

CHAPTER ONE

THE CONTEXT OF THE STUDY

1.1 INTRODUCTION TO THE PRESENT STUDY

This study describes the development and evaluation of a web-based package that was designed to assist teachers in using the Science-Technology-Society (STS) approach to teaching human population dynamics in South African schools. In order to improve on the web-based package, the package was evaluated using questionnaires and expert review. The information obtained from these methods was used to modify the package. Literature was reviewed on the problems experienced with teaching human population dynamics, requirements and demands of *Curriculum 2005*, Science-Technology-Society approach to teaching as an alternative method to teaching, the benefits of using computers, the theories of learning and professional development.

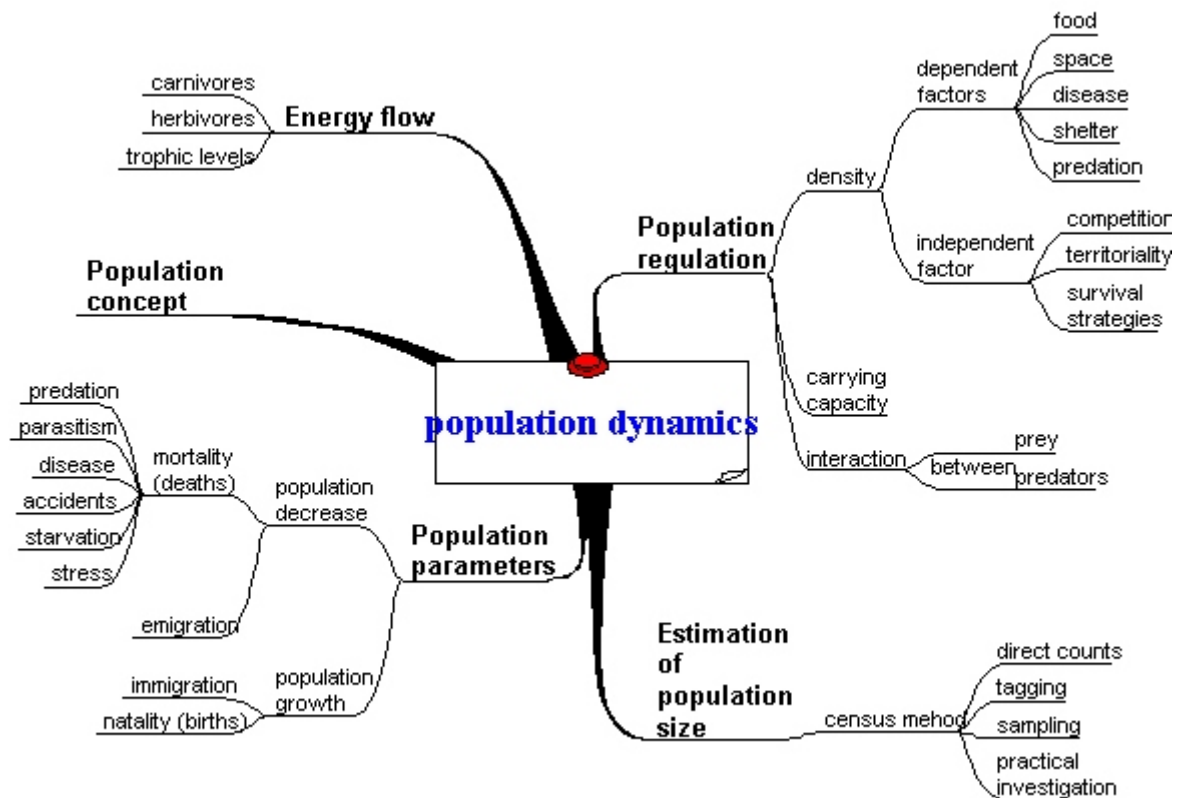
1.2 STATEMENT OF THE PROBLEM

Several educators claim that the biology curriculum in many countries is too theoretical and lacks relevance (Hurd, Bybee, Kahle and Yager, 1980; Hart and Robottom, 1990; Kumar, David, Berlin and Donna., 1996). In the USA, approaches to the teaching and learning of biology even in the 1990s are often textbook-centred and discipline-bound with little relationship to experiential learning, the personal needs of learners or societal issues (Hurd *et al.*, 1980; Hart and Robottom, 1990; Yager, 1993; Yager and Lutz, 1995). Research shows that South African schools also tend to follow a teacher-centred approach (Naidoo, Kruger and Brooks, 1990) and some researchers claim that schools concentrate on presenting concepts and principles based on an outmoded curriculum, which is too academic and which many teachers present in a way which lacks relevance (Singh, 1998 and Hockey, 1995).

A teacher-centred approach to teaching emphasizes the learning of facts so that learners can pass their examinations (Hockey, 1995). Most teachers emphasise their teaching on the final external examination, which has influence on how they teach their subject area. According to Naidoo *et al.*, (1990: 7) and Hockey (1995), *this teacher-centred approach to teaching has shown itself in classroom scenarios of discipline-bound, uncritical, transmissive teaching practices and behavior manipulation of learners through the use of textbooks and rote learning.* Hockey (1995:41) also argues that the pedagogy that teachers in South Africa tend to follow is predominantly teacher-centered, and traditional in its approach.

This teacher-centred approach can be seen in the teaching and learning of population dynamics. Human population dynamics is currently taught in the matriculation biology and geography syllabus in South African schools. The concept was introduced for the first time in the new syllabus of 1985 and was

examined for the first time in November/December 1987 (Hockey, 1995). The concept map below indicates the concepts taught under population dynamics.



Hockey (1995), in his research with 30 teachers in 19 schools from the Western Cape, found that human population dynamics as currently taught by these teachers largely emphasises the teaching and learning of facts and concepts, often out of any context to which learners can relate. He found that most teachers follow a mode of teaching that is suggestive of the above approach (i.e teacher-centred). The common use of this approach is, according to Hockey, mainly influenced by the large numbers of learners in their classes, which make teachers more comfortable to practice this mode of teaching. Most important is the fact that there has not been much emphasis placed on the teaching of population dynamics because it is the last section in the syllabus and teachers are pressed for time and skim through the content of population dynamics. Hockey suggests that there is very little time planning amongst teachers beyond timetable negotiations and exchange of ideas.

This teacher-centred and discipline-bound approach to teaching and learning creates problems because it tends to inhibit holistic thinking, critical evaluation of information and has no impact on the real lives of learners (Hockey, 1995). Such an approach is contrary to the belief that science teaching should make learning relevant to learners' daily lives and experiences (Singh, 1998). It is also contrary to the educational goals of developing intellectual autonomy in learners (Hart and Robottom, 1990). Secondly, the teaching approaches currently practised by some teachers do not meet the requirements and demands of *Curriculum 2005*.

These problems in the way human population dynamics is taught could be alleviated using the Science-Technology-Society (STS) approach to teaching.

1.3 STS - AN ALTERNATIVE APPROACH TO TEACHING HUMAN POPULATION DYNAMICS

An alternative approach to the teaching and learning of human population dynamics is the Science-Technology-Society (STS) approach, an approach that most South African teachers are unfamiliar with and unable to use. This approach emphasises social problems, issues and events as the starting point of learning experiences and the context in which science is learnt (Hart cited by Hurd, 1989). It makes science more relevant, interesting (Hart and Robottom, 1990) and easier to understand by linking it to real situations. Learners engage in activities which deal with problems affecting their society and they analyse these problems to attempt to find solutions (Fensham, 1994). These activities allow them to develop a variety of skills (Bybee, 1986; Rubba, 1987).

The STS approach requires learners to go out into the field to study real problems, issues or events. However, it is not always possible to do so in practice because of time constraints. To overcome this problem, STS can be taught through a computer programme. Chapter two (section 2.2) discusses in detail the use and benefits of using computers in teaching and learning.

The STS approach fits well with the requirements and demands of the new curriculum (*Curriculum 2005*) introduced in South Africa.

1.4 THE DEMANDS AND REQUIREMENTS OF *CURRICULUM 2005*

On 24 March 1997, *Curriculum 2005* was launched as a new education curriculum for schooling in South Africa which makes a number of demands on teachers. Sanders, Mckenney, and Van der Laan (1999) argue that “ *the new curriculum introduced by the government has placed responsibility for its success squarely on the shoulders of the teachers*”. *Curriculum 2005* requires that Natural Science teachers who previously taught in a very traditional way make some fundamental changes in the way they teach and the way that learners are expected to learn. The government requires that teachers draw from their own experiences to facilitate the development of learner support material to ensure that it is relevant and effective (National Department of Education cited by Sanders *et al.*, 1999). Four of the basic requirements of *Curriculum 2005* are that;

- lessons are made more relevant to the learners’ lives and experiences,
- learners become more actively involved in the learning process,
- learners develop a range of important skills, and

- assessment activities are used continuously to assist in the learning process (Department of Education, 2001).

Despite these demands of *Curriculum 2005*, research has shown that most teachers do not follow some of the outlined requirements because they find it difficult to understand the new curriculum, to teach accordingly and to produce their own teaching materials. Even though teachers are encouraged to design and produce their own learning programmes and learning materials, few teachers seem in a position to undertake this task. Some teachers have been found not to have time, the resources or often the skill to be involved in the development of high quality, educationally appropriate learning programmes and materials (Chisholm, 2000). As a result, some teachers feel over-burdened by what they regard as excessive and unrealistic demands that are being made on them (Chisholm, 2000).

Research has shown that teachers are struggling to implement the *Curriculum 2005*. They experience difficulties to;

- use activity-based lessons,
- use relevant lessons, and
- design their own materials and lessons (Khulisa, 2002).

One way to cope with some of these demands of *Curriculum 2005* is the STS approach and the use of computers to teaching.

1.5 AIM OF THE STUDY

A web-based package on human population dynamics was developed to help teachers teach human population dynamics using an STS approach. The aim of the study was to evaluate this web-based package and find ways to improve it.

This is important because designers do not adequately evaluate the programmes as they develop them (formative evaluation). Reeves (cited by Reeves and Hedberg, 2001:2) believes that “*at least part of the poor success record of instructional design is as a result of the fact that most designers have not used proper evaluation methods*”. As a result, designers have not been able to identify problems which could have been avoided by modifying the software during the developmental stages, and the quality of the resulting educational software is not optimized. Reeves and Hedberg point out that “*decisions informed by sound evaluation are better than those based on habit, ignorance, intuition, prejudice, or just best guessing*” (Reeves and Hedberg, 2001:2).

1.6 RESEARCH QUESTIONS

In order to evaluate the web-based package on population dynamics, the following two main research questions were used as a guideline:

- What are the views of natural science teachers and experts about the web-based package on an STS approach to teaching human population issues?
- How do the teachers and expert reviewers suggest the package can be improved so that it can better achieve its objectives?

1.7 IMPORTANCE OF STUDY

This study is important because it offers teachers an alternative way to teach science (human population dynamics) and at the same time provides them with useful material to use in their teaching as required in the new curriculum. According to Rogan (2000), "*Curriculum 2005*" has as one of its explicit goals the freeing of teachers from the restrictions of a rigid syllabus and the domination of the curriculum by textbooks. Even though the implementation of the new curriculum has not yet started at matriculation level, teachers are expected to develop learning programmes for their learning areas. However, teachers have experienced difficulties in developing outcomes-based packages which fulfil the requirements of "*Curriculum 2005*" (Pettitt, 2000; Sanders *et al.* 1999 and Chisholm, 2000). Because of these difficulties, and teachers' reliance on a teacher-centered approach this package is a valuable one. It will provide teachers with ideas about a learner-centered approach, which uses real-life problems in biology, and geography content (human population dynamics). It also enables learners to make links between their everyday lives and school activities.

1.8 CONCLUDING REMARKS

The next chapter explores the STS approach to teaching, theories used to design the instructional package, the benefits of using computers in teaching and the professional development of teachers.