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Science Teaching, Science Teachers: Differences in Challenges of Urban and Rural Teachers

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Abstract
This is an investigative and explorative study into the challenges of teaching Integrated Science in the public Junior High Schools in the Kwahu West Municipality. All the 60 Integrated Science teachers, as well as the eight circuit supervisors and science coordinators in the Municipality were purposively selected for the study. A descriptive survey design was used for the study. Data were collected with a set of questionnaire and an interview schedule and were analysed using frequencies, percentages and the independent sample t-test. The results indicated that the science teachers faced some challenges in dealing with the content of Integrated Science in the Junior High Schools. However, with the exception of the challenges relating to the understanding of professionalism, there were no significant differences in the challenges urban and rural teachers faced in the teaching of Integrated Science.
Key words: Integrated Science, Junior High Schools, challenges, urban, rural

1. Introduction

The Ministry of Education (MOE) in the 1987 Educational Reforms encouraged the acquisition of scientific knowledge through the study of General Science and Agricultural Science respectively. But upon several educational reforms, the Integrated Science curriculum has been introduced which integrates General Science, Agriculture and Technology as a unit subject (MoESS, 2007). According to MoESS (2007), the Integrated Science syllabus is a conscious effort to raise the level of scientific literacy of all students and equip them with the relevant basic scientific knowledge needed for their own living and also needed for making valuable contributions to production in the country. Any country striving to develop in order to raise the standard of living of its population and maintain a balanced economy must as a matter of necessity adopt science and technology as the basis for achieving sustainable development. It is believed that, science and technology played important role in transforming traditional European economies to the present high income levels (Anderson, 2006).

After many years of independence and despite the various actions such as policies and initiatives by successive governments, not very much has been achieved in our effort at developing the nation through science and technology education as Ghana still faces some problems of underdevelopment. Many Ghanaian science education researchers have elaborated on the causes for the present state of science education (Anamuah-Mensah, 1994; 1998; Anamuah-Mensah, Mereku & Ameyaw-Asabere, 2004; Fredua-Kwarteng & Ahia, 2005). Apart from the above discussions, there seems to be a dichotomy in the teaching and learning of Integrated Science between the rural and urban areas. Mansary (1991) in discussing the "marginalised in education" further asserted that rural-urban dichotomies have been a marked feature of African educational system with urban areas having greater proportion of educational facilities. He contends that "The best teachers are all to be found in the urban centres" (Mansary, 1991, p.18). Mansary (1991) concludes by suggesting an option of local communities supplementing teachers' efforts among other measures in inducing them to stay in their communities.In line with the above, Webster and Fisher (2000) pointed out in their study that, pupils' attitudes and aspirations in science were affected by their access to resources. A finding linking attitude, achievement and access to resources was also supported by Barton (2001). She found from her study that urban Australian pupils were placed at disadvantage achievement-wise. According to her, urban schools were less adequately resourced. Rural schools in Ghana may share many of the same challenges as schools in urban settings in western societies, with lack of funding and resources, aging facilities and difficulty in finding and retaining quality teachers being a commonplace in rural schools. A significant challenge facing schools in the communities is providing equitable educational opportunities (Anderson, 2006). The perceived isolation of rural schools and a low population density create an additional set of challenges. As a result, limited human resource and low income levels, lack of community partnerships and interest in schooling are often the case with rural schools.

It has also been indicated in a study of Zuniga, Olson and Winter (2005) that a sense of isolation and low population density make opportunity fewer for pupils in rural schools. Furthermore, parents in rural communities may be unaware of options, prerequisites, secondary school and tertiary entry requirements and expected parental involvement in the schools. Pupils in rural areas in Ghana often have unequal access to the kind of science class, teachers, resources (such as textbooks and laboratory materials and equipment) and opportunities

necessary for academic success in science as compared to pupils from urban or city. It is argued that the lack of these resources has a demoralizing effect on teachers to teach science (Fredua-Kwarteng & Ahia, 2005).

Science plays an important role in the society including rural and urban communities. The rural community that is always closer to nature needs a scientific knowledge base to involve in more informal conversations and debates on key environmental issues like water pollution, land and forest degradation aside career opportunities. Though, rural pupil may exhibit excitement about science or science programmes, with the given fewer opportunities to school science, might lead them to dislike science even more and the ultimate result may be fewer chances for rural pupils to enter science-based programmes or compete for jobs in the science fields (Zuniga, Olson & Winter, 2005; Coley, 1999). This is likely to lead to marginalisation and perpetuation of a cycle.

It is in line with the above discussions that, this study specifically takes a look at what differences may exist between the challenges faced by teachers in rural and urban areas in the teaching of Integrated Science in Junior High Schools in the Kwahu West Municipality in terms of the following areas;

(a) How do Integrated Science teachers in the Kwahu West Municipality view the scope of Integrated Science syllabus?
(b) What topics in Integrated Science syllabus do the science teachers in the Kwahu West Municipality find difficult to handle?
(c) How do the science teachers in the Kwahu West Municipality perceive students' behaviour towards the learning of Integrated Science?
(d) How do Integrated Science teachers in the Kwahu West Municipality approach the assessment of Integrated Science lesson?
(e) What are the views of the Integrated Science teachers in the Kwahu West Municipality on approaches to instruction in Integrated Science lesson?
(f) In what ways do the Integrated Science teachers in the Kwahu West Municipality develop themselves professionally?

2. Methodology

The study adopted a census sampling technique which was appropriate because the population was not large enough to be sampled. This is in line with the view of Nwana (1993, p.58) that every member of the population should be studied "when the population size of the whole population is small". Also, according to Krejcie and Morgan (1970) as cited in Sarantakos (2005) for smaller population say N=100 or fewer, there is little point in selecting a sample, rather the entire population must be surveyed. Based on the above assertions, the study had the following as the sample; 60 Integrated Science teachers drawn from seven circuits in the Municipality. It was realised from the data collected that 30 science teachers each were located in the urban and rural areas of the Kwahu West Municipality. Again, information gathered from the biographic data also showed that most of the science teachers held either a Teachers' Certificate "A", Diploma or Degree in Education. This implies they have all undergone professional training to qualify as teachers. The Integrated Science teachers who formed part of the sample were all selected. This technique was more appropriate because they were the right people from whom the needed information could be solicited to meet the purpose of the study and also the view of every member was considered as important (MacMillan, 2004; Nwana, 1993).

2.1 Research Design

The research design used for the study was the descriptive survey. It has the characteristics of analysing the relationships, differences and trends that contribute to the challenges teachers face in the teaching of Integrated Science in the Junior High Schools. By this approach, the researcher could
find clues to answer research questions which involved classroom related challenges (Cohen, Manion & Morrison, 2000; Sarantakos, 2005).

Fraenkel and Wallen (2000) identified three major difficulties associated with descriptive surveys which included the difficulty in ensuring that the questions to be answered are clear, getting respondents to answer questions thoroughly and honestly, and the difficulty of getting sufficient number of questionnaire completed and returned for meaningful analysis to be made. The above problems were overcome through the use of simple words, appealing to respondents to be frank and truthful and also making follow-ups during questionnaire administration.

2.2 Instrument

Questionnaire was the main instruments for data collection in the study. The questionnaire was used to gather information from the Integrated Science teachers and heads of public Junior High Schools while the semi-structured interview guide helped in gathering data from the circuit supervisors and the science coordinator. The questionnaire and the interview guide were developed through the extensive use of literature and consultations

with fellow researchers. The questionnaire was pilot – tested and it yielded Cronbach's Alpha value of 0.79 which suggests that the items were measuring the same thing (Vogt, 1999).

2.3 Procedures

Permission was sought from the Municipal Director of Education, Kwahu West, who is in charge of the schools selected for the study, to seek the approval for access to the schools. Two weeks were devoted for the distribution of the questionnaire in all the seven circuits. The collection of the questionnaire also took another two weeks. In all, four weeks were used for data collection which were administered by the two researchers and had a return rate of 100 percent.

3. Results and Discussions

The import of the study was to find out the differences which might exist in the challenges faced by teachers in the urban and rural areas in the teaching of Integrated Science. This flows with the view of Mansary (1991) who emphasised that rural-urban dichotomies have been a marked feature of African educational system and Ghana and for that matter the Kwahu West Municipality is no exception to this assertion. Therefore, to answer this question, five areas of challenges namely; understanding the content and disciplines in science, understanding pupils' behaviour towards the learning of science, understanding the processes in instruction and assessment, understanding the learning environment and understanding the teaching profession were of interest. Thus, to investigate the differences that might exist in the challenges faced by teachers in urban and the rural areas in teaching of Integrated Science, the independent samples t-test was performed. The results were considered separately to ascertain which of the challenge(s) was/were contributing to the differences encountered, if any.

The results obtained from investigating the challenges related to the understanding the content and disciplines in science, is presented in Table 1. It could be noted from the results in Table 1 that, when the mean score of teachers in the urban area (M = 3.39, SD = 0.80) was compared with that of the teachers in the rural areas (M = 3.69, SD = 0.78), with alpha set at 0.05, the test was shown to be not statistically significant, t (58) = 0.00, p > 0.05.

Table 1: Teachers' Responses on the Differences in Challenges Related to Understanding the Content and Disciplines of Integrated Science

	School type	N	M	SD	t	P-value
Challenge in content	Urban	30	3.39	0.80	0.00	1.000
of science	Rural	30	3.69	0.78		

N = 60 df = 58 p > 0.05

Source: Field Data, 2011

The implication is that as far as the challenges relating to the understanding of the content in science is concerned, science teachers in both the urban and rural areas face similar challenges.

Again, on the difficulty level of teachers in handling selected topics in Junior High Schools' syllabus for Integrated Science, mean scores of urban teachers (M =1.51, SD = 0.33) and rural teachers (M = 1.51, SD= 0.39) were compared having set alpha at 0.05, the results of the test is shown in Table 2.

Table 2: Teachers' Responses on the Differences in Difficulty Level in Handling Selected Topics in Integrated Science

	School Type	N	M	SD	t	P-value
Difficulty level in	Urban	30	1.51	0.33	0.02	0.982
handling topic	Rural	30	1.51	0.39		

N = 60 df = 58 p > 0.05

Source: Field Data, 2011

The test, as presented in Table 2, was shown to be not statistically significant, t (58) = 0.02, p > 0.05. It can therefore be concluded that, there is no significant difference between the teachers in the urban and rural areas as far this challenge is concerned. This outcome conforms to the biographic data collected on academic and professional qualification of the science teachers which indicated that most of the science teachers, 55 of them representing 91.7% of the total number of respondents, held either a Certificate "A", Diploma or Degree in

Education and as a result had almost the same level of subject matter knowledge. It was revealed during the interview with the circuit supervisors that most of these teachers were given sponsorship by the Kwahu West Municipal Assembly to attend Colleges of Education and were therefore obliged to serve in the Municipality after graduation from College.

On the challenges related to understanding the behaviour of the pupils toward the learning of Integrated Science, the result of the t-test performed, as presented in Table 3, was shown to be not statistically significant, t (58) = -1.33, p > 0.05, when the mean score of urban teachers (M = 2.77, SD = 0.63) was compared with the mean score of rural

Table 3: Teachers' Responses on the Differences in Challenges Related to Understanding Behaviour of Pupils

	School Type	N	M	SD	t	P-value
Challenge with	Urban	30	2.77	0.63		
					-1.33	0.188
pupils	Rural	30	2.98	0.63		

N = 60 df = 58 p > 0.05

Source: Field Data, 2011

teachers (M = 2.98, SD = 0.63). This implies that statistically, there is no significant difference between challenges science teachers in the urban and rural areas faced in trying to understand the behaviour of the pupils they taught. Mansary (1991) asserted that the equality of educational opportunity does not mean the provision of the same kind of experience but rather entails providing each individual with equal opportunity to develop his or her talents. With developed talents, the individual will be able to deal with challenges he or she faces in spite of where one finds himself or herself as depicted in the results shown in Table 3.

The challenges related to understanding processes in instruction and assessment was also tested using the mean scores of urban and rural teachers respectively. The result obtained is presented in Table 4. With the alpha level set at 0.05, the mean scores for urban teachers (M = 2.79, SD = 0.48) was compared with the mean scores of the rural teachers (M = 2.70, SD = 0.36), the test was shown to be not statistically significant, t (58) = 0.78, p > 0.05 as presented in the results in Table 4. This means that there is no significant difference between the mean scores of the two groups. Thus, science teachers in these

Table 4: Teachers' Responses on the Differences in Challenges Related to Understanding Processes in Instruction and Assessment

	School Type	N	M	SD	t	P-value
Challenge in instruction	Urban	30	2.79	0.48		
					0.78	0.436
and assessment	Rural	30	2.70	0.36		

N = 60 df = 58 p > 0.05

Source: Field Data, 2011

locations seemed to experience similar challenges when it came to issues on instruction and assessment processes in science lessons.

The result for the t-test on the challenges related to understanding the learning environment is presented in Table 5, using the mean scores of urban and rural teachers respectively.

Table 5: Teachers' Responses on the Differences in Challenges Related to Understanding Learning Environment

	School type	N	M	SD	t	P-value
Challenge with	Urban	30	3.28	0.48		
					0.87	0.390
learning environment	Rural	30	3.18	0.41		

N = 60 df = 58 p > 0.05

Source: Field Data, 2011

With the alpha level set at 0.05, the mean score for urban teachers (M = 3.28, SD = 0.48) was compared with the mean score of the rural teachers (M = 3.18, SD = 0.41), the test was shown to be not statistically significant t (58)

= 0.87, p > 0.05. The implication is that the teaching location of the science teacher does not pose a challenge to his ability to manage the learning environment. Thus, statistically there is no significant difference between challenge science teachers in the urban and rural areas faced as far as managing the learning environment was concerned.

The last theme which also looked at the challenges related to the understanding of professionalism was also compared using the means scores of the science teachers and the results presented in Table 6. Comparing the mean score of the urban teachers (M = 3.05, SD = 0.56) with the mean score of the rural teachers (M = 2.74, SD = 0.54) and with alpha level set at 0.05, the test was shown to be statistically significant, t (58) = 2.19, p < 0.05.

Table 6: Teachers' Responses on the Differences in Challenges Related to the Understanding of Professionalism

	School type	N	M	SD	t	P-value
Challenge in	Urban	30	3.05	0.56	2.19	0.033
profession	Rural	30	2.74	0.54		
N = 60	df = 58		p < 0.05			

Source: Field Data, 2011

The implication is that there is a significant difference between urban science teachers and rural science teachers in the challenges they faced in their bid to develop themselves professionally. This outcome confirms the findings of Anderson (2006) that a lot of rural schools in Ghana have difficulty in finding and retaining quality teachers and the perceived isolation of these rural schools create an additional set of challenges. Teachers in these areas sometimes find it difficult getting access to activities that promote the teacher's professional development. As contended by Mansary (1991), for most of the time the best teachers are usually to be found in the urban centres as result of the access to facilities available for professional development.

3.1 Conclusions

It can be concluded from the study that an independent samples t-test conducted to compare the mean scores of the challenges between urban and rural teachers in the teaching of Integrated Science showed that, with the exception of the challenges relating to the understanding of professionalism, there were no significant differences existing in the challenges faced by science teachers in urban and rural areas in the teaching of Integrated Science. In the light of the research findings and conclusion, the following recommendations are made:

1. The Ghana Education Service (GES) need to place more emphasis on the regular organisation of science-specific induction and in-service training programmes for both rural and urban integrated science teachers especially before a new school term begins.
2. Alternatively, the heads of schools could be well resourced to enable them play this vital role.
3. The science teachers in the rural areas need to be supported regularly by the GES to enable them develop professionally to meet the changing demands of their work.
4. Attempt should therefore be made by the municipal authority to ensure that the teachers in the rural areas are given enough teacher development programmes to improve their competence.

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