

Challenges Faced by Teachers in Teaching Integrated Science in Junior High Schools in Aowin Municipality-Ghana

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Abstract

Teachers face considerable challenges when teaching Integrated Science at the various schools. This paper identifies some of the challenges faced by teachers that are possibly hindering them from teaching science effectively and suggests recommendations for school administrators. This study followed a mixed-methods research design. The instrument used was a structured questionnaire. Data for the study were obtained by administering 70 questionnaires to 70 teachers. Six (6) public and one (1) private Junior High School were selected purposively. 10 teachers were sampled randomly from each Junior School making a total of 70. A questionnaire consisted of four-point Likert scale items and qualitative items were developed. 70 questionnaires were fully answered and returned. The data were analyzed using frequency counts and percentages. The paper recommended that, regular workshops should be organised for all teachers to enable them handle Integrated Science effectively, in- service training should also be an integral part of continuing teacher education and teachers should be supported in order to increase their level of confidence when teaching Integrated Science.

Keywords: self-confidence, Science teaching; challenges, teaching and learning, integrated science, secondary schools, subject matter knowledge, pedagogical content knowledge.

INTRODUCTION

Teaching Integrated Science offers considerable challenges and teachers express concern and apprehension when dealing with the situation. Teachers' lack of confidence when teaching topics outside their area of expertise is manifested in different ways such as when preparing lesson plans, choosing or devising activities and analogies to aid students' learning, answering students' questions, linking and applying various concepts and principles to everyday life situations, generating students' interest and passion for the Integrated Science. This article reviews various research studies conducted amongst teachers when teaching Integrated Science.

The aim of teaching Integrated Science is to provide a student-centered learning environment that meets the needs of individual students through adopting differentiated instructional strategies and to deliver an outcome-based curriculum with high pedagogical standards. Unlike the traditional didactic teacher-centered teaching approach that was adopted in schools, an approach that is active and child-centered was necessary to deliver the new curriculum that focused on developing critical thinking rather than rote learning (Davidson, 2010).

Teaching Integrated Science is no longer teacher-centered or dependent on memorization. In teaching, ADEC recommends using inquiry-based teaching approach to develop the students' scientific knowledge and skills (ADEC, 2010).

ADEC defines inquiry as "a process that encourages students to be self-directed learners, based on the students asking rich questions and developing their learning around those questions" (ADEC 2013, p. 12).

REVIEW OF THE LITERATURE

Teachers teaching Integrated Science in Junior High Schools face considerable challenges in lesson preparation and Integrated Science teaching. First of all, these teachers need to understand the structure and nature of the discipline and learn unfamiliar content knowledge, which is known as subject matter knowledge. Secondly, they need to transform the content knowledge into suitable activities, analogies, demonstrations or simulations and adapt them to the different students' abilities to help them learn, what is described by Shulman (1986, 1987) as pedagogical content knowledge. This review sets out to outline the challenges faced by science teachers when teaching integrated science and explore the strategies used by teachers in dealing with such situations. Inadequate background in the subject knowledge is one of the main factors that contributes to such challenges and will have an impact on the development of the teachers' pedagogical content knowledge as well as on the teachers' self-confidence and attitudes when teaching topics in Integrated Science.

The teachers' knowledge base strongly influences all aspects of teaching like preparation, planning and decision making regarding the choice of content to be learnt (De Jong, Veal, & Van Driel, 2002). Therefore, one can argue that one of the most important characteristics of being a good science teacher is having a very good basis of subject matter knowledge. However, research studies which have attempted to find a relationship between subject matter knowledge and good teaching (Abell, 2007; Childs & Mc Nicholl, 2007; Hashweh, 1987; Kind, 2009) suggest that while a good background in subject matter knowledge is a pre-requisite for good

teaching, it is not the only requirement. Exemplary science teachers, as argued by Shulman (1986, 1987) also need to develop pedagogical content knowledge which enables science teachers to blend “content and pedagogy into an understanding of how particular topics, problems, or issues are organised, represented, and adapted to the diverse interests and abilities of learners and presented for instruction” (Shulman, 1987, p. 8). Magnusson et al. (1999) describe pedagogical content knowledge for science teaching as the transformation of several types of knowledge not only subject matter knowledge. These knowledge areas consist of five components which include orientation toward science teaching, knowledge and beliefs about the science curriculum and assessment in science, knowledge about students’ understanding and misconceptions of specific science topics and knowledge about instructional strategies for teaching science or topic specific pedagogy. Pedagogical content knowledge develops with teachers’ experience (Abell, 2008; Davis et al., 2007). It is a cyclical process whereby teachers transform, reflect and evaluate their practices and continue to learn as they develop their practices. Pedagogical content knowledge is also content-specific or subject-specific knowledge that is fundamental for effective science teaching (Magnusson et al., 1999). Subject-specific knowledge entails general strategies applicable to teach science. Content-specific strategies, such as illustrations, models, analogies, experiments and activities are required when teaching particular topics within a science field. This implies that teachers need to develop different instructional strategies when teaching integrated science (one of the components of pedagogical content knowledge). Having an in-depth knowledge of the subject matter helps teachers provide alternative explanations or use different approaches to help students understand complex scientific concepts.

A study that Al Shammeri (2013) conducted to explore the views of 136 science teachers who are teaching a reformed science curriculum in Kuwait revealed that these teachers face a number of challenges like the difficulty of the content, heavy workload, lack of teaching tools, inadequate professional development, not enough time allocated to teach science and class management issues because of large class sizes. Another study that investigated the challenges facing primary science teachers in Turkey (Sengul, Cetin & Gur, 2008) identified a number of problems such as lack of pedagogical knowledge, lack of physical resources and time constraints. Al Ghamdi and Al Salouli (2013) interviewed science teachers in public and private schools in Al Dammam in the Kingdom of Saudi Arabia and the findings of their study suggest that insufficient instructional time, limited physical space, scarcity of resources, and professional development are barriers that hinder the implementation of the reformed science curricula. The above views are also shared by the teachers in the schools under study.

Teachers’ self-confidence when teaching is also another factor that hinders the teaching of integrated science in the selected schools of study.

Some research studies have also attempted to find a correlation between teachers’ self-confidence to teach the different sciences and the level of content knowledge (Appelton, 1995; Harlen & Holroyd, 1997; Kind et al., 2011). Studies with secondary school science teachers are scarce compared to studies carried out with elementary teachers. Appleton (1995) found that elementary teachers gained more confidence not only when they experienced success in learning science content but also when they experienced how the subject is taught after undergoing a science method course. This highlights the importance of developing pedagogical content knowledge. Harlen & Holroyd (1997) state that “confidence in a specific area of content is closely related to knowledge of that content” (p.103). However, confidence is also influenced by other factors such as school and personal experiences, the nature of initial and in-service experience, pressure of curriculum overload, support from colleagues and material resources and the teacher’s own view of professional capability. This factor refers to the teachers’ perceived self-efficacy. Bandura (1997) defines perceived self-efficacy as the “beliefs in one’s capabilities to organise and execute the course of action required to produce given attainments” (p.3). Self-efficacy beliefs have two dimensions. They indicate the level of self-confidence in teacher’s own teaching abilities, known as personal science teaching self-efficacy. They also reflect the belief that students learning can be influenced by effective teaching, which is known as the science teaching outcome expectancy belief. Teachers’ behaviour is based upon these two dimensions of self-efficacy beliefs. According to Riggs and Enochs (1990) “teacher efficacy beliefs appear to be dependent upon the specific teaching situation” (p. 627). Therefore, teaching is influenced by teacher’s self-efficacy and self-confidence.

METHODOLOGY

This study followed a mixed-methods research design. The instrument used was a structured questionnaire. Data for the study were obtained by administering 70 questionnaires to 70 teachers. Six (6) public Junior High Schools and one (1) private Junior High School were selected purposively. 10 teachers were sampled randomly from each Junior High School making a total of 70. With the random sampling method, the researcher wrote ‘Yes’ and ‘No’ on pieces of papers and teachers in each school were asked to select one. Those who selected ‘Yes’ were chosen for the study. The researchers explained the purpose of the study and emphasized that the participants will remain anonymous. The survey questionnaire consisted of four-point Likert scale items and qualitative items that were developed from and linked to the reviewed literature. 70 questionnaires were fully answered and returned. The data were analyzed using frequency counts, percentages. The research question was

developed to enable us to identify the challenges that Junior High School Integrated Science teachers are facing in teaching the subject.

FINDINGS AND DISCUSSIONS

A number of challenges were identified from the collected data and are addressed individually.

Professional Development

Abu Dhabi's educational policy agenda indicates that ongoing professional development will be provided to all teachers in public schools (ADEC, 2010). However, that is not the case in Junior High Schools in Aowin Municipality. It was evident in the findings of the study in Table 1 that only 3(4.3%) of the participants said that they receive professional development on the planning and teaching of science whilst 67(96.7%) do not.

Inadequate background in science

Inadequate background in the subject knowledge is one of the main factors that contributes to such challenges and will have an impact on the development of the teachers' pedagogical content knowledge as well as on the teachers' self-confidence and attitudes when teaching topics on Integrated Science. Results from Table 1 show that only 13(18.6%) of the participants have adequate background in science while 57(81.4%) have inadequate background in science.

Availability of resources

Different research studies have shown that students achieve better in science when they are taught through inquiry-based methodologies (Roccard, Csermely, Jorde, Lenzen, Walberg-Henriksson & Hemmo, 2007). This inquiry-based learning that provides students with opportunities to investigate and explore on their own requires appropriate space and physical resources that are needed for this exploration to take place. The majority of the participants perceived the lack of such resources as a barrier that has a negative effect on their lesson delivery. 55(78.6%) of the participants stated that the physical space, materials and equipment needed to teach science is inadequate while only 15(21.4%) indicated that they have sufficient resources to teach science.

Non-availability of resource centre

It is clear from Table 1 that, all the participants 70(100%) indicated that there is no resource centre in their school which is a barrier that has a negative effect on their lesson delivery.

Teachers' self-confidence

Teachers' self-confidence when teaching is also another factor that hinders the teaching of Integrated Science in the selected schools of study. Many teachers 45(64.3%) teaching Integrated Science to students at Junior High School express lack of confidence as a factor that hinders the teaching of Integrated Science in the selected schools of study. While 25(35.7%) indicated that they have confidence when teaching the subject.

Table 1. Challenges faced by teachers when teaching integrated science

S/N	Challenge	Number of Teachers = 70			
		SA	A	DA	SD
1.	I receive professional development training on planning and teaching of science	F(%) 2(2.9)	F(%) 1(1.43)	F(%) 45(64.3)	F(%) 22(31.43)
2.	I have adequate background in science	5(7.14)	8(11.42)	47(67.14)	10(14.3)
3.	I have available resources for teaching of science in my school	10(14.3)	5(7.14)	35(50)	15(21.43)
4.	My school have resource centre	-	-	60(85.7)	10(14.3)
5.	I have confidence when teaching science	15(21.43)	10(14.3)	30(42.9)	15(21.43)

Source: Field survey March, 2018

CONCLUSIONS AND RECOMMENDATIONS

This study was conducted to pinpoint possible challenges that might be hindering successful teaching of Integrated Science in Junior High School in Aowin Municipality. These findings have important implications for Teacher Educators and for school administrators and might indicate the need for, and be able to inform revisions of Teacher Education policies and school administrative strategies to address the emerging issues.

Inadequate background in the subject knowledge is one of the main factors that contributes to such challenges and will have an impact on the development of the teachers' pedagogical content knowledge as well as on the teachers' self-confidence and attitudes when teaching topics on Integrated Science.

It would have been beneficial to have regular workshops for all teachers to enable them handle Integrated Science effectively. The majority of the participants perceived the lack of such resources as a barrier that has a negative effect on their lesson delivery. Teacher education should take cognizance of changes in methodology and in the curriculum, so as to expose teachers to innovations in their profession; in-service training should be an integral part of continuing teacher education.

Teachers' self-confidence when teaching is also another factor that hinders the teaching of Integrated Science in the selected schools of study. Many teachers teaching Integrated Science to students at Junior High

School in Aowin Municipality expresses lack of confidence as a factor that hinders the teaching of Integrated Science. It would be interesting to conduct an in-depth research study with these teachers and devise strategies on how such teachers can be supported in order to increase their level of confidence when teaching Integrated Science.

References

- Abell, S. (2007). *Research on science teacher knowledge*. In Abell, S. And Lederman, N. (eds.) Handbook of Research on Science Education, p. 1105-1149. Mahwah NJ: Lawrence Erlbaum Associates.
- Abell, S. K. (2008). Twenty Years Later: Does pedagogical content knowledge remain a useful idea? *International Journal of Science Education*, 30 (10), 1405-1416.
- ADEC (2010). *ADEC Primary Science Teacher Guide for Abu Dhabi*. London: Pearson.
- Al Ghamdi, A.H., & Al-Salouli, M. S. (2013). Saudi Elementary School Science Teachers' Beliefs: Teaching Science in the New Millennium. *International Journal of Science & Mathematics Education*, 11(2), 501-525.
- Al Shammeri, A. (2013). Curriculum Implementation and Reform: Teachers' Views about Kuwait's New Science Curriculum. *US-China Education Review*, 3(3), 181-186.
- Appleton, K. (1995). Student teachers' confidence to teach science: Is more science knowledge necessary to improve self-confidence? *International Journal of Science Education*, 17(3), 357-369.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Company.
- Childs, A., & McNicholl, J. (2007). Science teachers teaching outside of subject specialism: challenges, strategies adopted and implications for initial teacher education. *Teacher Development*, 11(1), 1-20.
- Davidson, C. M. (2010). *The Higher Education Sector in the Gulf: History, Pathologies, and Progress*. Dubai: Gulf Research Center.
- Davis, E.A., Petish, D., & Smithey, J. (2007). Challenges new science teachers face. *Review of Educational Research*, 76 (4), 607-651.
- De Jong, O., Veal, W.R., & Van Driel, J.H. (2002). *Exploring Chemistry teachers' knowledge base*. In Gilbert, J.K., de Jong, O., Justi. R., Treagust, D.F. & Van Driel, J.H. (eds). Chemical Education: Towards Research-Based Practice, p. 369- 390. Kluwer Academic Publishers: Netherlands.
- Harlen, W., & Holroyd, C. (1997). Primary teachers' understanding of concepts of science: impact on confidence and teaching. *International Journal of Science Education*, 19 (1), 93-105.
- Hashweh, M, Z. (1987). Effects of Subject Matter Knowledge in the Teaching of Biology and Physics. *Teaching and Teacher Education*, 3 (2), 109-120.
- Kind, V. (2009). A Conflict in your Head: An exploration of trainee science teachers' subject matter knowledge development and its impact on teacher self-confidence. *International Journal of Science Education*, 31 (11), 1529-1562.
- Kind, V. & Kind, P.M. (2011). Beginning to Teach Chemistry: How personal and academic characteristics of pre-service science teachers compare with their understandings of basic chemical ideas. *International Journal of Science Education*, 33 (15), 2123- 2158.
- Magnusson, S. K., & Krajcik, J. J. & Borko, H. (1999). *Nature, sources and development of pedagogical content knowledge for science teaching*. In Gess-Newsome J. And Lederman, N. G. (eds). Examining pedagogical content knowledge: The construct and its implications for science education. p. 95 – 132. Dordrecht: Kluwer Academic Publishers.
- Riggs, I. M., & Enochs, L. G. (1990). Toward the development of an elementary teachers' science teaching efficacy belief instrument. *Science Education*, 74 (6), 625-637.
- Rocard, M., Csermely, P., Jorde, D., Lenzen, D., Walberg-Henriksson, H., & Hemmo, V. (2007). *Science education now —a renewed pedagogy for the future of Europe*. Luxemburg: Office for Official Publications of the European Commission.
- Sengul, S.H., Cetin, G. & Gur, H. (2008). The Primary School Science Teachers' Problems in Science Teaching. *Journal of Turkish Science Education*, 5(3), 82-88.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15 (2), 4-14.
- Shulman, L. S. (1987). Knowledge and Teaching: Foundations of the New Reform. *Harvard Educational Review*, 57 (1), 1-22.