

Teacher-Type Differences and the Challenges of Teaching Integrated Science in Basic Schools: Beginning and Experienced 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, there were no significant differences in the challenges beginning and experienced teachers faced in the teaching of Integrated Science.

Key words: Integrated Science, Junior High Schools, challenges, beginning teachers, experience teachers.

1. Introduction

According to Hayward (2003) the word “science” originally meant ‘knowledge’ however in schools and universities it tends to indicate the group of three closely linked subjects – Biology, Chemistry and Physics and even Mathematics and Agricultural Science in some schools and universities (Zumbach, Schmitt, Reimann & Starkloff, 2006). Science becomes integrated when the related disciplines such as Chemistry, Physics, Biology and Agricultural Science are combined as one subject to be studied. Integrated Science is therefore a straight-forward, easy-to-read but substantial introduction to the fundamental behaviour of matter and energy and living and non-living systems (Zumbach et al., 2006).

The teaching of Integrated Science is therefore aimed at introducing a course that presents a coherent and clear picture of all science disciplines in an interdisciplinary approach to help students confirm and calibrate the picture of the current scientific world (Tillery, 2001). Therefore, science should aim at the development of scientific behaviours in young people. This behaviour is characterized by exploration usually from a lively curiosity and by the careful, critical investigation of problems.

1.1 *The Beginning Teacher*

It is a widely held view that the initial teacher education cannot fully prepare the beginning teacher for teaching. Indeed, learning to teach and how to be a teacher will only begin to crystallize when the novice teachers enter their own classroom for the first time. The new generation of teachers has different expectations and experiences (Moore-Johnson, 2004). They expect reasonable pay and good working conditions and are unlikely to stay in one occupation throughout their working life. Cameron, Baker and Lovett (2006) also conducted a study in New Zealand on the desire of beginning teachers to change posting after their first year of teaching. They reported that interestingly, in the first two years of teaching, there was little movement found of beginning teachers between low, medium or high decile ranked basic schools. Beginning teachers are unlikely to leave the profession in the first two years despite the majority of them being employed in low socio-economic schools.

Harrison, Lawson and Wortley (2005) and Bullough (1989) investigated the effect of the use of reflective strategies by mentors to support beginning teachers’ learning and proposed that beginning teachers who first enter the classroom should be supported to deconstruct their taken-for granted notions of teachers and teaching and reconstruct a strong image of themselves as teachers. Without this, they may be doomed for failure as they may be repeating the same practice throughout their careers. In addition, time is required for the beginning teachers to consolidate learning and with growing confidence to reconstruct in practice a vision of himself or herself as a teacher (Langdon, 2007).

1.2 *The Complex Accomplished Teacher*

There is a good deal of support in the literature that an effective teacher is informed by inherent educational values and has a clear sense of purpose and agency. In addition, he or she contributes through reflection and critical appraisal, to the development of educational practices and policy (Thrupp, 2006). It is a broader vision with which the good teacher engages in moral and ethical decision-making about what to teach, when and how, and in what ways that encompass an inquiry approach to understanding the complexities of teaching and

individual student's learning. Rich learning opportunities are constructed for all students. In addition, the teacher is a student advocate, constantly interrogating his own assumptions to work, change and practice with social justice issues in mind (Cochran-Smith, 2004). Practitioners and theorists who hold this view of the teacher contend that the function of the teacher goes beyond measurable learning outcomes to foster civic tolerance and quality through democratic education (Feiman-Nemser, 2001). The individual teacher holds values such as trust, tolerance and integrity in high regard. Many scholars contend that emotional intelligence and particular dispositions are integral to good teaching (Langdon, 2000; Day, 1999; Hargreaves, 1998).

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

- (g) How do integrated science teachers in the Kwahu West Municipality view the scope of Integrated Science syllabus?
- (h) What topics in Integrated Science syllabus do the science teachers in the Kwahu West Municipality find difficult to handle?
- (i) How do the science teachers in the Kwahu West Municipality perceive students' behaviour towards the learning of Integrated Science?
- (j) How do Integrated Science teachers in the Kwahu West Municipality approach the assessment of Integrated Science lesson?
- (k) What are the views of the Integrated Science teachers in the Kwahu West Municipality on approaches to instruction in Integrated Science lesson?
- (l) In what ways do the Integrated Science teachers in the Kwahu West Municipality develop themselves professionally?

2.0 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. Information gathered from the biographic data also showed that a greater number of the science teachers, that is 33 of them, can be considered as beginning teachers having teaching experiences ranging between one and five years. Again, 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.

3.0 Research Findings

The study therefore concerns itself with the differences which might exist in the challenges faced by a teacher type, which is, beginning teachers (BT) and the experienced teachers (ET) in the teaching of Integrated Science based the five thematic areas. These are; 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. The differences were analysed using the independent samples t-test.

It could be observed from the results presented in Table 1 that, on the challenge related to understanding the content and disciplines in science, the mean score of beginning teachers ($M = 3.56$, $SD = 0.77$) was compared with the mean score of experienced teachers ($M = 3.86$, $SD = 0.78$).

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

	Teacher type	N	M	SD	t	P-value
Challenge in content in science	BT	33	3.56	0.77	-1.45	0.152
	ET	27	3.86	0.78		
N = 60		df = 58		p > 0.05		

Source: (Field Data, 2011)

With the alpha level set at 0.05, the test was shown to be not statistically significant, $t(58) = -1.45$, $p > 0.05$. The impression created from this result is that both beginning and experienced science teachers faced similar challenges in their bid to deal with the content and disciplines of Integrated Science. It based on the above revelation that the Independent Education Union (2004) commended that an improved and comprehensive induction programme is given to all teachers, whether beginning or experienced, to support in their work.

As indicted in the results shown in Table 2, when the mean score of beginning teachers ($M = 1.43$, $SD = 0.33$) was compared with mean score of the experienced teachers ($M = 1.61$, $SD = 0.37$), to determine if there were any differences in the level of difficulty in handling selected topics in the Integrated Science syllabus of the Junior High Schools, the test was shown not to be statistically significant, $t(58) = -1.97$, $p = 0.05$. This means that there was no significant difference in the scores of the two groups as shown in the results presented in Table 2.

Table 2: Differences in Difficulty Level in Handling Topics in Integrated Science between Beginning and Experienced Science Teachers

	Teacher type	N	M	SD	t	P-value
Difficulty level in handling topics	BT	33	1.43	0.33	-1.97	0.051
	ET	27	1.61	0.37		
N = 60		df = 58		p = 0.05		

Source: (Field Data, 2011)

Though learning to teach and how to be a teacher may only begin to crystallise when the novice teachers enter their own classroom for the first time, this outcome contradicts the view of Murdoch (1979) who shared his concerns about beginning teachers being set adrift as they try to find their own feet in teaching. It might be the results of the mentorship programmes initial teacher trainees were exposed to as part of their training.

The result presented in Table 3 shows the differences in the challenges related to understanding the behaviour of pupils towards the learning of science between beginning teachers and experienced teachers in the Kwahu West Municipality. The results of the t test performed was shown to be not statistically significant, $t(58) = 0.51$, $p > 0.05$, when the mean score of beginning teachers ($M = 2.88$, $SD = 0.58$) was compared with the mean score of experienced teachers ($M = 2.87$, $SD = 0.71$) with the alpha set at 0.05. This implies that statistically, there was no significant difference between challenges beginning and experienced science teachers face in trying to understand the pupils they teach.

Table 3: Differences in Challenges Relating to Understanding Pupils' Behaviour between Beginning and Experienced Science Teachers

	Teacher type	N	M	SD	t	P-value
Challenge with pupils	BT	33	2.88	0.58	0.51	0.960
	ET	27	2.87	0.71		

N = 60 df = 58 p > 0.05
 Source: (Field Data, 2011)

The challenges related to understanding instruction and assessment processes in science was also tested using the mean scores of beginning and experienced teachers respectively. The result obtained is presented in Table 4.

Table 4: Differences in Challenges Relating to Understanding Processes in Instruction and Assessment between Beginning and Experienced Science Teachers

	Teacher type	N	M	SD	t	P-value
Challenge in instruction and assessment	BT	33	2.77	0.46	0.50	0.617
	ET	27	2.72	0.37		

N = 60 df = 58 p > 0.05
 Source: (Field Data, 2011)

With the alpha level set at 0.05 and the mean score for beginning teachers (M = 2.77, SD = 0.46) was compared with the mean score of the experienced teachers (M = 2.72, SD = 0.37). The test was shown to be not statistically significant, $t(58) = 0.50$, $p > 0.05$ as depicted in the results presented in Table 4. This implies that there were no differences between the challenges beginning science teachers and experienced science teachers faced in dealing with the instruction and assessment processes in science.

The results for the t-test on the challenge related to understanding the learning environment is presented in Table 5, using the mean scores of beginning and experienced teachers respectively. With the alpha level set at 0.05, the mean score for beginning teachers (M = 3.26, SD = 0.44) was compared with the mean score of the experienced teachers, (M = 3.18, SD = 0.46), the test was shown to be not statistically significant $t(58) = 0.73$, $p > 0.05$, as depicted in the results. Thus, statistically there was no significant difference between the challenges beginning science teachers and experienced science teachers faced as far as managing the learning environment is concerned.

Table 5: Differences in Challenges Related to Understanding Learning Environment between Beginning and Experienced Science Teachers

	Teacher type	N	M	SD	t	P-value
Challenge with learning environment	BT	33	3.26	0.44	0.73	0.472
	ET	27	3.18	0.46		

N = 60 df = 58 p > 0.05
 Source: (Field Data, 2011)

The picture portrayed here might be as a result of the mentorship programme the teachers were exposed to during the initial teacher training programme. As claimed by Harrison, Lawson and Wortley (2005) and Bullough (1989), the use of reflective strategies by mentors to support beginning teachers' learning help them to construct a strong image of themselves as teachers and enable them manage their classrooms effectively.

The last theme which looked at the challenges related to the understanding of professionalism was compared using the means scores of the beginning and experienced science teachers respectively. The result obtained is shown in Table 6.

Table 6: Differences in Challenges Relating to Understanding of Professionalism between Beginning and Experienced Science Teachers

	Teacher Type	N	M	SD	t	P-value
Challenge in development	BT	33	2.87	0.55	- 0.39	0.701
	ET	27	2.93	0.59		
N = 60		df = 58		p > 0.05		

Source: (Field Data, 2011)

Comparing the mean score of beginning teachers (M = 2.87, SD = 0.55) with the mean score of experienced teachers (M = 2.93 SD = 0.59) and with alpha level set at 0.05, the test was shown to be not statistically significant, $t(58) = -0.39$, $p > 0.05$ as presented in Table 6. This means that there was no significant difference in the mean scores of the two groups.

4.0 Conclusions

It can be concluded from the study that an independent samples t-test conducted to compare the mean scores of the challenges between beginning science teachers and experienced science teachers in the teaching of Integrated Science in the Kwahu West Municipality showed that, there were no significant differences existing in the challenges faced by beginning and experienced science teachers 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 beginning science teachers and experienced science teachers 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 need to be supported regularly by the GES to enable them develop professionally to meet the changing demands of their work.

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