

CHAPTER ONE

THE PROBLEM AND ITS SETTING

1.1 INTRODUCTION

In the year 2001 curriculum 2005 was implemented in grade eight at all schools in South Africa. Curriculum 2005 makes extensive use of the Outcomes-Based Education (OBE) approach in all learning programmes of the school curriculum. Van der Horst and McDonald (in Bitzer 2001: 101) regard OBE as a learner-centred, results-oriented approach in which:

- Learners should be allowed to learn to their full potential;
- Positive and ongoing assessment should promote student confidence;
- Learning environments should be inviting, challenging and positive; and
- Multiple stakeholders, like teachers, learners, parents and the community should share the responsibility for quality learning.

Bitzer (2001:101) relates OBE with cooperative learning by arguing that cooperative learning could play a major role in promoting the critical cross-field outcomes specified in Curriculum 2005, both directly and indirectly. In planning and structuring cooperative-learning opportunities well, educators could mediate the development of

- Communication skills, by supporting learners to produce and respond to both simple and complex communications;
- Problem solving skills, by supporting learners to identify, clarify and solve problems in groups. This is against the traditional approach where questions are asked by the teacher who knows the answer rather than learners who do not know (Osborne 1997: 78).

- Personal and interpersonal skills, by enabling learners to work and maintain working relationships with others in cooperative groups.

In addition to promoting the critical cross-field outcomes, assessment as applied in cooperative learning could play a major role in realizing the objectives of OBE.

- Learning in cooperative groups allows for assessment that cannot be used when learners work alone, individually or competitively;
- Cooperative learning groups enable educators to assess diverse learning outcomes such as critical thinking and level of reasoning, skills performance, knowledge communication, interpersonal and small group skills, self-esteem and self-efficacy, and commitment to producing quality work.
- Cooperative learning provides additional sources of information like self- and peer-assessment, along with that of the educator.
- An opportunity is created to assess group as well as individual outcomes.

The foregoing highlights the importance of using suitable teaching and learning methods if the purpose of OBE is to be achieved. In science education, on the other hand, the national curriculum also specifies further outcomes that need to be addressed in all learning programmes. Curriculum development in science education at national level is, however, characterized by a rationalization of content and an increasing emphasis on science process skills. The outcomes statement outlined in Curriculum 2005 demonstrate the need for learners to use and develop their process skills within an investigative framework.

Without proper understanding of science process skills, facilitators will not have the know-how to facilitate learner's process skills appropriately. There is thus a need to integrate good teaching and learning methods with an understanding of science process skills. Such an integration is particularly important because teachers in particularly disadvantaged schools might not have the knowledge nor the skill to facilitate the learning of science process skills using cooperative learning approaches. This study will therefore investigate the effect of

cooperative learning on the development of learner's science process skills in two disadvantaged communities. In particular the study will evaluate the Group investigation method of cooperative learning, and the jigsaw method of cooperative learning in the development of learner's science process skills of observation, controlling variables, graphing, and experimenting.

1.2 MOTIVATION FOR THE STUDY

The background provided in section 1.1 and the literature review in chapter two emphasise both the importance of cooperative learning and science process skills in the learning of school science. However, it fails to indicate whether there is any relationship between the two concepts. This study was therefore initiated to investigate the effect of cooperative learning on the development of learners' science process skills. In particular the study will investigate the effect of the Group Investigation and Jigsaw methods of cooperative learning on the development of learners' science process skills of observation, controlling variables, graphing, and experimenting.

This is important because these skills are pedagogic means and not ends or goals of instruction. They are the devices the facilitator use to engage learners' minds and encourage their active participation in the learning process. Through these skills learners are engaged in making sense of their experiences.

1.3 RESEARCH QUESTIONS

This research will attempt to answer the following questions.

- What effect does the Group Investigation method of cooperative learning have on the development of learners' science process skills of observation, controlling variables, graphing, and experimenting?
- What effect does the Jigsaw method of cooperative learning have on the development of learners' science process skills of observation, controlling variables, graphing, and experimenting?

1.4 HYPOTHESES

The following null hypotheses are postulated.

1.4.1 Hypothesis one

The Group Investigation method of cooperative learning has no effect on the development of learners' science process skills of observation controlling variables, graphing, and experimenting.

1.4.2 Hypothesis two

The Jigsaw method of cooperative learning has no effect on the development of learner's science process skills of observation, controlling variables, graphing, and experimenting.

1.5 AIMS OF THE RESEARCH

The aim of this research is to evaluate the effect of two methods of cooperative learning on the development of learners' science process skills. Present workshops arranged by the Department of Education on OBE emphasise terminologies and other implementation procedures without paying considerable attention to the issues raised in this research. In particular, there is much emphasis on using group work in learning activities and less emphasis on the teaching methods that could be used to achieve the outcomes of the curriculum (in this case the development of science process skills). It is therefore the aim of this investigation to emphasize science process skills whilst engaged with cooperative learning.

1.6 METHOD OF INVESTIGATION

In this study a pre-test, post-test approach to research was used to investigate the effect of cooperative learning on the development of learners' science process skills at two schools. The pre-test is deemed important in that it serve somewhat as a point of reference of learner's competence in applying science process skills. This initial competence in science process skills is then compared with learners' competence after being exposed for some time to

cooperative learning methods. In this way the effect of the cooperative learning method, among others, becomes apparent.

The subjects for this research will be grade eight learners at two rural schools in the Northern Province of South Africa. The two schools were included in the research because of their unique characteristics. School A is used by the Department of Education as a pilot school for the implementation of curriculum 2005, and as such the teachers are expected to be familiar to teach using cooperative learning. The second school is not a pilot school and initial investigation indicated that cooperative learning had not yet been used in teaching learners. This was particularly important for this study as the results of the pre-test and the post-test would indicate the effect of the treatment, which in this case is cooperative learning.

A pre-test was administered to the 2001 grade eight learners at school A in October 2001. The learners at school A were exposed to the Group Investigation method of cooperative learning and thereafter a post-test was administered in April 2002. The 2001 grade 8 Common Assessment Task prepared for pilot schools was used for both the pre- and post-tests at school A.

At school B a pre-test was administered to the 2002 grade nine learners in April 2002. Technical problems (one teacher left the school and classes were combined and very crowded) prevented the start of the research at school B and therefore the same cohort was used the following year – by this time they were in grade nine and taught by a teacher (the researcher) competent in cooperative learning. A teacher who is competent and willing to use cooperative learning was not found for grade eights in this school. The learners at school B were exposed to the Jigsaw method of cooperative learning and thereafter a post-test was administered in August 2002. The Common Assessment Task was used for the pre-test and a self-constructed Natural Sciences Test was used for the post-test.

The data from the four tests were analyzed using descriptive statistics. The data were also analysed using the t-test for the testing of the null hypotheses.

1.7 DEMARCATION AND LIMITATIONS OF THE STUDY

1.7.1 Demarcation

The study is limited to the evaluation of the Jigsaw method of cooperative learning and the Group Investigation method of cooperative learning in the development of learner's science process skills. The study is further limited to assess the development of the science process skills of observation, controlling variables, graphing, and experimenting. These demarcations were necessitated by the limited nature of a dissertation of limited scope. In other words, comprehensive investigation of, for example, all the science process skills are beyond the scope of this research.

1.7.2 Limitations

The design of the study was limited to quantitative measures only due to the reasons advanced in section 1.7.1. Furthermore, no attempt was made to teach the particular science process skills used in the investigation. The literature on science process skills indicates that these skills need to be taught explicitly for learners to develop competence in applying process skills. The limited scope of this research did not allow for an intensive intervention that will address the process skills directly. In other words, the study did not attempt to teach the particular science process skills investigated in this research.

1.8 DEFINITION OF TERMS OR CONCEPTS

Cooperative learning: Cooperative learning is a set of teaching strategies used to help learners meet specific learning and interpersonal goals in highly structured groups (Eggen & Kauchak 1997). Cooperative learning is suitable for science teaching, especially in environments where the laboratory is a central part of instruction.

Science process skills: Science process skills are the sequence of events, which are engaged by researchers while taking part in a scientific investigation (Arena 1996:34).

Facilitation: Facilitation is the general way in which teachers react, respond, guide, probe, and interact with learners in the context of teaching, learning, knowledge acquisition and application (Ankiewicz, Adam, de Swardt & Gross 2001:191).

Scientific communication: Scientific communications in this context refers to the ability to listen, pose questions, and interact politely.

1.9 PROGRAMME OF THE RESEARCH

Below follows a brief description of what is contained in each chapter of this dissertation.

Chapter one focused on the introduction, research questions, hypotheses, aims of the research, research methodology, demarcations and limitations, definition of concepts, and the programme of the research.

Chapter two deals with the literature review on cooperative learning and science process skills.

Chapter three focus on the research design and the methodology of the research.

Chapter four presents the analysis and interpretation of data collected in the empirical investigation.

Chapter five provides an overview of the research by giving a summary of the main findings, recommendations, and conclusion.