knowledge and skills to social and inter-personal dynamics in schools and the society.

Keywords: Quality, Chemistry teaching, Academic, Leadership Development

Introduction

Chemistry is one of the Science, Technology, Engineering and Mathematics (STEM) education subject upon which global development of relevant knowledge, skills and values necessary for leadership development revolves. Nigerian society seems not to fare well in all levels of endeavors despite the endowed abundant resources. The high rate of social vices, poverty and political challenges plaguing the Nigerian society currently is no more news. This makes one to think of the quality of teaching of educational programmes being imparted to the citizens. One of the greatest problems facing Nigeria as a developing nation according to Alozie (2005) is poor leadership. An examination of the prevalent struggles in leadership in Nigeria generally is of serious concern about the future of this country. **To consciously demonstrate the characteristics of good leadership as lifelong skills in this 21st century, quality teaching ought to meet the demands of individual students through the use of innovative instructional strategies.**

Teaching is viewed by Joshua (2016) as a purposeful, interpersonal and interactive activity that helps another person to learn and change the way the person behaves particularly as applies to chemistry. Fundamentally, the teaching of chemistry involves hands on- minds- on activities and moral processes for knowledge, skills and attitude changes. Academic leadership qualities such as analytical thinking, mentoring, planning, organizing, accepting responsibilities, being assertive, solving problems and showing respect for human dignity are embedded in chemistry teaching. Commenting on science teaching in Nigerian classroom Okebukola (2014) noted is of poor quality. Conversely he suggested that science classroom should move from rhetoric to that of investigation, problem solving and experimentation.

The world over considers STEM education as the corner stone of modern development. The knowledge society demands that students be taught to think creatively and strategically apply the knowledge and skills to solving problems. This in a way promotes academic leadership development. Leadership according to Ekong (2017) is the provision of guidance, direction, exercise of authority, controlling, managing and supervising as well as providing knowledge and strategies to actualize set vision. To Leonard (2010), leadership is traits, qualities, behaviours and styles of doing things. Dajot (2017) Defined leadership as the ability to measure up to duties and responsibilities of a group, organization, state or society. Dajot maintained that learners, regardless of discipline should develop and sustain some attitudinal values like integrity, loyalty, empathy and patriotism. This invariably

will help the person with relevant knowledge and skills to live and also lead to the benefit of the society.

Chemistry as an experimental science demands students' acquisition of both declarative and procedural knowledge. Declarative knowledge consists of skills of experimenting, observing, hypothesizing, manipulating, reasoning, problem-solving, reporting and analyzing. Procedural knowledge is on how to perform and manipulate physical and intellectual tasks in chemistry using the skills. These are synonymous to responsive or proactive leadership competencies associated with creative spirit, team spirit, self-confidence, hard work and problem solving. These are possible to acquire if chemistry teaching is of quality in content and pedagogy.

Academic leadership in this study therefore, is more of students developing and applying knowledge, skills and positive attitudes to problem solving in life and the society. It also refers to students acquiring the relevant knowledge and skills embedded in chemistry to think critically, appraise and analyses situations, solve problems and better the lot of the society. These are the outcomes of quality teaching which is tantamount to quality academic leadership development.

Quality Chemistry Teaching

The ability to provide intellectual stimulation and leadership motivation through quality chemistry teaching is to the extent of utilizing appropriate and innovative hands-on, minds-on classroom activities by the teachers during chemistry teaching and learning processes. The word quality connotes different meaning at different times depending on the scale of societal values or application. Quality according to Udofia and Ekong (2018) as applied to learning or teaching means engaging in relevant, meaningful and stimulating interactive activities to bring about knowledge construction, disciplined enquiry and application to solving problems. Similarly, Ekong (2018) defined quality teaching as that which enables the target audience to develop all their attributes and skills to achieve their potentials as human beings and as functional members of the society.

Chemistry as a science subject has numerous utility values in all spheres of human activities. It contributes to human and societal development as a socially transforming process that provide knowledge, skills and values through which people can participate in, and contribute to their well-being and that of the society. Adesoji (2008) advanced that chemistry has the potential of exerting a dominant influence on the life of an individual as well as on the developmental effort of a nation. The knowledge explosions in this 21st

century significantly challenge the traditional method of teaching chemistry involving rhetoric.

Teaching is an art of giving and receiving information. Teaching according to Udofia (2017) should be more interdependent and interactive to ensure development of skills and competencies needed to function effectively in a culturally and ethnically diverse society. Quality chemistry teaching is that which emphasize and enhance acquisition of skills of problem solving, creative thinking, and analyzing, reporting, questioning, predicting, inferring and attitudinal change. In a nutshell, quality chemistry teaching means shifting the teaching of chemistry from theory to practice. It is that teaching which adequately trains students for knowledge acquisition, skills and attitudinal development to function and act in a civilized manner befitting to the society. The focus of chemistry teaching is to ensure the development of responsible, knowledgeable and skillful leaders.

Quality chemistry teaching demands teachers demonstrating instructional leadership characteristics such as effective classroom management, communication, evaluation, sympathy, hard work and honesty that would engender leadership qualities in students. Quality chemistry teaching therefore is about effective teaching to develop students' personal characteristics like **self-Control, enthusiasm, diligence, willingness to accept responsibility, initiative and vision in addition to professional capacities in students as academic leaders of the futures. This is to say that instructional delivery should be student centered and participatory in order to equip students with knowledge, skills and values as tools for leadership development.**

Quality teaching for Quality Academic Leadership in Education

Leadership is entwined with all aspects of the society and makes it necessary to teach leadership across all subjects. Furthermore, to rise above mediocrity and move to high levels of performance and educational commitment, Alozie (2005), opined that the curricula of basic, post basic, tertiary and post graduate programmes should be designed to focus sufficient attention on leadership development for Nigerian society to be able to compete globally.

Quality teaching, according to Ogunmade (2005), help teachers to focus on integration of curriculum content, functional pedagogical skills, reflective teaching, empathy and commitment to educational processes. Purposeful and conscious teaching helps students to learn and develop knowledge and skills towards academic leadership. This emphasizes the focus of quality chemistry teaching. **Njoku (2016) maintained that the type**

and quality of instructions received by citizens determines the rate, direction and development of the nation. Karmi (2004) maintains that the teacher as an educational leader should necessarily develop and use innovative learning materials for change and effectiveness in classroom activities. Proactive use of students centered strategies, mentoring and coaching to enhance students' interest and academic leadership skills therefore becomes imperative.

Academic Leadership Development

Leadership is a fundamental social activity inculcated right from home to the school, government or workplace. It is an act exhibited on daily basis by individuals or groups. The 21st century demands quality leaders to manage the dynamics of the society such as changing economy, insecurity, unemployment, health and other environmental problems. Such leadership skills need to be developed creatively and experientially and not by rhetorical method of teaching. The political, economic and security challenges, especially in Nigeria makes it very necessary for students to be engaged in leadership development. This demands quality chemistry teaching that would imbue the right academic leadership skills with right values for peaceful co-existence. Ben-Zvi (2003) asserts that leadership in education is to raise the ability of those led to solve problems, inspired by the leader, as well as building and encouraging those led to realize their potentials through quality instructional delivery.

There are many instructional methods such as discussion, role playing, experiential learning, that could be used to facilitate academic leadership development. For example when discussing the concept of balancing of equation which involves students articulating thoughts and ideas of elements reacting at varying ratios, students need to analyse the equation, reason, plan and solve the problem. This could be likened to leaders reflecting on issues, reasoning, making strategic plans and taking decisions under condition of uncertainty to solve problems. Students engage and constructing knowledge and skills, act as a precursor to students learning of leadership qualities of teamwork, organizing, planning and critical thinking. Also knowing how to present views and listen to other people's views is an important leadership skill in life. Academic leadership development can therefore be achieved through quality chemistry teaching by teachers demonstrating and acting of academic leadership characteristics.

Academic leadership development through quality chemistry teaching is based on the salient skills embedded in chemistry which are core interpersonal and social skills of good moral values. Students' engagement in

regular hand-on, minds-on activities help them to construct, organize and exhibit leadership of their own learning. For instance when students are taught concepts of organic structures, symbols and formula in chemistry, students have to organize ideas, plan and draw the structure and evaluate what they put down through planning, organizing and evaluating ideas as important leadership skills.

Similarly, precautions taken during chemistry experiments are synonymous to risk management and standards set by excellent leaders. Quality chemistry teaching has advantages of encouraging collaboration, increase creativity, problem solving and divergent thinking. This can only be achieved if instructional delivery strategies employed by chemistry teachers are appropriate and of quality. Udofia (2010) noted that quality chemistry teaching provides humanity with knowledge and skills about the environment, attitudes and values for better social living. The main thrust of academic leadership development through quality chemistry teaching is therefore based on positive association between the development of student's mental, physical and social abilities and competencies and contribution to the development of the society in this 21st century. The possession of knowledge and ability to apply the knowledge to relevant task in life is an asset to a leader.

Academic leadership development can further be regarded as the art of equipping individuals with leadership behaviour such as being visionary, creative, analytical in thinking, keen in observation, able to define operations, reasonable in action, focused, and problem solvers. Through these activities, students develop academic leadership competencies like team spirit, communicating, creative problem solving and self-direction. In leadership development, the focus is on mental, personal and social skills development (Leonard, 2010). Academic leadership development is an instrument that provide students with flexible thinking, planning, reporting and creative leadership competences which are required in this 21st century.

Implications of Quality Chemistry Teaching for Leadership Development in STEM

Quality chemistry teaching involve instructional delivery practices that makes it germane for developing academic leadership qualities in the students at all levels of education. These practices are embedded in the facts, principles, laws, concepts and theories as well as in the manipulation of physical and intellectual tasks in STEM subjects. Obanya (2011) maintained that students receive quality teaching to ensure quality learning, and quality in education is like saying 'what you sow is what you reap'. Quality chemistry

teaching involves practical works of different sorts which demands proactive use of transformative method to enhance students' potentials for positive academic leadership development. Quality teaching of chemistry provides pedagogical techniques for development of academic leadership skills.

Academic leadership is about practices, modeling and showing behaviors grounded in sound knowledge and skills. This implies that quality chemistry teaching could provide STEM students with the ability and capacity to understand and utilize critical thinking and analytical reasoning to solve complex issues in life. This is to the extent of chemistry teachers modeling good academic leadership behaviors for students to perceive, experience and practice in their day to day life. Students centered strategies that promote teamwork, self-direction, self-confidence, planning, creativity and problem solving demands greater attention to quality activities to develop moral behaviors, knowledge and practical skills acquisition befitting of leaders of the future.

Developing academic leadership qualities in students is an increasingly welcomed development in the society today. One important repercussion of building and mentoring leadership qualities in students is to develop such characters in the students' day-to-day life for better future. Chemistry is one of the STEM subjects which help students to explore and develop the inert potentials of inquiring and gaining knowledge and skills. Quality in instructional delivery of chemistry content and pedagogical knowledge is very apt for STEM students in this 21st century if it must match in future with any of its contemporaries.

Quality chemistry teaching would enhance elaborating and linking of science skills like observing, experimenting, analyzing, problem-solving, reporting, hypothesizing, classifying, reasoning and evaluating involved in inquiry based chemistry class to leadership development as one of the goals. This may significantly influence the rate of learning, understanding and acquisition of competencies of what is taught and put into practice good moral values and attitudes and contribute to decrease in school dropout.

Conclusion

The rise in societal challenges such as insecurity and moral decadence, poverty, unemployment, social inequality, increased in school dropout, political crisis and cultism in Nigeria in particular calls for effective leadership practices to solve and sustain development. Indeed, quality chemistry teaching is an indispensable factor in academic leadership development in any society because of its meeting of individual needs, needs of the society and the nation at large. The relatively poor social and human

development resulting in increasing social vices in the schools and society demands utilization of quality chemistry knowledge and skills to develop fundamental academic leadership skills in students especially in the girl child.

Teachers are expected to exhibit good instructional delivery qualities and accommodate the academic, social and emotional needs of the students irrespective of gender for effective academic leadership development. Successful academic leadership development underscores the fact that STEM education especially chemistry should be of quality, comprehensive and functional if it is to provide quality knowledge, skills and good moral behavior to the girl child to become responsible academic leaders of the future.

Recommendations

Having discussed the importance of quality teaching of chemistry for academic leadership development, it is recommended that:

1. Teachers should employ quality instructional strategies in teaching STEM subjects like chemistry to enhance acquisition of knowledge, skills and attitude that are essential in leadership development.
2. Chemistry teachers should link relevant terms in chemistry like problem solving, creativity, analytical thinking, critical reasoning among others to promote, mentor and inspire students as leaders for the future.
3. The Ministry of Education should ensure that programmes, policies and procedures for helping students develop academic leadership competencies are integrated in the curriculum.
4. Leadership training should be incorporated in the Jet/ Science club so as to enhance the development of academic leadership qualities in students.
5. STEM educators should be mentoring by showing core professional qualities as leaders for students to emulate.
6. Chemistry educators through workshops, seminars and conferences should not only dwell on cognitive development but encourage academic leadership development as part of interaction.
7. Science teachers, principals, supervisor and administrators of schools should make concerted effort towards effective implementation of science curriculum that also integrates leadership development.
8. Radical change in teaching and learning styles should be the focus of chemistry teachers to match with the 21st century world of best practices.

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