CHAPTER THREE

HISTORICO-COMPARATIVE STUDY OF THE INSET PROVISION OF MATHEMATICS EDUCATORS AT THE SENIOR PRIMARY LEVEL IN A SELECTED DEVELOPED COUNTRY

3.1 INTRODUCTION

There is no doubt that the various activities of today have their forerunners in history. Many facets of mathematics that will assist the educators in understanding the present can be gained by a study of the past. This chapter therefore begins with a brief review of the history of mathematics. The fundamental objective of this strategy is to provide the mathematics educator with an appreciation of the subject, thereafter leading to the effective teaching of the subject.

This is followed by a presentation of the INSET provision of mathematics educators at the senior primary level in England. It is believed that in advocating the principles of educational borrowing, the researcher would be able to analyse and evaluate England's experience for South Africa in general and KZN in particular.

A study of the INSET provision of mathematics educators in a developing country would have been invaluable to this study. It would have enabled the researcher to show to what extent the format and strategies of INSET provision vary between a developed and a developing country. However, numerous attempts to gain information proved fruitless and time consuming. Hence, a sub-section encapsulating the INSET provision of mathematics educators in the senior primary phase in a developing country was excluded in this study.

3.2 HISTORY OF MATHEMATICS

As was mentioned earlier in this chapter, the intrinsic value of the history of mathematics for the educator is undoubted. Furthermore, it provides the mathematics educator with a broader view of the subject. In view of the above statements a brief review of the history of mathematics will now be provided.

All primitive civilisations developed concepts of number and measure as soon as trade progressed beyond the process of barter. Almost 6 000 years ago the Sumerians were using a numeration system based on the number ten referred to as the denary system. They also used a system based on the number sixty referred to as the sexagesimal system (Fitzjohn and Weber, 1990:1162). The knowledge gained solved basic problems of agriculture and social organisation.

The flooding in Babylon and Egypt demanded seasonal surveys of land, the techniques of which led to geometry. Political, commercial and religious pressures to build palaces, ships, temples and tombs stimulated the further development of geometry (Fitzjohn and Weber, 1990:1162-1163).

The Greeks established mathematics as a rigid study, placing mathematical argument on a logical basis so that prepositions, previously not self-evident, could be deduced from basic assumptions. The golden age of Greece produced mathematical beauty that afterwards lay dormant for centuries.

After the decline of the ancient world, advances in mathematics took place largely within Asian and Arabic civilisations. By the year 900, Muslim scholars began to build on what they acquired in terms of Arabic versions of Greek and Indian mathematical works. Thus, mathematicians expanded the Hindu decimal positional system of arithmetic from whole numbers to include the decimal fractions (Webb, 1998:2).

The Renaissance in Europe saw greatly revived interest in mathematics. Arabic texts were translated and studied and a great deal of Greek mathematics was rediscovered through Arabic translations. From the fifteenth century to the nineteenth century, the development of mathematics was an entirely Western European phenomenon (Webb, 1998:2).

As trade spread, the need for standardised units increased. The earlier systems were all based on convenience: for example, parts of the body were used for measuring length, the working capacity of oxen for area, stones for weight and skins for volume. In 1791 the French devised the metric system based on the metre.

International trade has now forced most of the Western World to adopt the metric system of measurement.

In summarising, it will suffice to say that mathematics knowledge in the modern world is advancing at a faster rate than ever before. This could be attributed to the demands of modern science, technology, industry and commerce. While the computer has made possible the solution of several long-standing problems in mathematics, new and equally challenging problems continue to arise.

The researcher will now examine the INSET provision of mathematics educators at the senior primary level in England. This will serve as a model for a developed country.

3.3 THE INSET PROVISION OF MATHEMATICS EDUCATORS AT THE SENIOR PRIMARY LEVEL IN ENGLAND

3.3.1 HISTORICAL BACKGROUND

Social utility controlled the curriculum since the Elementary Education Act of 1870. This Act by W.E.Forster, the Vice-President of the Committee of Council, made provision for universal elementary education. Education aimed at the conquest of illiteracy through a curriculum limited to formal studies with learners learning by heart and complying to silence, orderliness and conformity to rule. The emphasis on the curriculum was learners' attainment in reading, writing and arithmetic (Choat, 1980:16).

Arithmetic was organised along class lines with extreme thoroughness. Textbooks were few, closely printed and packed with lengthy and involved examples. They were written for educators rather than children and their authors assumed that educators would give elaborate oral demonstrations and detailed explanations of each new stage of learning.

The value placed on prowess in arithmetic was so great that almost half of the school day was given to working exercises, the transcription of figures from the board or listening to explanations of how new answers had been obtained. Education in most schools remained geared to the principle of rote learning. This arrangement offered educators the prospect of improved examination results and therefore better salaries.

With regard to the development of INSET in this period, Bagwandeen (1991:253) characterises INSET of educators as comprising single lectures or short series of lectures as those given in 1873 and 1874 at the College of Perceptors by Professor Joseph Payne. The lectures were occasionally supplemented by group discussions.

Bagwandeen (1991:253) in referring to Henderson (1978:24) reports that in the early years of the twentieth century INSET received a major stimulus. The Board of Education provided a third year of study through one year supplementary courses for educators with two years of PRESET. Accompanying these courses, short vacation courses mainly for educators in the rural areas were organised by the Board of Education. In addition Local Education Authorities (LEAs), Universities and other bodies provided short summer courses, part-time courses and series of lectures in the winter term for educators (Bagwandeen, 1991:253).

It was not until the Hadow Report in 1931 that educational change attracted attention. For the purpose of this study the INSET provision of mathematics educators at the senior primary level will be discussed in distinct periods, namely, the period between 1930 – 1950, 1950 – 1970 and 1970 to the present.

3.3.2 INSET PROVISION OF MATHEMATICS EDUCATORS IN ENGLAND 1930 - 1950

The deliberations of these two decades although interrupted by the war years, prepared the way for the development and publications of the later years both in relation to primary education and mathematics. With regard to INSET these two decades set the scene for many of the post-war developments.

The apparent serenity of the primary education scene was disturbed by the Hadow Report. Consideration will now be given to this report.

3.3.2.1 <u>THE HADOW REPORT (1931)</u>

The Consultative Committee of the Primary Schools, chaired by Sir William Hadow, had challenged some traditional curriculum patterns in its report presented in 1931:

> ***'The traditional view, still widely held, that memory is especially strong in young children and that the primary stage is pre-eminently the time for a great deal of routine work, requires large qualification. Reliance should be placed at this stage not only on mechanical memory, but also on that aspect of memory that is assisted by reasoning and understanding. The power of reasoning in children between the ages of 7 and 11 appears to be more highly developed than is generally supposed. We are of the opinion that the curriculum of the primary school is to be thought of in terms of activity and experience rather than knowledge to be acquired and facts to be stored.'***

(Addison, 1981:13)

Addison (1981:13) claims that these recommendations required the educator to relate the organisation of teaching situations to the learning needs of the learners; individual work and group activity were to be combined with traditional class teaching. However, although the heavy responsibility imposed on the educator to be imaginative, adaptable and creative was recognised, the importance of INSET became apparent later as the implications of the new ideas emerged. Addison (1981:13–14) levelled the following criticism pertaining to the report:

- References to mathematics in the report were very brief.
- Some extracts were revealing since they indicated that the synthesis between the child-centred experience theme of the

general curriculum and the content of the arithmetic syllabus had still to be more fully explored.

- Computational accuracy and practical exploration were both advocated but the reader is left with a sense of unresolved tension between these aims.

In March 1942 Lord Butler, President of the Board of Education, appointed a Committee under the Chairmanship of the Vice-Chancellor of Liverpool University, Lord McNair, to investigate the sources of supply and methods of recruitment and training of educators and youth leaders (Bagwandeen, 1991:253). With regard to INSET the McNair Committee recommended that educators be granted at least a sabbatical term on full pay after five years of consecutive teaching. It also proposed the establishment of an area training service to provide both PRESET and further professional training. In addition consideration was given to Schools or Institutes of Education established by Universities to exercise influence upon education on a partnership basis with Colleges (Bagwandeen, 1991:254). Bagwandeen (1991:254) stipulates further that these Schools or Institutes of Education which were subsequently established, positively stimulated INSET.

With regard to wartime measures of social reconstruction, Matthews (1992:6) considered the 1944 Education Act to be the first. Brief consideration will now be given to this Act.

3.3.2.2 THE 1944 EDUCATION ACT

Bailey (1992:67) echoes that while the 1944 Education Act reformed the whole structure of education in England, it made no reference to curriculum matters save for religious and physical education. Nevertheless, he claimed that the Act opened the way for curriculum innovation. The 1944 Education Act, states Matthews (1992:6), required each local authority to ensure that in their area there are sufficient schools for providing the following:

- Primary education that is defined as full time education suitable to the requirements of junior learners up to the age of 12.

- Secondary education that is defined as full time education suitable to the needs of senior learners in the age group 12 – 19.

This Act, argues Matthews (1992:6), catered for the capabilities of all learners rather than for just an elitist few.

3.3.3 INSET PROVISION OF MATHEMATICS EDUCATORS IN ENGLAND 1950 - 1970

When the Russians launched the first Sputnik in 1957 the Western World viewed this development with grave concern. Up until then the countries of the West had rather patronisingly regarded the Union of Soviet Socialist Republics (USSR) as a backward giant of a nation, hopelessly engaged in trying to educate its largely peasant people to achieve the technological advantages of its more favoured European neighbours (Moon, 1986:147). This formerly retarded nation had outstripped its European neighbours in finding scientists and mathematicians of a very high calibre.

In order to keep up with the USSR at all costs, the first step was to change the name of the subject. Almost overnight the word arithmetic disappeared from the timetable, being replaced by that much more glamorous term: Mathematics (Moon, 1986:147).

A reassessment of the study of science and mathematics soon followed. In England, the Nuffield Mathematics Teaching Project began in September 1964. Moon (1986:122) remarks that this date could be seen as marking the beginning of the English response to the international movement for mathematics reform at the primary level. Pretorius (1976:105) claims that it was due to the interest that the Nuffield Foundation showed in mathematics that there was a quickening in the pace of curriculum development in the early sixties. Since the Nuffield Project dominated the development of mathematics teaching and INSET provision for a decade or more, it requires further attention.

3.3.3.1 THE NUFFIELD PROJECT

The Nuffield Project's main aims were to stimulate interest in mathematics and develop methods of teaching the subject more efficiently to learners from five to thirteen years. The theme of the project was that the curriculum should be taught in terms of activity and experience, rather than knowledge to be acquired and facts to be stressed.

Incentives to the project creation were the results of the research work of psychologists such as Jean Piaget and Jerome Bruner. Most important of all, the Nuffield attitude was perfectly in line with the general acceptance of learner centred education which emphasised individual expression, inhibitedness by too rigid subject barriers as being incorrect and the importance of learners discovering for themselves (Pretorius, 1976:63).

Emphasis was placed on structural apparatus while the task of the educator was to create a learning situation in which the learners were able to use their own creativity to construct their own concepts. The lessons begin with free play with the structural apparatus followed by games involving rules leading to activity involving verbalizing and writing. The essence of this approach was that learners should work at their own pace, make their own discoveries and think for themselves. This would also occur in an atmosphere where there would be little in the way of controlled direction.

Mathematics teaching was conducted through the use of syllabi by educators rather than through the offer to schools of teaching material utilizing structural material and guides, which could be adapted and modified as educators saw fit. Educators were also invited to make their own contributions towards improved mathematics teaching. This attitude emphasised the evolving nature of mathematics teaching and the need for educators to adapt to changing circumstances.

In 1964 and 1965 LEAs were invited by the Schools Council to volunteer for participation in the Nuffield Project. A condition of participation by the LEAs was the provision of teachers' centres containing large workrooms with appropriate storage space and rooms for meetings and seminars. This was essential, as the INSET of educators was an integral part of the Nuffield programme. The centres were seen as the best means of training the educators, disseminating the trial material and publicising the results (Pretorius, 1976:68).

The project generated within fourteen selected pilot areas representing communities throughout England, Wales and Scotland. The local centres became resource centres in relation to the primary school curriculum as a whole. In 1966, sixty-five new areas were included. Altogether 2 200 schools, 13 000 educators and 500 000 learners were involved in the project.

Over two hundred centres were eventually active where educators discussed, modified, amplified and adapted the Nuffield materials, so that the project involved the educators as well and not just a central team. Ten regions were formed to coordinate the activities of the LEAs. These regions arranged local meetings, ranging in length from one day to a conference lasting a week. Within each region there was a great deal of activity, courses, exhibitions and above all discussions. A certain amount of aftercare was carried out. This included holding the occasional national conference and updating some of the educators' guides (Pretorius, 1976:68).

Moon (1986:68) outlines the following merits of the Nuffield Project in respect to mathematics:

- Learners were more alert and ready to think for themselves.

- Their powers of reasoning were more developed and this showed in other subjects as well.

- Learners have learnt to work together quietly, each contributing their share in the discovery or in applying a technique.

- Learners of all levels of ability could successfully solve the problems set if these were carefully selected.

- The more intelligent, creative learner could often discover other relationships in the situation.

- The less intelligent learner found satisfaction in the practical aspect itself and in the mastery of the technique required.

The following criticisms of the Nuffield Project with respect to mathematics were highlighted by Moon (1986:83):

- The mathematical achievements of the learners were difficult to assess because the project did not lend itself to the traditional methods of testing.
- The basic number of skills, for example, bond-work was seen as being done insufficiently and was questioned by the public in general.
- Group activity appealed to the extrovert personality and was seen as a method inhibiting some learners.
- It required inspired hard work on the part of the educators, firstly, in devising the problems and secondly, in checking the progress of each learner. Major drawbacks experienced by the organisers have been due to lack of dedication on the part of the educators or to recently qualified, inexperienced educators.

The project ended officially in September 1971. Ernest (1989:9) considers the main characteristics of the decade of the 1960s with respect to mathematics as:

- The broadening of the mathematics curriculum to include new topics, both pure and applied.
- Curriculum development projects in mathematics, such as the Nuffield Project, at the primary school level.
- Progressive teaching methods, including discovery learning and the beginnings of interest in problem solving and mathematical investigations.

Ernest (1989:9) stipulates that the 1960s could be seen as a starting point in relation to innovations in the teaching of mathematics over the next few decades. With regard to the development of INSET of educators in England in the 1960s, Mkhize (1989:24-25) outlines the following:

- The increase in the number of teachers' centres and the prospect of the school-leaving age raised brought about some important developments in INSET in that more educators attended INSET courses.
- The centres served as venues for professional interchange of information, ideas and innovations and for the exhibition of teaching and learning resources.
- Television emerged as an INSET medium.
- A substantial number of non-graduate educators enrolled in the Open University for degrees like Bachelor of Education (B.Ed.) and higher degrees like Masters in Education (M.Ed.).
- There was greater emphasis on school-based INSET.

3.3.4 MATHEMTICS TEACHING AND INSET PROVISION IN ENGLAND 1970 - PRESENT

By the mid 1970s a public reaction to innovation programmes in education had set in. Sovchik (1989:6) points out that 'back to basics' became a rally cry among many critics of education. The Schools Council decided that it was time to take a look at mathematics teaching in the primary school. The main aims of the Schools Council were to find out how far the various changes that were lumped together under the umbrella title of modern mathematics had penetrated schools, to pin point any difficulties, to look at mathematics attainment and standards and to present educators with an overall picture of what was happening (Ward, 1979:10).

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In 1972 the Primary School Mathematics Evaluation Studies Project was established. The first few months of the project were spent obtaining a general impression by talking to learners, educators, advisors, lecturers and people concerned with curriculum development in mathematics. According to Ward (1979:11-12), the project found general agreement on the following matters:

- Since the mid 1960s, there had been a gentle swing of the pendulum away from some aspects of modern mathematics, both in content and method. Learners in some cases had been hampered by weaknesses in their basic skills of computation.

- There had been a renewed emphasis on instant recall of addition and subtraction of facts and on learning tables.

- Concern was raised over two very different types of schools – the small hard core of rigidly traditional schools and the few progressive schools where too many ideas were taken up too quickly.

With regard to INSET, Bagwandeen (1991:256) mentions that during the 1970s doubts about the quality and effectiveness of much traditional INSET began to be expressed. He claims further that resources to support INSET provision were in short supply and those made available were not always deployed to full advantage. Courses were designed to benefit individual educators. Furthermore, the traditional formats of INSET courses were incapable of providing adequately for the different school contexts in which educators were working (Bagwandeen, 1991:257).

This review sketched the background to the conditions that existed with regard to INSET when in 1971 the James Committee under the Chairmanship of Lord James was formed to consider the education and training of educators. The thinking of the James Committee was governed by two principles. Firstly, that their proposals should be capable of speedy implementation. Secondly, that the status and independence of both the teaching profession and Colleges of Education should be enhanced.

While the Committee made 133 recommendations, the main issue was that the education and training of educators should fall into three cycles. The first concerned the personal education of the student, the second the pre-service education and the third the in-service education. Highest priority was to be given to the expansion of the in-service cycle. The Committee recommended that every seven years all educators would have 12 weeks paid leave for in-service education and a national network of professional centres would be set up for this purpose. According to Bagwandeen (1991:257) there can be no doubt that the James Committee Report held the promise of being a most powerful catalyst in the development of teacher education and INSET in England. Bagwandeen (1991:258) makes reference to the following possibilities offered by the James Committee Report:

- It advocated the necessity of life-long education.
- It came down on the side of voluntary participation by educators.
- It offered a solution to a long-standing weakness of the career arrangements for serving educators.
- It suggested that INSET is a critical factor in education because knowledge, society and educators are all subject to continuous change.

The James Committee had hoped that the urgency with which they had produced their report would be matched by an equal urgency in decision-making by the government. As the James Committee Report proved highly polemical, a lengthy period of consultation was initiated. This resulted in a Government White Paper, Education: A Framework for Expansion (Bagwandeen, 1991:260). Bagwandeen (1991:260) indicates that the James Committee and the White Paper did little to advance a meaningful policy for INSET.

In the 1980s there was a rapid increase in INSET in various directions (Mkhize, 1989:25). Bagwandeen (1991:260) in referring to Whittaker (1982:27) and Lewis (1984:7) suggests that the emphasis on INSET could have resulted from the cutbacks in initial training at this time in England.

School focused INSET became the key to INSET provision in England. School principals and LEAs had begun to recognise that the basis of success for INSET lay in the individual school and its staff (Bagwandeen, 1991:260).

With regard to the development of mathematics teaching, the most important event in the 1980s was the publication of the Cockcroft Committee Report. Ernest (1989:2-3) highlighted the following significant issues and recommendations made by the Cockcroft Report:

- Recognition of the importance and the potential of microcomputers and electronic calculators for the teaching of mathematics.

- Acknowledgement that the learning of mathematics involves more than basic knowledge of facts, skills and procedures. It also crucially involves conceptual structures, the general strategies of problem solving and attitudes to and the appreciation of mathematics.

- Acknowledgement that successful learning requires a range of teaching styles at all levels, including discussion, problem solving, mathematical investigation, appropriate practical work, in addition to the more traditional approaches of exposition and the practice and reinforcement of skills.

- A powerful critique of the traditional forms of school assessment in mathematics at age 16, which for a great many learners focused more on failure than on mastery and success. Associated with this is a further critique of the nature and demands of the mathematics curriculum for the below average attaining learner.

- Recognition of the inadequacy of much of the teaching in schools due to the insufficient training and preparation of many educators in mathematics, and the use of non-specialists to teach mathematics.

- Recognition of the necessity for curriculum leadership in school mathematics at all levels, including the coordination of mathematics in primary and middle schools, and a recognition of the complex demands of this role, and that of the Heads of mathematics Departments in secondary schools.

- Recognition of the importance of mathematics in the world of work and in society in general, tempered with knowledge of many adults' ignorance and fear of mathematics. More generally, there was an acknowledgement of the importance of broader social issues and contexts for the teaching of mathematics in a number of ways, especially with regard to gender and the issue of the under-achievement of girls in mathematics.

Ernest (1989:4) maintains that, perhaps, the most important development in the teaching of mathematics in the 1980s had been the widespread recognition and adoption of the range of teaching styles endorsed by the Cockcroft Report. Ernest (1989:4) provides the following opportunities that mathematics teaching at all levels should include:

- Exposition by the teacher.
- Discussion between educator and learners and between learners themselves.
- Appropriate practical work.
- Consolidation and practice of fundamental skills and routine.
- Problem solving, including the application of mathematics to everyday situations.
- Investigational work.

With regard to the development of mathematics in the 1990s, Ernest (1989:7) questioned whether there would be further reaction in the 1990s against what was seen as progressive of the 1980s. While he maintained that such a reaction was possible, he also claimed that several new factors would suggest that mathematics education was not doomed to replay history. Ernest (1989:10) outlines the following new factors:

- There is a new realism. Those involved in education accept their accountability to parents and authorities as a matter of fact.

- The desired outcomes of education have been redefined to include more than the basics. Employees and authorities agree that in addition to literacy and numeracy school leavers need presentation, communication and decision-making skills, and the ability to solve problems, to participate in teamwork and to work co-operatively. These are the skills addressed by contemporary mathematics teaching at its best.

- The mathematics educator has become increasingly professionalised with an all-graduate entry to the profession. Teacher education requires four years of advanced study for an honours degree in education, or a three-year B.A. or B.Sc. followed by one year of study for a Postgraduate Certificate of Education (PGCE).

- Mathematics education has also become more professionalised, as the growth of mathematics teaching and research journals since the 1960s indicate. The volume and standards of research on the teaching of mathematics have both risen and practitioners are better informed of its results and of the justification for contemporary practice.

Ernest (1989:10) states further that:

> ***'Provided the mathematics teaching community sustains and enlarges those aspects of accountability, justification and professionalism, there should be no reason for the pendulum to swing against current innovation.'***

At this juncture it is also important to note that the most important development of the 1980s and the 1990s for the teaching of mathematics has been the advance and spread of the products of the new technology. These include the electronic calculator, the microcomputer and interactive video systems, as well as video recorders, programmable robots such as the Turtle and other devices (Ernest, 1989:12).

The significance of these products will undoubtedly influence the mathematics curriculum in two ways – on the contents and in the modes of teaching and learning. With regard to the impact on the content of mathematics curriculum, the universal adoption of new technological products means that knowledge, familiarity and competence in using those resources is a required part of mathematics education.

With regard to the effect of the new electronic technology on the modes of teaching and learning mathematics, the educator is no longer the sole arbiter of truth. Although they can be used in a variety of ways, the new electronic resources encourage an exploratory approach (Ernest, 1989:13).

Having discussed at length the development of mathematics teaching in this period, it is important to now consider the support which can and should be provided to enable those who teach mathematics to develop and extend their professional skill. Biggs and Shaw (1995:217–226) highlight the following points which they believe justify support for mathematics educators:

- All those who teach mathematics use continuing support throughout their careers in order to be able to develop their professional skills an so maintain and enhance the quality of their work.

- School-based in-service support for educators is of fundamental importance.

- The effectiveness of school-based support depends upon the leadership of mathematics coordinators or Heads of Department, hence, it is essential that they themselves should receive support and training.

- The training of coordinators and Heads of Department is likely to contribute most quickly and effectively to the overall improvement of mathematics teaching and should be given top priority.

- It is necessary for those who teach mathematics to have an opportunity to meet other mathematics educators.

- Adequately resourced centres could play a vital role in improving the teaching of mathematics.

- Every effort should be made to encourage membership of the professional mathematical associations and that the associations themselves should do as much as possible to develop their local activities.

- The long-term effectiveness of in-service courses can be greatly diminished unless there is suitable follow-up.

The extent to which these recommendations are implemented is important. It will depend upon the response of those who teach mathematics and the central or local government.

In order to gain information on mathematics teaching and INSET provision at present in England, the researcher contacted Sharon Rampersad, presently a mathematics educator in the senior primary phase in England. The researcher requested that the respondent provide a brief overview of mathematics teaching and INSET provision in England at present. The following represents the respondent's response.

- The latest development in mathematics teaching is the release of The National Numeracy Curriculum. This curriculum was introduced to upgrade the teaching and learning of mathematics in the primary school. In order to implement this new curriculum it was compulsory that all primary school mathematics educators undergo retraining.

- Every mathematics educator is also provided with a National Numeracy Curriculum Pack, which is produced by the Central Government. This pack contains a syllabus, lesson plans, mathematical vocabulary, worked out examples, mental exercises and so on. The pack must be displayed in the classroom at all times.

- A mathematics lesson in the allocated hour per day could follow the following format:

  Mental teaching (25 minutes)
  Written exercise (±15 minutes)
  Plenary (10 minutes)

  This format serves as a guide and is left to the discretion of the educator.

- Audio-visuals are common teaching tools for educators learning to teach mathematics effectively. It displays how mathematical topics could be successfully taught using available resources.

- School focused INSET is seen as the key to INSET provision. All primary schools have a subject leader, a mathematics coordinator who is responsible for mathematics teaching and learning in the school. Mathematics coordinators closely monitor teaching techniques in the classroom. Mathematics educators are monitored on a weekly basis. Feedback is provided and a discussion ensues. Negative feedback results in a demonstration lesson. Mathematics coordinators also ensure that all classrooms are equipped with mathematical apparatus like calculators, geoboards, angle measures, graph paper, square-lined paper, scales, clocks, dices and so on.

- Local boroughs also play a key role in the provision of INSET. Every borough provides their respective schools with a year-plan with regard to INSET courses. Educators are required to select courses that they believe would enhance their ability to teach mathematics effectively. In attending INSET courses that incorporate the different aspects of mathematics teaching, educators are instilled with a greater degree of confidence in their teaching. The basic aim of these courses is to inculcate in the mathematics educator the necessity to use the numeracy hour to uplift the level of mathematics teaching and learning. Supply educators are provided to substitute mathematics educators attending INSET courses. Supply educators also have access to these INSET courses.

Having reflected on the present, the researcher felt it would assist this study to make reference to a way forward in mathematics teaching. Matthews (1992:85) believes that the way forward into the 21st century can be summed up under the following alphabetical headings:

A for assessment, both diagnostic and prescriptive. Educators must access each individual learner in order to prevent mismatch of mathematical tasks. They must also have evaluated their own aptitude for the mathematics they are teaching, by an outside assessor.

B for balance. The work presented to learners must have a balance between acquiring concepts, learning skills and facts and undertaking investigative work. A balance of choice of structural apparatus and educational software must be decided by the school so that the learning of mathematics is not over-dependent on the limitations of only one or two manufacturers' dreams of mathematical salvation.

C for communication. It is important for the educator to communicate satisfactorily with all learners and for learners to communicate their mathematical findings to each other as well as to the educator. Parents should play their role in communication so that they are aware of and in sympathy with the mathematics their children are learning and the way in which learning is taking place. Above all, perhaps the most important communication is that which must take place between one educator and the next regarding each learner's level of mathematical attainment, whether by written records or verbally.

3.4 CONCLUSION

This chapter opened with a brief review of the history of mathematics. This, it is believed, would provide the mathematics educator with an appreciation of the subject, consequently leading to effective teaching of the subject.

The balance of the chapter provided a catalogue of facts and information tracing the development of mathematics teaching and INSET provision in England. In advocating the principles of educational borrowing the researcher firmly believes that the initiatives presently being undertaken in South Africa in general and in KZN particularly could be influenced by this study, indicating the development of mathematics and INSET provision in England over the years. In examining and evaluating England's experience, the following is of relevance and significance to this study:

- It became clear in this chapter that high priority is accorded to the expansion and improvement of INSET to ensure the quality of effective mathematics teaching.

- This chapter underscored the great role attached to the INSET needs of educators as one of the key factors affecting educational change.

- Evident in this chapter was the commitment of the government in terms of the various commissions that were appointed to investigate INSET resulting in recommendations that would lead to effective mathematics teaching.

- A range of courses was outlined in this chapter, designed to update, refresh and improve the competency of the already trained mathematics educators.

- School focused INSET was seen as the key to INSET provision. School principals recognised that the basis of INSET is the individual school and the mathematics educators.

- Evident in this chapter was the increased need for teachers' centres. This served as venues for professional interchange of information, ideas and innovations and for exhibitions of teaching and learning resources.

In concluding this chapter, it is true to say that South Africa is presently undergoing changes in its education system. This is apparent when one looks at the new Outcomes Based Education system. The extent to which the development of mathematics teaching and INSET provision in England over the years influence the initiatives presently being undertaken in South Africa will depend upon those who teach mathematics and those who are responsible for the provision of INSET for senior primary mathematics educators. In the next chapter, the INSET needs of educators of primary school mathematics with particular reference to senior primary mathematics in KZN will be reviewed.