

Science Teacher Quality and Effectiveness: Gweru Urban Junior Secondary School Students' Points of View

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Abstract

The purpose of this study was to examine the perceptions among junior secondary science students from Gweru Urban secondary schools in Zimbabwe towards science teachers' teaching quality and effectiveness. This qualitative study approached and interviewed Form 2 students from 10 different schools in Gweru urban. The results show that three key dimensions of science teacher quality and effectiveness emerged: teacher's scientific knowledge, teacher's pedagogical skills and teacher's social competence. Findings suggest that the teachers can promote and enhance teaching effectiveness by applying a positive student approach, understanding students' learning difficulties, acknowledging the individual student, being someone the students can trust, being able to organise and teach in interesting and flexible ways, using good teaching methods, their ability to plan and structure the content and the use of practical investigative science in the classroom. Student perspectives, however, retain a humanistic vision of teaching and learning. Students want teachers who care and respect them, who help them learn and make learning interesting and fun. This study adds value by unveiling the key antecedents and predictors of students perceptions thus confirm previous findings that teacher quality is an important educational issue. It is apparent from this study that quality teachers must embrace the vision of caring for students and their learning. The results of the research indicated that students highly value teachers who are both passionate about the subject taught and passionate about their students. Secondary school science students prefer teachers who teach science in a way that is both interesting and relevant to the student.

Keywords: science, teacher quality, students perceptions, teacher preparation

1. Introduction

Increasingly, nations need a skilled, knowledgeable workforce and a citizenry equipped to function in a complex world. Competent workers and citizens, in turn, need a sound understanding of science and mathematics; elementary and secondary schools are responsible for ensuring that they acquire this knowledge. In recent years, one of the most important goals of teachers' education is to prepare "effective" teachers, who are able to facilitate learning for all students. Effective (science) teaching is undoubtedly an important – if not the most important – objective in school science education. This paper recognises what constitute pre- and in-service teacher education courses are aimed at facilitating more effective pedagogical practices amongst teachers-to-be and teachers respectively. Additionally knowing that science teacher quality is related to students' achievements is very important for the educational community especially for the Universities and colleges responsible for teacher training. They need to know students opinions on science teacher's effectiveness in order to take into consideration in the future changes of Program Studies, the content of the courses and the topics that are needed to be introduced in these.

A number of desirable and undesirable teacher attributes that affect classroom teaching have been well described in educational literature. (Sheehan and Duprey, 1999; Spencer and Schmelkin, 2002; Okpala and Ellis, 2005). These attributes include personality traits, instructional organization, and the instructor's ability to make the subject useful. Schaeffer, Epting, Zin and Buskist (2003) studied both faculty members' and students' perceptions of effective teachers and effective teaching. Their study yielded characteristics that included the following: caring,

encouraging, approachable, enthusiastic, respectful, knowledgeable, empathetic, passionate, and having a sense of humor. Gordon and Yocke (1999) have shown that a teacher who develops a clearly defined, well-organized topic is typically considered to be helpful in the learning process while Rosip and Hall (2004) indicate that an energetic instructor who can simplify complex topics, while appearing completely in control of the class, is perceived to be more effective than instructors who do not exhibit these characteristics. On the other hand, Babad, Avni-Babad and Rosenthal (2003) have also shown that an educator who is easily understood, stays focused on the learning objectives, and interacts directly with the students is perceived to create a better environment for the retention of knowledge than instructors who do not.

According to Cohen (1981) teaching effectiveness can be defined as the ability to be useful, helpful, and valuable in facilitating learning. Thus an effective teacher is one who contributes to a student's acquisition of knowledge and skill by using a number of techniques associated with the promotion of learning and who displays personal characteristics commonly associated with a positive learning environment. Dunkin (1997) considered that teacher effectiveness is a matter of the degree to which a teacher achieves the desired effects upon students. Teacher effectiveness is thus used broadly, to mean the collection of characteristics, competencies, and behaviors of teachers' at all educational levels that enable students to reach desired outcomes, which may include the attainment of specific learning objectives as well as broader goals such as being able to solve problems, think critically, work collaboratively and become effective citizens.

Defining teacher quality has been both problematic and elusive. Although defining and measuring teacher quality remains difficult, a growing consensus is developing about some of the characteristics of high-quality teachers. Research studies have found that teachers more effectively teach and improve student achievement if they themselves have strong academic skills (Darling - Hammond 2000), appropriate formal training in the field in which they teach (Ingersoll 1999), and several years of teaching experience (Wayne and Younger 2003).

Some indicators of quality, such as holistic view of subject matter, subject-matter knowledge, pedagogical knowledge and knowledge about students are components in the definition of highly qualified teachers (Rice, 2003). The teaching commission of the United States (2004) notes that quality and effective teaching entails critical knowledge of one's subject, knowing how to teach it, and actually being able to teach it by combining passion and art along with academic prowess. Hart and Teeter (2003) posit that having the skills to design inspiring learning experiences and having a caring attitude toward students as the two most important qualities for an effective teacher.

Research studies on teacher quality provide convincing evidence that quality teachers matter, but the evidence on what constitutes a quality teacher are mixed (Hanushek, 1997; Darling-Hammond, 2000). This study was undertaken to bridge the research gap by using a qualitative approach in analyzing the perceptions of Zimbabwean Junior secondary school students on science teacher quality and effectiveness.

2. Rationale for the Study

There is wide agreement among researchers and educators that teachers play an important role in the lives of students—that students will fare better if placed in a classroom led by Teacher A than in one led by Teacher B. But what characteristics distinguish the more effective teachers from others? And why do these characteristics matter? In other words, what is it about specific characteristics that lead to greater effectiveness? These are some of the most fundamental questions in educational research and are related to nearly every major aspect of educational systems, including teacher training.

Teacher effectiveness has become a standard for teacher preparation (Wong and Wong, 1998), a basis for staff development (Danielson, 1996) and a guideline for teacher evaluation (Flores, 1999). In fact, since the middle of the twentieth century the issues of teacher quality and effectiveness have attracted the attention of the educational community. As a result a wide range of scholars (Danielson, 1996; Harris, 1998) have focused on this issue and have approached the topic by establishing categories of teacher characteristics, viewed mainly from the perspective of adult-teachers, administrators, teachers educators and educational researchers. Despite the importance of knowledge about students' perceptions as an informant to effective teaching, there is dearth of literature in this area in Zimbabwe. It was therefore important for the researchers to identify the qualities of science teachers preferred by Zimbabwean junior secondary school students which enhanced the students' learning outcomes.

The findings of this study will help the Ministry of Education to improving teacher quality in Zimbabwean schools. Improving teacher quality thus entails policies concerning recruitment, early preparation, retention (including attention to working conditions), as well as professional development. The study will also benefit teacher training institutions to come up with educational programs that prepare effective highly qualified science

teachers as well as drawing up in- service programmes that equip science teachers with current pedagogical skills to enable them to achieve positive educational outcomes in students.

3. Aim of the Study and Research Questions

The aim of this study was to examine the perceptions among students from Gweru urban junior secondary school students towards science teachers teaching quality determinants and what they value in their science teachers. Specifically, what are the instructional practices of teachers who facilitate high growth in student achievement? In an effort to address this guiding question, the following research questions were formulated:

- 1). How do students define an effective teacher?
- 2). What kind of knowledge do students have about the characteristics of science teachers' effectiveness?
- 3). What qualities do students value in their science teachers and why?
- 4). How might student knowledge of effective teacher be infused into the content and experiences of science teacher education programs?

4. Methodology

4.1 Design

A qualitative survey design was used in this study. By using this approach the researchers expected to maximize the exploration of junior secondary school students' subjective experiences and perceptions of important effective science teaching characteristics. As Leedy and Ormrod (2001) point out, qualitative designs are normally appropriate for studies that seek to gain insight about the nature of a particular phenomenon. This study sought to establish characteristics of effective science teachers and quality science teaching as perceived by junior secondary science students from Gweru Urban secondary schools in Zimbabwe.

4.2 Sample

The sample consisted of 60 students of form 2 grade who attended 10 different Secondary Schools in Gweru urban. Six students from each school were selected in such a way that the sample appeared to be representative of the population by gender, socio-economical status and school achievement. The sample was conveniently selected from schools where the researchers had contact persons for easy data collection.

4.3 Data Collection

Data were collected over a three-month period through audio-taped interviews conducted in the schools by the researchers. Interviews contained both closed and open-ended questions designed to elicit the children's understanding of effective teachers. Drawing from their own experiences as secondary students, participants were asked to identify characteristics of effective science teachers as well as identifying characteristics that they believe were important to effective science teaching.

All the audio-taped discussions were transcribed by the researchers in protocols analysed and placed into categories for teachers' pedagogical skills, scientific knowledge and social competence. Initially, each participant was interviewed individually and after each child interview, all of the students in a school were brought together for a group interview where the researcher could clarify and pursue new ideas, respond to comments and questions of the students.

4.4 Data Analysis

Content analysis was used in data analysis. Responses were first analysed by listing all the attributes identified by the participants. Participants' responses were then put into attribute categories.

5. Findings

The data of this study were analysed by codes and then shaped into categories according to the literature. Findings fell into three distinct groupings:

- (i) Teacher's social competence. This concept has, as its consequence, the teacher's ability to communicate with the student, a positive student approach, understanding students' learning difficulties, acknowledging the individual student, being someone the students can trust.
- (ii) Teacher's pedagogical skills. This component includes that which in more general terms is called teaching skills, interpersonal skills, classroom procedures and the ability to organise and teach in interesting and flexible ways, using good teaching methods.

- (iii) Teacher's scientific knowledge. This component is related to the teachers' subject knowledge and their ability to plan and structure the content.

5.1 Students' Definition of an Effective Teacher

The essence of the definitions of effective science teachers from students across the schools were described in the words of one student from Ascot high school who said, "*the most important thing teachers do is to help us learn science*". Generally, learning was at the heart of students' explanations about their good science teachers. For example, they noted that effective teachers like to help students understand and "*try to explain, more than once if it is necessary, what we don't understand*". An effective science teacher "*has to possess sound knowledge and understanding of his discipline; has to know very well the content of science can explain everything very well, use demonstrations, laboratory practicals and information communication technologies in teaching science*". Finally an effective science teacher is one who "*can make teaching science fun and interesting so that students want to learn*".

6. Discussion

6.1 Teachers' Scientific Knowledge

The learners identified various forms of knowledge needed by effective teachers in teaching science: science knowledge and pedagogy including knowledge of students' abilities. Students noted that teachers need to have knowledge and skills in topical issues related to the science subject. Effective science teachers must have studied this subject. Students said that science has to be taught by qualified science teachers who know how to explain and teach the subject. Atilla (2007) argues that having science teachers who know their content helps promote scientific literacy and foster an understanding and appreciation of science among students of all ages. Furthermore an important area of knowledge of science teachers, as identified by these students, is the knowledge of their students' abilities and interests. The students argue that teachers should know about their abilities, so that they could help them in learning the difficult scientific concepts, should know their interests and what they like to do, so that teachers could make science a more fascinating subject (not so boring). Students also stated that an effective science teacher should consider other subjects in the curriculum when giving homework so that they can do the science work during the school time. The frequency and the scope of knowledge about students, mentioned by these children, indicate the importance they place on their teachers' knowledge of them beyond the academic achievements.

6.2 Teachers' Pedagogical Skills

Students identified teacher competence in the classroom as a factor that helped them in the learning of science. This component includes that which in more general terms is called teaching skills, i.e. the ability to organise and teach in interesting and flexible ways, using good teaching methods. Students discussed the ability of their teachers to explain clearly scientific information, concepts, and students' questions as well as their teachers' willingness to address and answer questions. The teacher's ability to communicate with the student, a positive student approach, understanding students' learning difficulties, acknowledging the individual student, being someone the students can trust are some of the skills students identified as helping them understand scientific concepts and phenomena effectively.

Additionally they mentioned that effective science teachers promote and encourage student centred teaching and cooperative learning. Co-operative learning groups promote community aspects of the classroom and the role of discussion with peers in helping students to learn science. This offers many benefits for students for their learning and growth. For example, peer-peer discussions in co-operative learning groups can promote meaningful learning by helping learners to help each other to incorporate new experiences and information into their existing cognitive structures in a non-arbitrary and non-verbatim way. Therefore, it is believed that co-operative learning can foster the development of deep understanding (Joyce et al, 2000a).

In the interviews conducted, students cited that teachers can make science learning fun and interesting by using a variety of materials and strategies in their teaching.

The use of the interdisciplinary approach, projects, fieldwork, plays games, give choices and show tricks to motivate students. Finally, to be good and effective teachers, science teachers need to manage their classrooms effectively. Students explained that teachers must be attentive to behaviour, state clearly what they want from students, have rules that all must follow and set a good example.

6.3 Teachers' Social Competence

Students also seem to be aware of their teachers' personal qualities, what kinds of people they are and how they treat them. In this study student identified significant behaviours they associated with their effective teachers. Sixty percent of the students identified their effective science teachers as respectful of students while 30%

recognized them as fair and polite. They explained that respect of students develops interest and motivation to learn and that teachers should not have a favourite, they must like all students equally. The remaining 10% said that effective teachers are fun with a sense of humour and very enthusiastic.

This humanistic behaviour refers to the teacher's vigour, power, involvement, excitement, and interest during a class presentation. Enthusiasm manifests itself by the teachers use of eye contact, gesturing, movement, use of supportive and approval behaviours, variety of teaching techniques, and love of science. Students also wish to see the teachers who care about them, who are accessible not only in the class but also outside the class, and who create a stress-free learning environment. The indication here is that students from these schools care deeply about the kind of people their teachers are and they understood that teachers' attitudes affected students' learning and learning was at the heart of the science education process.

7. Conclusion

The findings of this study indicate the ability of students to define effective science teachers by their characteristics and can argue what they value in their science teachers. This research shows that students want teachers who know to teach science, help them learn science and make learning fun. Further more students want teachers who care about them, and their interests, who treat them with respect. Treating students with respect is the basis for the relationship-centred framework that focuses on fulfilling students' emotional needs to ensure that they want to learn science.

The results of this study do confirm previous findings (Darling-Hammond, 2000; Okpala & Ellis, 2005) that teacher quality is an important educational issue, and that teacher subject knowledge and pedagogical skills are an important component of teacher quality. It is apparent from this study that quality teachers must embrace the vision of caring for students and their learning. The primary customers of educational organizations are the students, and quality teachers need to be committed to students and their learning goals. Quality teachers must have the ability to use a variety of instructional methods in their classroom to meet students' learning needs, create a relaxing environment and cater for students' needs and interests.

Finally if science educators are to achieve the goal of science teacher education to prepare effective teachers who are able to facilitate learning science in all students, they must be informed and guided by the voices of students themselves, as they spend their time with teachers and they are the persons to whom teachers addressed in the education process.

8. Recommendations

The study makes the following recommendations:

- 1). Teachers do not enter the classroom as finished products. Most teachers who remain in the profession improve and grow over time and become better therefore we should connect teacher professional development with teacher preparation standards, student standards, curriculum and assessments to achieve an aligned system of preparing and supporting new and in-service teachers.
- 2). Continuous professional development is critical to developing and maintaining high quality science teachers. The Ministry of Education should ensure that all teachers have the chance to improve their classroom instruction by receiving ongoing training aimed at professional growth and better student outcomes. The Ministry of Education should "be held responsible for ensuring that all teachers benefit from scientifically based professional development opportunities that focus squarely on assessing and improving instructional practices and thereby raising the quality of science education.
- 3). Teaching skills and content knowledge of teachers should be routinely observed in the classroom and evaluated throughout their careers. Such teacher performance evaluations should include relatively low-stakes evaluations, such as ones that provide remediation to a teacher, determine assistance required by the teacher, or identify the effects of a professional development program, or evaluations for more high-stakes decisions, such as performance pay, promotion, or tenure.

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