

## CHAPTER 5

### CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Summary of the Study and Conclusions

The purpose of this study was to investigate the effectiveness of programmed instructional material, LIY Reflection in the teaching of Reflection to Form Two pupils in a rural school. It was a small scale experimental study using the pre-test and post-test control group design.

The sample of this study comprised Form Two pupils in a rural school. They had scored less than 40% in their semester 1 Mathematics test or the monthly school Mathematics test. 35 pupils were assigned to the experimental group and 37 pupils were assigned to the control group. These pupils were also identified by their Mathematics teacher as being slow learners in Mathematics .

The instruments used were designed and developed by the researcher. They were validated by a panel of experienced Mathematics teacher. The feedback questionnaire, pre-test and post-test were used in evaluating the effectiveness of the self-instructional programme. The experimental group studied using the programmed instructional material while the control group was taught by the researcher using normal classroom instructions.

The mean, median, minimum, maximum and standard deviation of the achievement scores were computed. Paired t-test was used to determine whether there is any significant difference in achievement scores of the pupils. Group t-test was used to compare achievement scores across groups, that is between the experimental and the control group.

The feedback questionnaire responses from the pupils were analysed. Programme duration (time allocated for the two different lesson presentations) was noted.

The programmed instructional material, LIY Reflection consists of Unit 1 to Unit 4. The preparation was time consuming and great effort was made so that the content abides by the school Mathematics syllabus. Besides this, careful planning was needed to ensure that the language used is suitable and the flow of the programme is sequential with no dead ends. The inclusion of self-learning aids such as the flipping of tracing papers which allows the pupils to have the feel of Reflection requires meticulous planning on the part of the programmer. A panel of experts were consulted to ensure that the materials are in line with the learning abilities of the pupils. These Units were then used in the experimental group of this study.

This study on the effectiveness of programmed instructional material, specifically LIY Reflection in the teaching of Reflection to Form Two pupils in a rural school has arrived at the following conclusions.

Both the experimental and the control groups have improved in their post-test scores as compared to all their respective pre-test scores. This indicates that the pupils from both groups have gained in knowledge after using LIY Reflection and after following the normal classroom instruction respectively. From Table 4.3, no significant differences were recorded for the mean post-test scores of Unit 1 and Unit 4 for both the experimental as well as the control group. This shows that for Units 1 and 4, the pupils from the experimental group did not perform significantly better than the pupils from the control group. Perhaps with better phrasing and more examples, the programmes in Units 1 and 4 can be improved to help the pupils gain more scores for the respective post-tests.

However, significant differences were recorded for Unit 2, Unit 3 and the Overall Units. The implication is that well designed programmed instructional material can help the pupils in the experimental group perform significantly better than the pupils from the control group. The significant differences of the mean post-test scores recorded for the Overall Units for both the groups show that on the whole, LIY Reflection has helped the pupils perform better.

Generally, when appropriate instruction was given as to how to use the programmed instructional material, LIY Reflection, the weak pupils in Mathematics could produce good performance in Mathematics, specifically Reflection. The pupils were capable of learning Reflection with minimal help from the teacher. This could be due to the fact that the lesson content was unitised and the pupils were tested to ensure their mastery of each frame within the unit before they proceeded to the next frame. Furthermore, LIY Reflection offers immediate reinforcement of correct responses. Pupils are notified of wrong responses immediately with a clue and provided with remedial steps before trying the question again. These immediate feedback help pupils check their own learning. The pupils in the experimental group also took less time to learn Reflection using the programmed instructional material as compared to the control group which followed the normal classroom instruction.

In this study, the pupils in the experimental group have very positive attitudes towards learning Reflection using programmed instructional material. 85.7% of them suggested that programmed instructional material be extended to other topics in Mathematics, other subjects or to other pupils.

## 5.2 Implications and Recommendations

The results of this study had shown that slow learners in Mathematics could learn through programmed instructional material. In the normal classroom instruction situation the slow learners are usually not given sufficient time and attention by the teacher to learn a concept. As a result they tend to lag behind and the gaps in knowledge widen with each lesson.

The Education Ministry sees the need for self-access, self-directed and individualised learning among students in the school. The Smart School project which had taken off on January 1, 1999 with 81 secondary schools aimed to facilitate individual - based learning. The role of teachers would then change to that of facilitators (The New Straits Times, 1997). However, some locally produced software are lacking in quality, they are just like workbooks (Sunday Star, 1998). Further the economic downturn had delayed the construction of some smart school complexes (The Star, 1998). As an alternative measure, it is suggested that programmed instructional material in the printed form be recommended for secondary schools.

Programmed instructional material in the printed form is cheaper than in other medium. Das (1993) stated that programmed instruction through the teaching machine is more expensive than programmed instruction through programmed books, as each student needs a machine to learn. A large number of machines or computers have to be purchased and installed in a school to cater to all students. Furthermore, the breakdown of a machine causes interruption in learning. The maintenance of machines is costly and difficult. Programmed instructional material as in this case, in the printed form is reusable and will save on cost. It acts as a cheaper remedial aid to slow learners, to those who may have

missed the normal classroom instruction and to those who need revision. It is recommended that secondary schools use programmed instructional material to help slow learners particularly in Mathematics. This will make individualised learning possible and the mastery of a particular topic could be ensured.

The popularity of printed text over other medium are supported by other studies. Gan (1998) reported that 90% of the students of the distance education program in Universiti Putra Malaysia are found to prefer printed copies of the modules rather than the online text. Price et. al (as cited in Gan 1998) found that students prefer course content on traditional paper as compared to those presented on the Web because they can be taken home, read on the bus and can also accommodate their scribbled annotations. In a study by Baker (as cited in Gan 1998), the majority (77%) of the students chose paper-based lecture material over electronic copies. The advantage of printed material is its usability. There is no need to learn another skill like computer literacy before using the programme.

In this study, one of the problems encountered by the teacher in the normal classroom instruction is noisy neighbouring classes. The teacher has to talk as loudly as she can so that the pupils can hear. In the experimental group, noisy neighbouring classes did not distract the pupils as they could read and practice the programmes on their own without having to communicate much with the facilitator.

The inadequacy of existing normal classroom teaching in coping with the widely different abilities and needs of the pupils requires urgent steps and realistic strategies to prevent the current situation from becoming worse. Whatever new steps or measures taken should not further burden the teachers. The development and utilisation of

programmed instructional material especially for pupils who are slow learners in Mathematics seems a feasible strategy and further investigations should be encouraged.

Das (1993) listed a few suggestions to ensure good quality programmes and the proper implementation of them. Programmed texts should be available and be prepared by experts who have taken into consideration the content and objectives of education. There should also be proper facilities for storing the programmed learning texts. Students must be allowed to learn at their own pace. There must be no uniform speed of learning enforced by the school. Upon completion of one programme, students should be guided to the next one.

### 5.3 Suggestions for Further Research

This study attempts to investigate the effectiveness of programmed instructional material in the teaching of Reflection to Form Two pupils in a rural school. Further research is necessary to achieve other relevant objectives. These include:

The sample in this study is limited to Form Two pupils in a rural school. Therefore, the findings of this study could not be generalised to the student population at large. Further studies could be conducted to include pupils from other age groups, socio-economic status, different Mathematical abilities and from both the urban and rural parts of the country.

To further investigate the effectiveness of LIY Reflection, there is a need to include other variables such as sex, retention ability of the pupils using it and the problems faced by the facilitator as the programme is implemented.

This study has provided evidence to suggest that the pupils using the programmed instructional material generally scored higher in the post-test. As this study only covered one topic in Mathematics and for a duration of only five school days, it is recommended that further studies be carried out to cover other topics in Mathematics and for a longer duration of time.

Like any other techniques of learning, programmed instruction has its limitations too. Das (1993) is of the opinion that students following the programmes may get the impression that there is a single answer to every question, which is not correct. They may feel that knowledge is fixed and orderly, which is wrong. Future programmes should consider this limitation and try to rectify it.

Long-term development and refinement of programmed instructional material require the cooperative efforts of many personnel and agencies. Subject matter specialists and behavioral scientists can provide the essential input of substantive and procedural knowledge. School personnel and state education departments should assist in determining how well the new materials work.

Investigation on the possibility of using programmed instructional materials as after-school or take-home learning modules for the slow learners should be considered. With the help and cooperation of parents and teachers the pupils can only benefit from the programmes.