Interpretation of inclusive education practices in science at a basic school

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Abstract

The research was a case study designed to investigate inclusive education practices in a science class at a Basic School in Winneba, Ghana where inclusive education is practiced as in all ten regions. The sample for the study consisted of one head teacher, a science teacher, three interpreters and one resource teacher from the Basic School. The main instruments used for data collection were questionnaires, informal interviews and observations. Findings showed that the teacher and interpreters both prepared for science classes having the special needs in mind. However, about half of the respondents, upon interaction with them, demonstrated that they earnestly did not have the expertise to organise inclusive science classes. Team preparation and teaching was highly practised for support. It was recommended that they use multi-media technologies, attend teacher development programmes, and use their limited teaching resources to augment their teaching skills as they are mostly not used. Since the study was conducted in only one inclusive school, the findings may not be for generalization.

Keywords: inclusive education; interpreters; science education; special needs; teacher preparation

Introduction

When knowledge and skills are transferred from one generation to another through research and training, education is said to have taken place. This kind of education is needed in every country as it drives development. The study of science and its application in the field of technology not only contributes to national development but also enables us to properly understand our world (Gordon, 2004). Science is said to be a difficult subject regardless of one's age, culture, and education. Thus many individuals opt out in the learning of science at various levels of education; a trend that could affect science, technology, mathematics and engineering (STME) in a country (Eminah, 2007). The study of science is worse for students and pupils who have different ranges of disabilities and are yet obliged to join a 'normal' stream of learners under an inclusive education programme.

The term *inclusive education* is very broad and has several definitions and explanations. It aims at training and teaching children or individuals with special needs or disabilities in a general classroom setting. Inclusive education seeks to address the needs of special needs students such that they are provided with quality education (Dreyer, 2017). It ensures that teaching resources

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and methods employed by the teacher make all children feel welcome, accepted, and receptive to cognition (Burnett, 2009). Inclusive education is geared toward addressing the educational needs of all students in a general or 'normal' classroom (Ainscow & Miles, 2008; Artiles, Kozleski, Dorn & Christensen, 2006).

Several policies have been drafted to make inclusive education implementation possible. These policies which drive inclusive education takes its root from the disability movement. They include key conventions and milestones between the years 1948 to 2006 (Dreyer, 2017). In Ghana, a policy was drafted in 2011 placed children with mild and moderate disabilities in mainstream public schools. However as at 2013, the Inclusive Education programme initiated in 2011 had been expanded from 29 districts in seven regions (out of 10) to 46 districts in Ghana (Gadagbui, 2009). When it comes to the teaching and learning of science, many special needs educators have identified science instruction as a particularly useful subject for students with disabilities (Villanueva, Taylor, Therrien & Hand, 2012). Sadly, when it comes to the development of curriculum policies for inclusive education, the science teachers are not consulted (Idol, 1997).

Since the inclusion of students with special needs in the science classroom is a constitutional obligation, teachers have to be conversant with dealing expertly with special needs students (The Republic of Ghana, 1992). Best practices have to be adopted bring out the special talents in such challenged students so that they become useful to themselves and society at large. A small number of teaching techniques have been effectively used in inclusive education classrooms. Mention can be made of team teaching, support services, and collaborative methods (Bohning & Stefanich, 2001). In every science class, the scientific method is employed to accommodate the various needs of all students, especially the special needs student. This makes the collaborative method or what is also called team teaching the most appropriate (Haskell, 2000).

Lang (2014) and other researchers have argued that 'active involvement' underlies the best practices in the science education of special need pupils, especially those who are deaf or hearing impaired. They argued that practices that encourage 'minds or hands on' activities, manipulation of materials in the science classroom, active participation, interactive learning, experiential learning, inquiry learning, and discovery learning are the best (Marschark, Lang , & Albertini, 2002).

Studies on the need for and assessment of general inclusive education at the Basic Education level have been carried out in Ghana but none was found to be on inclusive science practices, at the time of this study. However, literature revealed that Serwaa-Ameniampong (2012) had carried out a study on the factors that hinder the introduction of elective science programmes at the only upper secondary technical school for the deaf in Ghana. Thus, this study investigated inclusive education practices in science at a Basic School in Winneba to ascertain teachers' knowledge about their preparation and implementation of science lessons in inclusive education settings.

Methodology

Study design

A case study design with a qualitative approach was adopted to assess the practice of inclusive science education at the South Campus University Practice Basic School. The study population comprised of all the 187 Basic school pupils including special needs pupils, one head teacher, one science teacher, three interpreters, and one resource teacher at the school. Purposive sampling was employed to select the sample of interest. This was comprised of the head teacher, resource person,

interpreters, and the science teacher, who numbered six in all. The specialities of these participants were Basic and Special education (Neuman, 2014).

The main instrument used for this study was a questionnaire. One set of the questionnaires was designed for the headmistress while the other set was made for the teacher/interpreters or resource teacher who teaches or interpret for the pupils with special needs. The teachers' questionnaires were aimed at assessing their knowledge on inclusive education practices in Basic School science and how they implemented such knowledge. The headmistress' questionnaire was aimed at finding out her knowledge on inclusive education (as an administrator of an inclusive education centre), science education practices, and other relevant information required for the study. Both sets of questionnaire were aimed at understanding respondents' ideas and knowledge about inclusive education as well as how this knowledge affected their science practices and delivery.

Formal and informal observation as well as discussions with the headmistress, some teachers and interpreters were made and noted. The special needs students were observed at in class during a science lesson. This was done so that the variety of data collection instruments would provide a platform for corroboration and complement each other to obtain a holistic view. It also served to check the validity and reliability of the main iunstrument used (Cohen, Manion, & Morrison, 2011).

Data Collection and Analysis

When the necessary contacts had been established and permission granted, the questionnaire designed for the various participants (respondents) were given to them for completion. There were also informal interviews with the sample to obtain an in-depth understanding of some information that had been supplied on the questionnaires but were not clear and to obtain information on other pertinent issues not captured on the questionnaires. This was also done to promote co-operation among all participants in the study. All the questionnaires administered were returned. Responses to the questionnaire and interview items provided enough information for a fair assessment of inclusive education practices in a science class. It reflected other data captured by observation and informal discussions with the staff and students. Questionnaire items were also grouped to see which ones best answered specific research questions. Descriptive statistics (percentages) was used to analyse the results gathered because Eni-Olarunda & Ogunleke (2005) did a similar research study.

Results and Discussion

The study revealed that 80% of the respondents of the questionnaires were able to teach children with different types of special needs and agreed that special needs pupils could also learn in the same classrooms as their peers. About 60% of the respondents alluded to the fact that they prepared for science lessons with students who had special needs in mind whiles 40% of respondents didn't prepare with special needs students in mind.

The study also revealed that the 60% of the respondents who prepared for the science lessons had extended training (of about four semesters) in special education. However, the remaining 40% of the respondents had had only one semester training in special education. Thus, they had general knowledge about educating this group of challenged or special need students. Yet, they knew how to organise equally appropriate science lessons for pupils with special needs, possibly from team work. Interestingly, even though 60% of the respondents had obtained extended training in special education and claimed to know how to prepare science lessons with students with special needs in

mind, more than half of this percentage (that is 40% of the 60%) attested during the interview session that they had difficulties in practice when faced with the challenge of organising truly inclusive science lessons. They admitted that translating some science words, concepts or procedures into the sign language for conceptual and cognitive understanding or the acquisition of some learning skills were a challenge.

Delivery of science instruction for pupils with special *needs has been identified by **m**any special educators and science teachers as a challenging job.* A number of science teaching methods have been effectively used in inclusive education classrooms where the focus is on student needs, abilities, and interest (Stefanich, Holthaus, & Bell, 2001). Thus, it is important for teachers and interpreters to be conversant with these approaches and learn to apply them appropriately. Among the teaching methods used by teacher/interpreters included group discussions. The science teacher indicated that group discussions facilitated the teaching of science in inclusive education classroom during an informal discussion and this was confirmed by the interpreters.

Science teachers, already have concerns with the existing wide range of needs in a regular or normal classroom. Thus, including students with special needs can undermine teachers' preparations and cause disruption to learning processes (Therrien, Taylor, Hosp, Kaldenberg, & Gorsh, 2011). As noted earlier on, about 40% of the respondents trained for special needs students were not sure if they were professionally dealing with such challenges in their classroom lessons. The headmistress did not quite agree with this report about her staff's inadequacies as they had been trained to organise lessons in science for pupils with special needs. She added that help was available for those who had challenges with their lesson preparation and implementation for science classes, to which her staff differed. Similarly, Oliver and Reschly (2010) also found out from their study that special education teachers as well as general education teachers were not adequately prepared to manage students with behaviour disorders in the classroom.

This current study also revealed that in as much as the school had teaching and learning materials, it wasn't enough and did not satisfy the learning needs of all the students. Most of the interpreters, until this study, were not aware that these materials were available; thus they did not use them when interpreting lessons in the classroom nor encouraged the science teacher to use them. It must be noted that the school did not have a conventional science laboratory and so the few resources that the school had in stock were kept away in the head teacher's office. A reason could be because the available science teaching and learning materials were so few such that they could not satisfy the learning needs of all the students. This discouraged practical activities and demonstrations by both teachers and pupils in science lessons. The head teacher lamented about the inadequate resources for teaching science lessons and added that this can lead to abstract teaching and foster route learning among students. However, research has shown that the use of science teaching and learning materials has a positive impact on learning as well as teacher delivery (Deku, 2013).

Also, due to the large number of pupils, the teachers were afraid that the few materials available could get broken, destroyed or spoiled. Most of the interpreters who were also teachers in effect are not even aware that these learning materials are available thus they do not use them. The use of teaching and learning materials when interpreting in the classroom is one of the most essential components for any program in which the individuals are deaf or have hearing-impairment (Obosu, Adu-Agyem & Opoku Asere, 2013).

Most of the respondents from the study got help from other teachers and collaborated with them whenever it was time to teach science. The resource teacher was also always available to give the

necessary help needed. However, from the findings, about 80% of the teachers and interpreters did not go for workshops to upgrade themselves. They also did not use multi-media technologies during science lessons. It is a common fact that teachers who do not get in-service training often miss out on new teaching pedagogies which could enhance their teaching skills, and their students' learning skills.

Science teachers, especially, need innovative skills to teach students with these diverse learning needs. This often presents a challenge for the teachers as various teaching methods have to be adapted to meet the demands of special needs students. The teaching and learning of science involves the use of teaching and learning materials. Thus, teachers strive to create adaptations to meet the learning needs of all students as many special needs pupils are present in most general education settings.

Special need students, especially the deaf students, understandably, value teachers who respect diversity, appreciate their challenge, and can use sign language clearly. An interpreter's duty is to enhance communication between an individual who is deaf or has a hearing-impairment and a hearing individual who does not use sign language. It can therefore be said that how well a student with special need – such as a hearing impairment - performs academically is dependent on the quality and availability of interpreting services (Hart & Lee, 2003).

Team preparation and teaching has been found to produce effective results. In a study by Gardiner and Robinson (2011), teacher trainees and students agreed to work cooperatively and collaboratively to make the learning of science more interesting. As said earlier on, 60% of the respondents knew how to supposedly organise lessons with pupils with special need in mind because they had been trained for such a purpose. Being aware of their personal lapses and inefficiencies, they resorted to collaborating with each other whenever it was time to teach science. The resource teacher was also always available to give the necessary help needed. It should be noted that the resource teacher was deaf and as such understood what it entailed to learn science in an inclusive setting. She taught her colleagues things that they didn't know when it came to the deaf culture and in particular how to break certain concepts down for the students to understand (Roald, 2002). The team work appeared to augment both the interpreters' and teacher's pedagogical skills with the special need students. This observation has been made in other studies. Moin, Magieri, and Zigmond (2009) also found that, as far as special needs students are concerned, engaging in collaborative activities in the science classroom comes with both benefits and unmet potential.

It was found that more than 60% of the participants in this study had not gone for further in-service training to learn new teaching skills or use multi-media technologies during science lessons with challenged students in a secular classroom, since their initial basic training. This could partly be attributed to the fact that even though workshops are organised by the Ghana Education Service to address the ever changing needs of our educational system, little attention is given to those who teach science to students with special needs. Several studies have shown that most teachers implement someone else's plan when it comes to addressing special needs pupils. Oftentimes, they are not suited to one's immediate environment (Idol, 1997).

Science, which has been described as a difficult subject that is hard to understand must be presented in a sequential and organised order so that students can piece concepts that they come to understand into conceptual frameworks. Thus, it is important that information be broken down so that they can be assimilated by the children (Khurshid & Iqbal, 2009). The current study

revealed that this was not too easy for the participants, if they had to work individually, so that they had to collaborate through team teaching to make an impact. With team teaching, a positive effect was always achieved.

Conclusion and Recommendations

Findings from the study indicated that both the teacher and interpreters attempted to prepare for science classes with special need students in mind according to the best of their abilities. Team teaching and collaboration was employed to overcome any short coming in their delivery of science lessons, regardless the fact they did not attend in-service training or use modern technological tools. One snag was that the teacher and interpreters were not able to effectively use the few resources that the school had for the students' benefit. The resource teacher was helpful in providing the necessary inputs to facilitating conceptual understanding among students. She was also very helpful in facilitating collaboration among teachers. Through it all, the special need students collaborated with each other and the teachers amiably so that they demonstrated some conceptual gains.

Science teachers should be educated on how to teach science to special need pupils, especially deaf or hearing impaired pupils. Non- science specialised teachers who are asked to teach science in inclusive schools should be given capacity enhancing training to be able to teach it effectively. These two groups of teachers should also be encouraged to do a lot of collaboration when it comes to the teaching of science to special need pupils. Lastly, educational provisions and equipment for science teaching and learning should be made available in all schools that practice inclusive education to promote the learning of science.

Since the inclusion of pupils with special needs in general education settings is a current approach endorsed by international organizations such as UNESCO, the Government of Ghana, through the Ministry of Education and the Ghana Education Service (GES) has adopted this approach. However, there is no policy except that which is written in syllabus by the Ministry of Education and the Ghana Education Service that governs the teaching of science to special need pupils or students with disabilities. All stakeholders – science teachers, special educators and policy makers - should come together to ensure that science education is made accessible to every child, even those with special needs.

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Credits

We express our genuine appreciation to teaching staff and students of the University Practice Inclusive Junior High School & Primary School