CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter explains the usefulness of the research model as a scheme of connecting concepts to find the necessary information about the implementation of the 60:40 policy in the three selected regular day secondary schools. It completes the last three stages: 9 (conclusion), 10 (implications) and 11 (recommendations) of the research methodological process illustrated in Figure 3.1, page 99.

5.1 The effectiveness of the research model

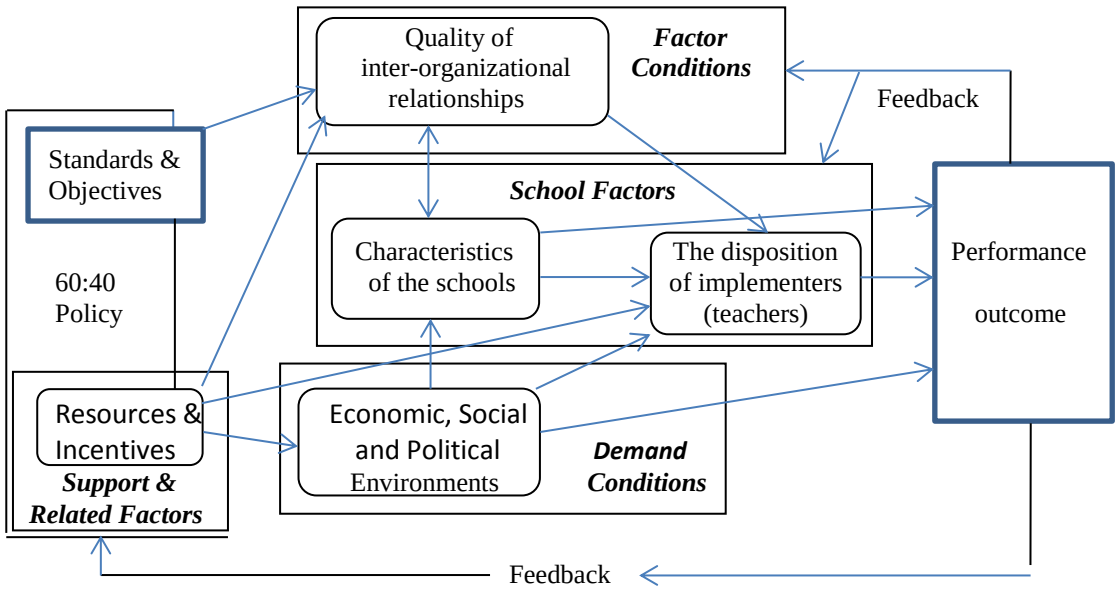

Figure 5.1: The Research Model for the Implementation of the 60:40 Policy

The research model has been indispensable for studying the implementation of the 60:40 policy at the secondary schools. It has acted like a path-finder that provided the direction and the scope to examine the extrinsic factors related to the teaching and learning of science and technology. It also has helped to examine the intrinsic values

such as the disposition of the teachers towards the policy, strategy, structure, culture and the leadership to pursue the implementation of the policy. Without this model it would be difficult to have a holistic approach to study the implementation of the policy. Although it has not clearly indicated the strategy but its presence could be felt based on the existence of the goals and objectives and the inter-organisational relationships between the policy makers and the policy implementers. The existence of the strategy for the implementation of the policy is imperative because without it the objectives of the policy cannot be achieved within the stipulated timeframe.

The research model has supported the findings done by BPPDP (Ministry of Education, 1996) pertaining to the academic achievement of students in the rural areas with respect to four school factors:

(a) The teachers play the key role in the teaching and learning process with reference to experience, skill, knowledge, creativity, leadership, initiative and emotional intelligence.

(b) Curricula and students for science and mathematics must match the intellectual levels of students.

(c) School structure and organisational environment must have the facilities, tangible and intangible resources and management capability to enable the development of conducive climate for teaching and learning to take place.

(d) The external environment needs to play a supportive role for students to achieve academic success. Parents, industries and government are involved.

5.2 Summary of the Findings

The schools characteristics are found to be less than ideal for expediting the implementation of the policy but the facilities are good enough to constitute the basic requirements for the teaching and learning of S and T subjects in the schools.

Therefore the teachers play the important role in the implementation of the 60:40 policy. They hold the intellectual capabilities to bring about the learning of S and T among the students but the art of creative and innovative teaching is much to be desired. However they are not confident that the policy will succeed and not motivated by it. Therefore they are not inspired by the policy and as a consequence their effort to see to the implementation of the policy is not at the optimal level.

The curriculum for science is not really an issue as it is adopted and modified to meet the intellectual level of the students at each grade. The problem lies with the teachers not knowing how to adapt the formulated curriculum to meet the needs of the students and for the policy to succeed. On the other hand the students said that they took up the study of science based on their self-interest but the teachers could not make them to experience better learning of the science subject. As a consequence, the school environment is not encouraging the students to take up the study of science.

The teachers accept the fact that S and T should be strongly emphasized in the secondary schools and it is important for the country to become a developed nation. However the teachers are uncertain about the policy and therefore they are in a state of dilemma in implementing the policy.

The factor conditions (inter-organisational linkages, competitive rivalry, strategy and structure) provide further idea of other internal conditions that have acted to influence the implementation of the policy. Each of the conditions has a direct influence in encouraging or discouraging students to take up the study of S and T. For example the head teachers have the potential capability to play an imperative leadership role in bringing about the necessary changes in relation to the factor conditions for the schools to successfully implement the 60:40 policy.

The interesting observation of the operation of the factor conditions in the secondary schools is the presence of the capability to capitalise on the available resources to create values in their chain of activities to gain the advantage to get more students to take up the study of S and T subjects. These factor conditions can influence the operation of the school settings either to enhance the implementation process and the achievement of the 60:40 policy at the secondary schools (Figure 5.2) or to act otherwise. Yet only 30% of the desired goal of the policy has been achieved from the time the policy was introduced in early 1970s.

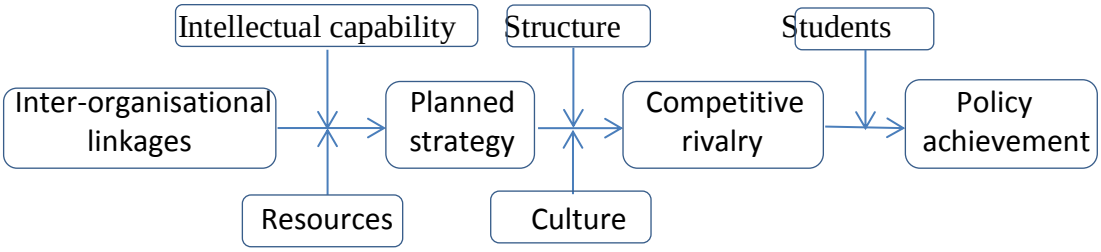

Figure 5.2: Factor Conditions Chain Activities

The strategy is not aligned with the culture and the structure for the successful implementation of the policy. This situation suggests that the development of the strategy cannot be done without the participation of the people in the schools. It has a serious repercussion on the policy implementation.

The schools are dependent on the MOE for their various needs to carry out their functions as teaching and learning organisations to serve the community. The supports include the provision of funds for development and improvement of the school facilities to cater for the increasing students and the needs of the students and the availability of trained teachers. The inadequacy of supplies of trained teachers and for laboratory works has an adverse effect on the students in their learning of S and T subjects. These deficiencies have caused the students to divert their interests towards the study of social sciences in the schools.

Parental support of their children's education is just as important. It involves the home supervision of their children's learning. Parents are to ensure that their children revise their lessons at home. This can help them to reflect on what they learnt for the day and enable them to become more intellectually creative and improve their school performance.

Supports from the MOE and parents are not well coordinated and collaborated to encourage more students to take up the study of S and T subjects in the schools.

The interest of the teachers should be well appreciated in order to enable them to have the right motivation to encourage more students to take up the study of S and T.

The demand conditions for favourable industrial development, creation of opportunities for employment and advancement, and research and development in the country are still not at the optimal level to stimulate more students to take up the study of S and T or to enhance the implementation of the policy in the secondary schools. This is a question of demand and supply. A teacher has rightly pointed out that "there must be attractions to draw the students in the early years towards the sciences such as good job prospects, incentives and scholarships." Another teacher believed that "it is a question of how much support is given to encourage the students to do S and T and the future job prospects are important."

5.3 Discussion of the key findings

The findings of the study stated in chapter 4 are related to the four research questions:

1. How have the *school factors* influenced the students to take an interest in the science stream?

2. What are the prevailing *factor conditions* to enhance students' interest towards the study of science in the secondary school?

3. What are the *support and related factors* prevailing in the school to enhance the study of science?

4. What are the prevailing *demand conditions* in the industries and government sector providing the impetus for students to join the science stream in the school?

The discussions of the findings are done in accordance to these research questions.

5.3.1 School factors

The school factors are made up of two components: the school characteristics and the disposition of the teachers to the implementation of the policy.

(a) The school characteristics

The schools have been identified as the centres where the learning of S and T take place. This implies that the schools have the necessary facilities, curriculum, students, the teachers and the environment for the teaching and learning of S and T subjects.

- The facilities and conducive environment for teaching and learning

Even though teachers claimed that the school facilities needed improvement to enhance the environment for the teaching and learning of S and T (Table 4.1, p. 128), they admitted that the school facilities could still be used for the teaching and learning of S and T subjects (Table 4.11, p.145). This suggests that the teachers must be able to take advantage of the existing assets to create the environment conducive enough to encourage students to take up the study of S and T.

Other research studies have found that the school structure and its facilities and the management capacity helped to create a conducive climate for teaching and learning of science to take place (BBPD, Education Ministry, 1996, Nagaraj, Chew, Lee &

Rahimah, 2009 & Sufean & Norliza, 2009). Cavallo & Laubach (2001) and Fouts & Myers (1992) found that the role of teachers and the presence of positive climate for study improve the interest and achievement of students in the academic area. Cavallo & Laubach also found that experiments in science make the students more motivated to study science. Simpson & Oliver (1990) found that conducive classroom environment enhances the students' desire to study science subjects.

However, the problem of getting the students to take up the study of S and T stream still persists in the secondary schools. The findings from the students (Table 4.5, p. 128) suggest that the teachers do not create an environment conducive enough for the learning of S and T subjects.

- The curriculum

Teachers pointed out that the syllabus for the study of science does not match the needs of the students and for the policy to succeed. They reasoned that the syllabus of science at the lower secondary school level has become so low that the quality of students doing S and T has declined. When these students reached the upper secondary school level, they have difficulty in learning the S and T subjects. The teachers said that the emphasis in the learning of science should begin at the early stages in the life of a student and that it needed a well-developed and coordinated spiral curriculum for science from the primary to the secondary schools to encourage more students to study S and T in the secondary school level.

The study done by BPPDP, Ministry of Education in 1996 on the rural schools had pointed out that the curricula for science and mathematics developed for the students at the particular grade fit the intellectual level of the students for learning to take place. This concept is in line with the well accepted principle of Jerome Bruner that teaching should begin from the intellectual level of the student to enable the student to learn any subject. However there is a condition attached to this principle that the subject must be

taught in the honest way to the child. This means that concern and attention must be given to the student in his learning of the subject. If this is not done, then the student's learning of the subject at whatever grade will be affected. Having taken that concept into consideration in the development of the curricula for science and mathematics in the schools there must be other variable factors that caused the students in the lower secondary school level to be weak in their science or mathematics. It would be the size of the class, the constraint of teaching time or the teaching of the subject. However the teaching of the subject is within the control of the teachers. Anderson in 1983 found that teachers did not fully understand that the formulated curriculum and the implemented curriculum for science are different. This aspect is explained by Costa (1995) that the curriculum for science should relate to "the students' character, experience and relevance in their daily lives and should not take it just as a subject for study only." If this is not done, Costa stressed that the curriculum makes teaching boring and uninteresting to the students.

Gray (1999) and Tan (1991) found that in Malaysia there is a mismatch between the formulated curriculum and the background of students and the cause attributed to this is that the curriculum for science is adopted from the developed country. On the other hand, Gray (1999) and Olugbemiro (1997) said that science is universal but it has to be adapted to the domestic conditions such as local culture and language. The findings suggest that a country can appropriately adopt the well-developed and tested curricula for science and mathematics from the developed country but the teachers who used the curricula should be capable to adapt them to the local culture and language and the intellectual level of the students.

Perhaps the findings by the team from the School of Language Studies and Linguistic of the University of Kebangsaan Malaysia in 2007, on the effectiveness of the Smart Schools would be relevant here. The team found that in spite of having the necessary

facilities for the teaching of science and mathematics, the smart teaching concept is not successful. One of the problems of the Smart Schools is that the teachers are not creative enough to generate learning programmes for individual needs or to bring about interactive teaching but only concerned to complete the syllabus. The teachers have the difficulty to adapt the curriculum to match the needs of the students. Therefore it suggests that the implementation of the curriculum for science has become the issue but not the formulated curriculum.

- Students

Most of the students (83%) indicated that they take up the study of S and T because of their self-interest and that their parents have little influence on their choice (Table 4.3, p. 131). Seymour (2001), Jones & Young (1995), Cavallo & Laubach (2001), Young et al (1997) and Freedman (1997) found that the interests of the students to study S and T education are also related to affective factors like self-concept pertaining to science, motivation for success and self-confidence. In fact the students admitted that they are also influenced by education exhibitions, media and internet to study S and T subjects. The school has little influence on them in the choice of their study. Chew et al (1995) found that external factors such as careers and job opportunities also motivate students to take up the study of S and T. In fact, the study found that most S and T students (85%) look forward to pursue their education in the S/T fields at the higher level. They have ambitions to become professionals, improve their standing in society, to help their families and widen their social circles with others. The finding by Suan Yoong & Aminah Ayob (2004) has provided the substantiation that the students in secondary schools in Malaysia are more positive to learning S/T subjects than their counterparts in West Europe and Japan.

However, the teachers believed that the students do not have the right attitude, perception, aptitude and intelligence to take up S and T studies (Table 4.2, p. 130). They said that the students in the science class are difficult to teach compared to a homogeneous group. A heterogeneous cohort of students with diverse intellectual abilities, attitudes and values toward S/T and coupled with the shortage of time stresses the intellectual capability of the teachers.

The teachers said that proper selection of the students is important to ensure the quality of the outcome. When this is not done, the poor results discourage other students from taking the study of S and T subjects. Enforcing a strict selection of students for the study of S and T helps to give a better value to the students in terms of learning the S and T subjects. As for the teachers the teaching becomes less stressful and enables greater student participation to enhance learning.

However, the perceptions of the students towards the study of S and T are different from those of the teachers. The students said that they are there to study S and T and are satisfied in what they are studying but *the teachers need to bring about more effective teaching so that they can experience better learning of the S and T subjects* (Table 4.5, p. 132 & Table 4.6, p. 132). Woolnough (1994) found that the understanding of the theories and factors are important in studying science and that the experiments and co-curriculum activities are beneficial to them. Young et al (1997) and Woolnough (1994) found that co-curriculum activities pertaining to science and technology have very positive correlation with participation in science but this is given less emphasis in schools. It suggests that teachers should have the initiative to provide the means to stimulate learning of the science subject by conducting experiments and encourage co-curriculum activities in science.

- Teachers and their disposition

The success or failure of the implementation of the 60:40 policy depends on the teachers. This implies that the success of the policy depends on having more students studying the S and T stream in the upper secondary school. The disposition of the teachers towards the policy is an imperative implication for the successful implementation of the policy in the secondary schools. The disposition of the teachers refers to their cognitive understanding of the policy, the direction and intensity of their response to the policy (Van Meter & Van Horn, 1975). The findings of the teachers' disposition to the policy have been disclosed in Chapter 4 and the findings are now summarised in Table 5.1. The first three issues are known as the survival values because they relate to the teachers' profession and the average value is found to be 82.7% and the next three issues are known as the policy implementation values because they relate to the teaching of the students and the average value is -73.3%..

Table 5.1 Teachers' Disposition towards implementation of the Policy

Issues	Teachers' responses Yes (%)	No (%)	Common Cause/Reason
1. Should S/T be strongly emphasized in secondary schools.	80	20	Students matured enough and qualified.
2. Study of S/T crucial in secondary schools.	80	20	Schools are sources of learning of S/T.
3. S/T necessary for country to become a developed nation.	88	12	S/T is important.
4. Feasible to encourage more students to study S/T in secondary schools.	48	52	Students not good enough.
5. Excited/Motivated by the policy.	28	72	Students not good enough.
6. Confident policy will come true.	4	96	Students not good enough.
Survival value (80+80+88=248/3)	82.7		
Policy implementation value (52+72+96 = 220/3)		- 73.3	

When it comes to the issues related to their profession as S and T teachers, they show very high cognitive understanding of their responsibility towards the study of S and T. They have provided different reasons to sustain their supports for the importance of S

and T and their positions as teachers. However when it refers to the implementation of the policy they show very negative responses towards it. They show poor cognitive understanding of the policy, rejection of the policy and low intensity to the policy implementation. They have provided the same reason that students are not good enough to study S and T in the three different situations (items 4, 5 & 6). This suggests that teachers have difficulties in implementing the policy in their schools:

(a) Teachers have different values and beliefs about the policy and develop different attitudes towards it. They are uncertain regarding the feasibility of implementing the policy because of their divergent views about the policy and its purposes. As a consequence there is no synergy in their effort to arouse the interest of the students to study S/T subjects in the schools. This is one of the factors that the team from the University of Kebangsaan Malaysia's School of Language and Linguistic (2007) found about the ineffective performance of the Smart Schools i.e. the teachers have no idea of the Smart School teaching concept. Instead they are obsessed with the idea that the students are not good enough to do S and T studies and that they and their teaching approach cannot do much to encourage more students to take up the study of S and T.

In 2001, TIMSS-R found that 70% of the science teachers in Malaysia do not have the preparation and conviction to teach science subjects or the enthusiasm and motivation for teaching science subjects. Furthermore, Roth & Robottom (1998) found that teachers do not teach with high conviction because they themselves cannot integrate science concepts with the daily life. It is apparent that the situation has not changed. This suggests that the students have become the victims of the situation.

(b) Teachers are not appreciative of the policy because the percentage of students reading S and T subjects declined from 26.3% in 1988 to 25.7% in 1998 and then picked up again from 2010 and maintained at 29.5% from 2011 until the following year

(Table 5.2). Most students prefer to study arts and social sciences instead of S and T subjects. They are not in the position to control such adverse development.

Table 5.2: Percentage of students studying in the Science stream in the Upper Secondary Schools

Year	Students studying Science
1988	26.3%
1998	25.7%
2010	30.1%
2011	29.5%
2012	29.5%

Source: From Table 1.6, p. 17.

It is in fact more difficult to get the students to appreciate the policy when the teachers are not. This suggests that teachers can act as a barrier to encourage more students to study S and T.

(c) There are teachers who give values to the teaching and learning of S and T subjects in the schools. But in reality fewer students are doing S and T compared to students doing arts and social sciences. The attributable cause according to TIMSS-R (2001) and Roth & Robottom (1998) and Penizzon & Levins (1997) is that teachers do not teach with high conviction because they cannot integrate their teaching of the science with the students' experience and understanding of their daily lives and as a result they cannot influence the students to be interested in science. The implication is that the teaching of science is one thing but the ability to be creative and innovative to encourage students to be interested in science is another thing.

(d) Teachers have regarded the students as the problem to achieve the policy. This is a simplistic solution but not a creative one because it does not serve a useful purpose or bring about any innovation. A creative teacher is motivated to confront a problem and enjoy solving it especially a difficult and complex one. This brings to mind the finding of BPPDP (Education Ministry, 1996) about what are needed to be successful in the teaching and learning process: "experience, skill, knowledge, creativeness, leadership,

initiative and emotional intelligence." This suggests that teachers cannot be judgemental but to take up the challenge to teach science to the students in the honest way according to Bruner.

(e) There is always a shortage of experienced and creative science teachers to make things possible. This situation is assimilated from the students when they said that the lessons are not interesting and not clearly presented and do not help them to understand the subject. It is only when teachers begin to feel the importance and give values to the teaching of S and T subjects and to the policy, then they will become motivated enough to become creative. It suggests that most of the teachers are fence sitters. Those teachers who felt that S and T should not be emphasized in the secondary schools have in a way abrogated their responsibility to encourage more students to study S and T.

(f) The teachers have not lost sight of the schools as the places for the students to learn S and T. The teachers have clearly defined that the schools are the 'primary sources' for the creation of S and T students for the markets. Teachers are aware of this vintage point but it has not been reinforced with the emphasis on the importance of the policy and the provision of incentives for the teachers and students.

In reality, although there are adequate resources available in the secondary schools for the study of S and T, yet fewer students want to study S and T. The existence of this situation in the secondary schools reflects the lack of aspiration and inspiration of the teachers (and possibly at the primary and lower secondary schools) and this arises from the fact that the learning of a subject in school is based on a spiral curriculum. It is difficult to avoid saying that teachers who are trained and experienced to teach S and T subjects have not used their creative skills to explore and challenge the intellectual potential of the students. The students have said that the lessons are not intellectually demanding. This is even more difficult for the inexperienced teachers to resolve this issue. In other words, teachers from primary and secondary schools should teach their

students to fish so that they can continue fishing in their quest for S and T knowledge for the rest of their lives. According to Sharifah Maimunah (2000) the science education is basically to make a person more capable to deal with life.

(g) Teachers who have no confidence of the policy will succeed, are not going to put in real effort, passion, creativity, personality and intelligence into their teaching. They continue to maintain their normal teaching of S and T subject as a subject basing on their knowledge and experience.

(h) Teachers realised the importance of S and T for the country to become a developed nation and that the secondary schools play a crucial role to make it possible. In order to get an insight into such a situation, the leadership in the secondary schools has been examined. It is found that the three schools practised transactional leadership style where actions are only taken when things happened. This is more a reactive rather than a proactive approach to problem solving. In a dynamic environment where changes are taking place continuously a transformational leadership style is more useful to transform and energise an institutionalised traditional culture for implementing the policy. It also requires flexibility among the teachers. It is found that the majority of the teachers need to learn the art or skill of being flexible and capable to adapt to meet the needs of their students. For example, in the Nullfield Science programme started in the 1960s in England, it took 10 years to discover that the problem of implementation was primarily due to the teachers and that younger teachers were more adaptable to make the new programme to come true. It suggests that the implementation of the policy requires more than just the teacher's effort but the other influencing factors such as leadership, flexibility and emotional intelligence.

5.3.2 *Factor conditions* to enhance students' interest towards the study of science in the secondary school

The factor conditions refer to the relationship between the policy makers and the policy implementers, the competitive rivalry, strategy, structure and culture.

(1) Inter-organisational linkages

In schools the inter-organisational linkages are not well developed (Table 4.23, p. 164). In the education system the policy is done by the policy making body which is isolated from the implementing body. As a consequence the implementers (S and T teachers) do not have a clear idea of the purpose of the policy and the strategic actions they need to take. This has led teachers to lose confidence in the policy. There was no team effort in the planning of the strategy and this has caused a drift between the two bodies. Furthermore there is the absence of enforcement activities to ensure the successful implementation of the policy. It suggests a state of confusion in the control of the implementation process.

(2) Competitive Rivalry

A strong competitive rivalry exists among the secondary schools. Students with good results in the PMR and SPM move to better schools even though the school has Form Five and Form Six classes. As a consequence the school loses its better students to other schools after the examination results are released. This is because the school is not competitive enough to retain its good students.

The schools compete not only for better students but for better teachers. They also compete for financial needs from the government to improve their teachers and for new teaching and learning technological aids or programmes, and resources for their libraries and improvement of the facilities for sports and the school physical environment.

The Ministry of Education and the Education Department have not adequately and fairly provided the necessary supports for all the three schools (Table 4.25, p. 166). Besides that, the schools are competing for limited resources such as funds and good teachers. The resources are being thinned out due to the expansion of the education

system in the country because of the growing student population over the years. This is shown in the 10th Malaysia Plan that the student population in the upper secondary schools will increase from 766,216 to 841,937 in 2010 and then to 860,000 in 2012.

It appears that schools have to evaluate and use the resources at hand, to improve on their strengths where there are weaknesses, and develop the capacities and competencies to improve the value of the teaching and learning activities to gain the competitiveness to attract more students to take up the study of S and T subjects within the schools. It needs the creative ability of the human resources in the schools to create the competitive advantage.

From the positive aspect, competitions among the schools help to improve the quality of the teaching-learning process and upgrade the standard of the schools in the long run, and in the process help the schools to achieve the policy.

Competitions in reality create challenges for the schools and compel them to generate creative ideas to bring about innovations such as more effective ways of teaching or the development of better learning programmes. The consequential effect is to attract more students to stay on in the schools and concurrently to attract other students to the schools.

The implication is that the school that is losing its good students to other schools should make changes to encourage good students to stay on to complete their education in the upper forms. Royalty of students to the school depends on how the school satisfies their needs. The school should be able to give the students more than their expectations. Their expectations can be from many sources such as good trained teachers, the culture of the school, the leadership style of the teachers, the conducive school environment and the caring attitude of the teachers. In reality, every student wants to study in a good school. A school that is devoid of good students will find it difficult to implement the policy.

(3) Strategy

It is difficult to envisage that the schools are in the position to establish a planned strategy. They are under the Ministry of Education and their financial requirements are provided by the Federal Government. The strategy for the schools is fundamentally provided by the Ministry of Education (MOE).

However, schools have their own emergent strategies which enable the school head teachers and administrators to make necessary changes based on their learning and experiences acquired over time. The emergent strategy practised by the schools is likened to the palm tree that bends whenever the wind blows. The schools adhere to new programmes introduced by the MOE. The schools are in reality practising emergent strategies whenever they responded to the demand for change by the MOE. This strategic approach is necessary for the schools to remain competitive and resilient to achieve the school objectives.

The findings suggest that the secondary schools have not established the objectives for the development of the strategy to implement the policy. The research data identified that the changes made by the head teachers are basically reactive in nature i.e. the transactional type at the official level. However, at the personal level, they do practised transformational leadership style and come out with emergent strategies. They are encouraging teachers to work in teams in problem solving and in school activities. They act like charismatic leaders in sharing their visions with the teachers and encouraging cross-subject team formation, trust worthiness among teachers and supporting the teachers in terms of professional development and leadership training. However they are slow to change by virtue of the fact that they are not at liberty to decide what they considered to be good for their schools. As a result they are also slow to change the perception of students to go for the S and T subjects because there is little emphasis on the 60:40 policy from the Ministry. Whatever is the strategy the

policy makers have developed has not met the expectation i.e. the objective so far. Therefore liberalization of central control for decision-making to the schools appears to be a necessary step for the head teachers to bring about transformational changes in the schools and to ensure greater accountability, transparency and responsibility.

(4) Structure and Culture

The structure and the culture of an organisation are so closely related that the two become interchangeable. The structure gives rise to the culture and since structure is the outcome of the strategy, therefore there is a close relationship between strategy and culture.

Going down the stream, strategy is evolved to achieve the objective. Strategy, structure and culture are the sequential steps in a chain reaction to achieve the objective. They are actually the interlocking mechanisms that the schools need to have to achieve the 60:40 policy. Any misfit among the three mechanisms affects the process of implementation of the policy. This explains the slow journey the implementation of the policy has taken so far.

The dominant structure of the three secondary schools is basically a three level hierarchy with the head teacher at the top level, the subject/field specialist teachers at the second level and the teachers at the third level. The structure is not really hierarchical but more of a lean (horizontal) structure.

The school culture is fundamentally task-oriented. Teachers are penalised for late submission of assignments and they are nervous and tense coming to school. The head teachers prefer stability over change. Teachers who are aggressive & competitive do not get advantage. Head teachers treat all teachers alike.

In a task-oriented culture, people are reactive to problems rather than proactive to solve a problem before it happened i.e. no order no action. As a consequence, a task-oriented culture influences the development of transactional leadership style among the

head teachers in their formal administrative role. However, from the information gathered from the teachers, the head teachers do practised a flexible leadership style at the informal level. They share their visions with the teachers, encourage teachers to create, innovate and lead, provide opportunities for teachers to take risks and experiment, encourage team works and collective responsibility and cross-subject team formation, and create trusting relationship. An informal learning culture is apparent in the schools. However the transactional leadership style dominates the management of the schools as it is the accepted formal approach in the education system.

This aspect of the study indicates that the concept to empower the schools to be independent in their decision making should be encouraged to bring about greater transparency, accountability and responsibility for the encouragement of students to take up the study of S and T, thereby improving the implementation of the said policy. As an independent body it develops its strategy and becomes accountable.

5.3.3 The support and related factors to enhance the study of science

The supports provided by the Ministry of Education and the State Education Department (Table 4.25, p. 166) are said to be as follows:

(1) The necessary facilities like science laboratories and instruments and equipment for the teaching of S and T are provided to all the three schools. One school is said to be fully equipped, another school is 90% equipped and the remaining school only 40% equipped. There is an apparent disparity of support for the provision of the facilities like science laboratories, instruments and equipment for the teaching of S and T subjects to the schools. There is an issue of equality and accessibility to facilities among the three schools and the creation of different environments for the teaching and learning of S and T. It also gives rise to different prospects to the students to take up the study of S and T subjects in different schools.

(2) All the three schools do not have adequate number of trained science teachers to meet the needs of the schools. This shortage of trained teachers in S and T subjects has put the schools in a disadvantaged situation to encourage more students to take up the study of S and T.

(3) Modern teaching audio-visual aids like projectors and computers and teaching programmes are not fully available in two of the three schools. The audio-visual aids as teaching technology can help to facilitate the teaching and learning of S and T. This disparity creates different encouragements to the students to take up the study of S and T.

(4) The requests for replenishment of supplies for laboratory lessons are not promptly fulfilled in all the schools. The lack of supplies for laboratory lessons has affected the teaching and learning of S and T subjects. The consequential effect is the discouragement of the interest of the students to further their study of S and T subjects at the higher level.

(5) Most of the teachers have agreed that they are provided with specific courses for leadership and curriculum development and introduced to new monitoring and coaching programmes to develop leadership skills. They also affirmed that they are provided with external support such as collaboration network opportunities. They are given the recognition and rewards for good performance and achievement.

(6) There is an apparent dichotomy of interests among the parents with regard to supports they give to the schools. One group of the parents has supported the schools and their children's education while another group of parents has not supported the schools or their children's education. Their supports of the schools are in terms of their participations in the school activities.

(7) Besides material supports for the schools, supports for benefits of S and T teachers are also needed critically in terms of special incentives for teachers in the S and T field,

opportunities for promotion for teachers to be based more on seniority than merit and credibility and the provision of more non-academic staff such as lab assistants and support staff to assist the teaching staff.

5.3.4 Prevailing Demand Conditions

The demand conditions referred to opportunities for employment and research and development in the industries and the government sector.

(1) Opportunities for employment

In Malaysia the manufacturing sector is based on labour intensive and low value added technology. The manufacturing sector is slow to develop high technology, knowledge-based and capital intensive aspects because they do not have the heavy capital investment and technological expertise to move up the value-chain of the organisational activities. This is identified by the fact that the ratio of professionals, scientists and engineers per 1,000 population is only 2 compared to Japan and other developed nations which had the ratios ranged from 6 – 10. As a consequence, the progress in technological production and the creation of innovative products is slow to provide enough job opportunities to absorb the S/T graduates.

Table 5.3: Employment by Major Occupational Group, 2006-2015

Major Occupational Group	Thousand Persons							
	2006 ('000)	(%)	Estimated 2010 ('000)	(%)	Estimated 2015 ('000)	(%)	2010 - 2015 ('000)	(%)
1. Senior Officials and Managers	903.9	8.1	941.9	8.0	1097.7	8.3	155.8	16.5
2. Professionals	613.8	5.5	741.7	6.3	1031.6	7.8	289.9	39.0
3. Technicians & Associate Professionals	1417.2	12.7	1660.0	14.1	2248.4	17.0	588.4	35.4
Subtotal	2934.9		3343.6		4377.7		1034.1	30.9
4. Clerical Workers	1048.9	9.4	1142.0	9.7	1256.4	9.5	114.0	10.0
5. Service Workers & Shop & Market Sales Workers	1729.6	15.5	1942.6	16.5	2274.8	17.2	332.2	17.1
6. Skilled Agricultural & Fishery Workers	1450.7	13.0	1295.1	11.0	1230.0	9.3	- 65.1	-5.0
7. Craft & Related Trade Workers	1249.8	11.2	1259.7	10.7	1322.6	10.3	62.9	5.0
8. Plant & Machine Operators and Assemblers	1528.8	13.7	1495.2	12.7	1362.2	10.3	-133.0	-11.1
9. Elementary Occupants	1216.3	10.9	1295.1	10.9	1401.9	10.6	106.8	8.2
Subtotal	8224.1		8429.7		8847.9		418.2	5.0
10. Total Employment	11159.0	100	11773.3	100	13225.6	100	1452.3	12.3

Source: From Table 1.11, p. 21.

In the 10th Malaysia Plan it is estimated that for the first three categories of occupational groups (for graduates and professionals) 1,034,100 jobs would be created from 2011 to 2015 i.e. at an average of 206,820 jobs per year (Table 5.3 portrayed in p. 21). This is even more difficult to gauge, when the 60:40 policy has yet to be fully implemented. The Government has advocated the need to have more students to study S and T in order to have the k-workers for the economic development of the country and to make Malaysia a developed nation. The industries want to have these workers but they do not want to spend time and money on training them to reach the level of knowledge and skills that they need. Without further growth in the industrial sector it is difficult to envisage an increasing demand of employment for S and T graduates in the near future.

Malaysia is encountering the issues of shortage of skilled workers; looking forward to the returns of Malaysian experts; engaging foreign experts in high technological industries and experts in horticulture and food production and encouraging foreign direct investments in the development of small and medium enterprises. It is not easy to justify to the students to take up science and technology-based studies or courses.

There is also an issue relating to the mismatching of graduates with the need of labour market. The labour market requires a combination of specializations. Public administration for example, requires knowledge not only of public administration but also knowledge of accounting, business administration, law and even the sciences and technology. Issues relating to agricultural development, rural development, extension education and urban planning require a combination of disciplines.

It is even suggested that the background of the non-professional graduates should be broadened to include elements of professional courses in order to match the labour market requirement (Lee, Quek, & Chew, 2001, p.174).

In the same manner, students today require skills beyond basic mathematics, science, languages and humanities. They need to equip themselves with creative thinking and interpersonal skills to increase their changes of successful school-work. Further, as the process of globalization progresses the secondary school curriculum needs to prepare students for global citizenship and for higher education. They need to understand and appreciate the complexity and interdependence among the countries and their differences and to have the competency to communicate with people in other countries (Hobbs and Chernotsky (2007, p. 2, cited by Nagaraj, Chew, Lee & Rahimah, 2009, p. 264).

The situation for graduates in S and T getting employed is becoming more complicated, besides competition for the available jobs, the employers too are becoming more selective of whom they wanted to employ. It is no longer the reality that the best grade scholars would get the jobs. According to Noor Azina Ismail (2011) "having good grades could no longer guarantee employment for Malaysian graduates." They needed to "have a good command of English and other soft skills such as analytical thinking, intelligence, independence, leadership, communication and computer skills and work experience." She found that graduates from rural areas and from public universities faced more difficulties of getting employment because of the lack of exposure to English speaking. She also observed that male graduates had more chances than female graduates for employment.

There are opportunities for employment in the country but it is found that graduates are very selective in the type of organisations, often targeting multinational companies. They have high expectations and tend to seek jobs that can quickly put them in the main stream of work. They have little or no work experience and expect the organisations to go easy on them. This is in particular with the over qualified graduates who embarked on post graduate courses with minimal work experience and in some cases none at all.

Many of graduates hold jobs that are not in correspond to their education and expectations (Noor Azina Ismail, 2011). The effectiveness of education appears to become an issue (Hussein Ahmad, 2012, p. 317) and the expansion of the labour market demands is not in balance with the expansion of higher education in the country. The services sector requires people who not only possessed the right technical knowledge, but also the right soft skills such as interpersonal, communication, wisdom, maturity and are business oriented. It is difficult to get graduates with such kind of quality.

The universities are facing a difficult task to produce graduates to meet the needs of the industries as well as to change their mind-set to be more flexible and adaptable to the opportunities available in the country. In this way they can learn to become entrepreneurs on their own and will not be so dependent on other paid jobs. In turn they can create jobs for others to get employed.

Parents too are concerned about the courses their children will take up at the higher institutions of learning. This is because the investment cost for studying S and T courses is higher than the arts and social sciences. The parents, especially those who are poor, find it risky to invest on their children's education in S and T studies when there is uncertainty of the prospects of well-paid jobs. As a consequence students too can be dissuaded from taking up the study of S and T in the secondary schools. This in turn creates the challenge for the implementation of the policy in the secondary schools.

On the other hand, the government needs to stimulate and promote the development of opportunities to bring about diversification of industries for the creation of greater variety of job opportunities for the graduates in S and T fields and to broaden the prospects of opportunities for research and development. With these changes and with employment opportunities for S and T graduates, students will be encouraged to take up the study of S and T in the secondary schools.

(2) Opportunities for advancement, and research and development

Without greater economic development, it is difficult to envisage more opportunities for employments and advancements. Therefore there is a need to encourage more development and establishment of high skill technology industries and scientific agricultural productions. The country should be able to attract more FDIs for the creation of opportunities for the employment of scientific/technological skilled workers and for job advancements.

The external environment is the driving force that influences the students to take up the study of S and T in the schools. If the market could not provide employment opportunities for those with skills in S and T capabilities and salaries better than other jobs, then students will not be discouraged to pursue S and T based subjects in the secondary schools.

However, if the country does not continue to emphasize the importance of the S and T education, then the country will not be able to have a ready pool of S and T educated workers to feed the needs when required. The country should continue to generate more scientists and technologists to attract foreign investments to bring about the development of high technological industries in the country. What the country has experienced now is only a temporary setback. Greater concern and effort should be given to ensure that more students are encouraged to take up the study of S and T in the secondary schools as a preparation for the country to turn around in the very near future. This implies that the 60:40 policy has its rightful place in the secondary schools.

5.4 Implications of the study

Fifteen implications with regard to the implementation of the 60:40 policy are derived from the study.

5.4.1 Teachers' perception of the 60:40 policy status

The research study found that teachers who are involved in the teaching of S and T subjects have different perceptions about the said policy and most of them are not confident that the policy would work. They have different objectives, understanding and interests towards it. This resulted in the absence of convergent sense of purpose and it created problems and delays in the implementation of the policy. This is because most of the teachers are not aware of the importance and long-term implications of the 60:40 policy to enable them to justify their involvement in the teaching of S and T subjects in the schools.

As a consequence, most of the teachers do not have such aspiration to motivate and sustain the interest of the students in studying S and T subjects and to enable them to continue such studies at the higher level because they have institutionalised the belief that the students are not good enough to do S and T studies. The study found that most of the students indicated that the teachers cannot mould them to become students of S and T because the teachers themselves are not knowledgeable about the S and T subjects. The teachers do not see the relationship between the formulated curriculum of science and the students' character, experience and relevance in their daily lives and as such they teach science as a subject for study only. In a way they have ignored the intellectual level of the students. Unless the situation improves, it is difficult to contemplate more students taking up the study of S and T in the secondary schools.

5.4.2 Ability to add Values to the Teaching-Learning Process

The ability to add values to the activities in the teaching-learning process to improve the quality of the S and T education becomes important in the secondary schools. The ways to add such values have been determined by other researchers:

(a) Cavallo & Laubach (2001) and Woolnough (1994) found that creating conducive classroom environment enhances students' desire to study science subjects.

(b) Ferguson & Fraser (1998) found that the relationship between students and teachers influences the student-interest towards science and mathematics.

(c) Artwater et al (1995) and Simpson & Oliver (1990) found that the form of teaching influences students' interest to study S and T based subjects.

(d) Cavallo & Laubach (2001), Freedman (1997) and Gallagher (1994) found that science students prefer to study science that is laboratory centred because it enables them to learn science through enquiry and helps students to pursue science courses at the higher level.

(e) Young et al (1997) and Woolnough (1994) found that students studying science discover that the understanding of the theories and factors is important, that experiments help to improve knowledge in the area of science and those co-curriculum activities such as science society and science competition benefit them.

(f) Fouts & Meyers (1992) found that the attitude of teachers and a positive climate for study affect the interest of students toward a particular subject. For example teacher's enthusiasm and attitude toward science have encouraged students to pursue S and T at the higher level (Cavallo & Laubach (2001); Lawrence & Coleen (1985).

However, the study found that most of the students said that classroom environment is not conducive. They said that the lessons were not intellectually demanding, not interesting and did not help them to understand the subject taught. These situations do not add values to the activities in the teaching-learning process and therefore will not encourage the students to continue studying S and T at the higher level.

The study also found that students are aware of the benefits of studying S and T over the arts and social science especially in terms of professional occupations and higher income levels. However, most of the students have the fear that S and T subjects are

difficult to study and therefore they will not do well in the examinations. As a consequence, they want to do arts or social science. According to Crawley & Black (1992) such negative consideration towards science at an early stage can lead to negative attitude toward science. They suggested that the students' poor concept about the learning of S and T subjects in the schools can be changed if value can be added to the teaching-learning process of S and T education in the schools.

When the teaching-learning environment for S and T education provides more benefits than what the students have expected, the students will become loyal customers to the study of S and T. Failing which it will not be possible to get more students to engage in the study of S and T and once these students are lost it will be difficult to get them later on at the higher level.

Teachers are the most important elements in the schools to bring about this transformation. It needs to have honest creative teachers who have the knowledge, creative intellectual ability and the personality (such as the flexibility, adaptability, persistency and challenging attitude) for change to happen. The learning of S and T should make the students to become more creative and to enjoy a life of discovery in S and T. Unless teachers are capable to do all these, it will be difficult to envisage the generation of creative science students to perpetuate their interest in the study of S and T from the early stage.

The expected kind of value adding to the activities in the teaching-learning process is not noticeable in the schools. Teachers are teaching the science subject to complete the syllabus for the sake of examination but not for the understanding of the concepts and theories of science. They therefore do not capitalise on the existing infrastructures and the students to bring about greater values in the teaching and learning of Sand T subjects among the students.

A parallel example is the Nullfield Science programme that was introduced in England in the 1960s. The programme was based on active learning where a student actively engaged in a problem to learn a concept. Many years later, it was found that teachers needed to be properly trained for working with the new materials and possessed a teaching personality compatible with the methodology required in this new programme to bring about the successful implementation. It was also found that younger teachers were more adaptable to new programmes than the older teachers (Lee, Eugene C., 1963).

5.4.3 Teaching of S and T and the concepts of Jerome S. Brunner and Jean Piaget

The schools have the basic facilities for the teaching and learning of S and T, teachers therefore, play the imperative role in stimulating and motivating students to learn S and T. The opinion of the teachers about the feasibility to encourage more students to take up S and T studies is divided. This conflict of interests among the teachers has hampered the progress in implementing the policy. This development has affected the approach to the teaching and learning of S and T in the secondary schools. There is therefore no uniformity in the methodology of teaching S and T subjects among the teachers. The approach to teaching S and T subjects is done in variance with the concept propounded by Jerome S. Brunner and the theory of cognitive development by Jean Piaget.

Jerome S. Brunner said that any child can be taught to learn a subject if it is done in an honest way from the level of the child's intelligence. Jean Piaget told us that learning of S and T subjects can only take place through the interaction between the environment (teachers) and the intellectual level of the student resulting in assimilation and accommodation. This implies that appropriate opportunities should be created and

made available for students to interact with their learning of the S and T based subjects such as programmed learning and practical works in the laboratories and outside.

Sharifah Maimunah (2000) recommended that the teaching of science should be done in an enquiry approach to enable the students to acquire the culture of a lifelong learning. This is in line with the concepts of Jerome Bruner and Jean Piaget. Unless this is done it is difficult to envisage more students will be encouraged to take up the study of S and T subjects in the secondary schools.

5.4.4 Ability to give value to the students in the learning of S and T

The student respondents in the study have high aspiration for studying S and T education at the secondary schools and the desire to continue on studying S and T courses after completing their high school education. They value thinking ability, expertise in the fields of S and T and becoming professionals with attractive and adequate salaries and becoming useful members of the society. These aspirations and values of the student respondents have been found by other researchers too.

Chew et al (2001, 1995) and Leong et al (1990) found that the secondary school factors play a more important role in the academic achievement of the students, such as public library, distance from school, health of student, education aspiration and professional aspiration of students and family. Woolnough (1994) identified that the quality of teachers in the school, work experience and societal values influence students to study science and engineering at the higher education level**.** Panizzon and Levin (1997) said that the aspiration of a livelihood influences a student to further his education at higher level in the field of his interest based on what he has known and seen. Young et al (1997), Woolnough (1994) and Schibeci (1986) provided further ideas that a student's interest in the science profession is influenced by his interest and

achievement in school and the socio-cultural factors like environment of family, community and school.

Therefore the teaching and learning of S and T at the secondary schools should take into consideration the needs of the students for wanting to take up such studies at the higher level. Sharifah Maimunah (2000) in her definition of science education has said that the central approach to the teaching and learning of S and T is the mastery of scientific skills such as process skills (the mental ability to analyse, synthesize and evaluate), manipulative skills (psychomotor skills used in scientific investigations) and thinking skills (creative thinking and critical thinking). On the other hand the development and inculcation of values and attitudes can be derived from the teaching approach e.g. the enquiry approach. These are basically the values that influence the students to think and act rationally to cope and live successfully in a changing world. These are the values parents want their children to gain in studying S and T and they encourage their children to do S and T subjects.

The schools do not have the capabilities and core competencies to create the values to encourage more students to take up the study of S and T. This is because most of the student respondents in the three schools (61%) are demanding for intellectually creative teachers and appropriate pedagogy. The teaching approach is therefore an issue. This implies that the central objective to the teaching-learning approach in S and T education i.e. the mastery of scientific skills has not been practised in the schools. The situation becomes even more acute when there is a shortage of S and T teachers (Sharifah Maimunah, 2000).

5.4.5 Emphasis of S and T Education at the Secondary Schools

Most of the teachers (80%) conferred that S and T education should be emphasized at the secondary schools. They also indicated that the students are matured enough to

study S and T subjects and to become more creative and intelligent. *Yet over the past 20 years there are more students taking up the study of arts and social science than the S and T.*

The reason as attributed by 20% of the teacher respondents is that most of the students are not capable to study S and T. However this reason is in conflict with that of the majority of the teacher respondents who identified that the students are matured enough to study S and T.

The plausible reason is the application of the tradition pedagogy of imparting S and T knowledge to the students i.e. based on memorization of facts or rote learning. This traditional approach has not encouraged more students to study S and T subjects in the secondary schools.

The vital objective is 'to instil within the child the disposition to make enquiry in the manner well known to scientist' (Gagne, 1963). Hence, if S and T education should be emphasized in the secondary schools, then the appropriate pedagogy should be applied to enable students to learn S and T in the creative way. The current approach of rote learning should give way to the enquiry or discovery approach where learning could be achieved through understanding of the information received.

However teachers first have to master the methodology of this approach. Unfortunately today S and T subjects are taught in the memorization of facts and the text books in use are short of experimentations and creative activities. The study found that such a situation has prevailed in the secondary schools – quote "Not so much for the sake of learning but just to teach and finish the syllabus quickly whether students understand or not and then proceed to do the revision just give the students the answers."

For example the objective of the Smart school concept is to transform the traditional rote learning to creative learning. For this transformation to take place it needs more

than just the provision of the facilities and teaching materials. It requires first of all the right teachers to bring about the required change in the culture of the school. Teachers actually play the crucial facilitating role here to select or create appropriate learning programmes and activities that challenged the students' intellectual ability and extend their knowledge. Students in turn receive intrinsic rewards such as interest in the learning task and satisfaction in making a discovery that will motivate them to learn more efficiently and effectively. Skills learned in discovery-learning situations can be more easily transferred to new learning activities and apply to other situations. Teachers need to internalise this responsibility to stimulate enquiry or discovery learning among the students so that more students can be encouraged to take up the study of S and T.

5.4.6 Policy Planners and Implementers not interacting

The top-down approach in the education system has hindered the implementation of the policy. In the first place the schools are not involved in the development of the programmes or activities and the control process for the implementation of the said policy. Taylor et al (1997) have warned that any educational policy cannot be fully realised if the implementers do not understand the concept that is veiled in the policy from the top. As a consequence, it causes unnecessary conflicts between the policy makers and teachers.

The study found that the teachers have no confidence in the 60:40 policy because they do not have enough knowledge of it. This has put them in the state of uncertainty. The top-down approach usually has the necessary control system to ensure efficient implementation of the policy as seen in organisations. This approach has not been noticeable in the education system which is more complicated than an organisation.

The study suggests that the team effort between the policy makers and the implementers is imperative for the development of the right strategy and the control systems for the successful implementation of the policy. Both parties must take responsibility, accountability and transparency for the implementation of the policy.

5.4.7 Teachers' perceptions of their students

Teachers opined that S and T students lacked knowledge and skill in S and T, creativity, literacy and achievements and as a consequence the implementation of the said policy has become difficult or impossible.

This suggests that teachers are not able to capitalise on the students' weaknesses to guide them through in the learning of S and T and instilling in them the art of investigation and discovery, moving from extrinsic to intrinsic rewards and improving their creative thinking skills and motivating them to pursue their studies in the S and T areas at higher levels.

Every student in a class has some degree of creativity and can be taught to improve his or her creative skill. With the creative skills students can find excitement in the learning of S and T. At this stage the students are motivated to read beyond what has been taught in class. It is a challenge for teachers to develop the creative skills in their science students in the ways they are being taught. For a few teachers it is difficult to ignore the challenging situations presented by the students and they enjoy such challenging situations.

The study found that teachers are asking for more incentives for teaching S and T based subjects as well as asking for more teaching time in these subjects. It makes sense to provide incentives to such creative teachers in order to motivate and to encourage them to become more creative, effective and caring for the student's demeanour. It can also act as an exemplary to others.

5.4.8 Supporting role of the Government to the secondary schools

The study found that the Government has to show more concern for the implementation of the 60:40 policy through exercising greater interest and enforcement. It has to exercise more concerted efforts to provide funds for upgrading the necessary facilities and materials for the teaching of S and T subjects in the schools. The S and T teachers have to be given the training to work with the new materials and the methodology required in the new programme to bring about the successful implementation of the said policy. The teacher said that the distribution of funds for development and the provision of training of S and T teachers are not done according to the needs of the schools. This has caused the three secondary schools to have unequal opportunities to implement the said policy.

The policy has not been given much publicity for the people to learn about it and to have a more concrete understanding of its implication in the transformation of the national economy in this century and the need to encourage their children to take up science and technology in their pursue of higher education.

5.4.9 Strategy

The teachers have no confidence of the policy because of the poor strategy for the implementation of the policy. Strategy implementation is to convert strategic plans into actions and to attain the desired results. The strategy therefore must have the right guidelines and provisions for the right things to be done in the policy implementation process.

The study suggests that the schools have not established the objectives for the development of the strategy to implement the policy. Whatever changes make by the head teachers are reactive in nature i.e. the transactional type at the official level.

However, at the personal level, they practise transformational leadership style and come out with emergent strategies. They encourage teachers to work in teams in problem solving and in school activities. However they are slow to change by virtue of the fact that they are not at liberty to decide what they consider to be good for their schools.

Whatever the strategy the policy makers have developed it has not achieved the objectives so far. Therefore the liberalization of central control for decision-making to the schools is a right step for the head teachers to develop the appropriate strategy to bring about transformational changes in the schools and to ensure corporate governance prevails. On the other hand, strategies cannot be executed without a number of supporting systems for their operations such as rewards and incentives for the teachers and the students to sustain energetic commitment and execution of their roles in the implementation process. Other supporting factors include the structure and culture of the schools and the MOE and the parents of the students. The head teachers can learn to set up the appropriate strategy to implement the policy and become accountable and responsible for its involvement in the implementation of the policy.

5.4.10 Structure and Culture

Generally structure and culture are evolved from the strategy developed for the organisation resulting in the strategy-structure-culture fit. Any misfit among the three mechanisms the process of implementation of the policy is affected. This probably explains the slow journey the implementation of the policy has taken so far.

The dominant structure of the three secondary schools is basically a three level hierarchy. The structure then gives rise to the culture.

The study suggests that the school culture is fundamentally task-oriented. In such a culture, the head teachers are reactive rather than proactive to solve a problem i.e. no

order no action. As a consequence, a task-oriented culture influences the development of transactional leadership style among the head teachers.

However, from the information gathered from the teachers the head teachers informally practised a flexible leadership style. They share their visions with the teachers and encourage teachers to create, innovate, lead, work in teams and take collective responsibility. An informal learning culture is apparent in the schools.

Therefore the concept to empower the schools to be independent in their decision making should be encouraged to bring about greater corporate governance for the implementation of the said policy. In this way, efficiency in a stable environment will give way to achieve effectiveness in a dynamic environment.

5.4.11 Leadership

The study indicates that the head teachers practised management by exception in terms of looking for deviations from rules and standards and taking corrective actions. It is done in a passive manner as interventions only occurred when standards are not met. As transactional leaders they initiate structure and are considerate to teachers and therefore they are good in team management.

The head teachers also engage in transformational leadership style by providing visions and the sense of mission, instilling pride, respect and trust, inspiration, promoting intelligence, rationality and careful problem solving, and showing individualised consideration. Thus, transformational leadership is being built on top of transactional leadership in order to produce levels of effort and performance of the teachers beyond what occurs with a transactional approach.

Therefore schools should be given more liberty to bring about necessary changes to ensure the successful implementation of the policy. Furthermore, head teachers should have the appropriate leadership personality, flexibility and the foresight of what their

actions or omissions can bring about changes to be comparable with the needs of the schools to bring about the successful implementation of the policy.

5.4.12 Incentives for studying S and T in Schools

The study found that it is necessary to motivate students to take up the study of S and T in the schools. The teachers said that this can be done by the provision of incentives and scholarships.

Poor families whose children are capable of studying S and T should be given money to ensure that their children study in the S and T streams in the secondary schools. Good students should be given scholarships to study S and T in secondary schools. Praises and encouragements from the teachers can provide further incentives to motivate students to do S and T studies in the secondary schools.

It is better to give monetary incentives while they are at the secondary schools on three grounds namely the investment cost is low and more students can get them, can create a prolonged effect on the receivers and a challenge to other students to go for S and T education.

5.4.13 Economic Growth in the long term

With fewer students interested to take up the study of S and T in the secondary schools, then fewer candidates will be available for the study of S and T courses at the higher learning institutions. The consequential effect will be that the economic growth of the nation will be sustained only from massive government investment and government-supported bank lending but not by productivity growth. This kind of economic sustainability can only be temporary because it will be subjected to limitations of supply of resources and by the law of diminishing returns. Costs of raw materials will increase as supplies of such materials declined. Then economic growth will slow down.

Long term economic growth sustainability depends on having the required community of scientists and technocrats to meet the needs of the industries and the cultural values for creative thinking and innovation to bring about the necessary research and development. The 60:40 policy is in actual fact the cradle to bring about productivity growth as it provides the creative means to sustain the economic growth of the country. This situation is practised in many developed countries. For example in Germany and the Scandinavian countries "considerable emphasis is placed on investment in education, vocational training and research. This effort is not generally directed towards specific outcomes but rather it provides the basic underpinning for a highly educated and skilled workforce, and for the development of advanced scientific and technological knowledge" (Harrison et. al., 2000, p.287). It is envisaged (based on the current position) that if the manufacturing sector is to move to new technology in capital equipment, Malaysia will still have to look elsewhere for the required quality labour.

It is an imperative issue for the government to direct its attention to the secondary schools and the public universities to promote the quality of S and T education and to encourage more students to take up the study of S and T. Unless the country has its factor endowments based solidly on its quality of S and T education, its economic growth can only be based on its limited natural resources. Then according to what the 96% of the teachers said, "We are not confident that the 60:40 policy will come true" and as such the idea of the country becoming a developed nation will have no meaning.

5.4.14 Students and Family Incomes

The study found that most of the students (47%) studying S and T in the secondary schools are from families with low monthly incomes and this is followed by students (31%) from families with high monthly incomes. Students from families with the

medium monthly income constitute the lowest percentage (22%). When these results are compared with those obtained from the study done by Sufean Hussin & Norliza Zakuan in 2009 on the S and T undergraduates at the public universities, the results are very different. The undergraduates from families with the low monthly incomes represented the highest percentage (72%), and the undergraduates from families with the medium monthly incomes constituted 25% as the next category. 3% of the undergraduates were from families with high monthly incomes. Both the results are summarised in Table 5.4.

Table 5.4: Family incomes

Monthly Family Incomes	S & T Students in Secondary Schools (%)	S & T Undergraduates at the Universities (5)
RM500 – RM2500	47	72
RM2501 - RM5500	22	25
RM5501 & above	31	3

Source: From Table 4.26, p. 164.

The findings imply that S and T students from the secondary schools who continue to further their studies in S and T will be mainly from families with low and medium monthly incomes. S and T students from families with high monthly incomes will be dissipated from continuing their studies in S and T at the higher levels of education possibly from switching to other fields of study or have gone overseas to further their studies. The findings also provided the indication that students from the low and medium income families should be given the necessary encouragements and incentives to take up the study of S and T at the secondary schools.

5.4.15 New Knowledge-Based Industries

The study found that existing industries have to become more knowledge intensive, so that they will in turn create new knowledge-based industries. This will then enable the economy to be characterized by knowledge-based activities and thereafter these high

technology industries will become the major contributors of employment opportunities, exports and the gross domestic product (GDP) of the country. As a consequence, knowledge will become a valuable commodity. The knowledge should be science based because without it technology intensive approaches to production processes cannot be possible. The need to have a pool of expertise in various fields is to provide the opportunities for the industries to get the higher technological skills and expertise to modernise and enhance their production processes and the generation of more innovative outputs to attain competitive advantage. Thereby, economic growth will be stimulated.

The idea to improve the labour force with tertiary education is to create a critical mass of scientific and technical manpower in the country. This is because a highly educated workforce is extremely crucial in driving the knowledge economy. This reinforces the emphasis on the 60:40 sciences to arts policy in the schools in order to provide the student inputs for the tertiary education institutions to create the necessary scientific and technical manpower. This has been the problem the government is wrestling with because of the uncertainty about the teaching of science and mathematics (for example the language to be used to teach the two subjects) and what type of schools to bring about the successful implementation of the S and T curricula in the secondary schools and the provision of trained, experienced and creative teachers for the teaching of S and T subjects in the schools. Therefore setting a clear policy for the S and T education in the long term should be done to provide the direction and scope for the teaching and learning of S and T and the strategy for the implementation of the 60:40 policy in the schools.

5.5 The 60:40 Policy Implications

Six implications with regard to the said policy are identified.

5.5.1 Science and Technology Education

Most of the teachers (80%) agreed that the teaching of S and T should be strongly emphasized in schools. The teachers imply that S and T education should be strongly emphasized and that more students should be encouraged to take up the study of S and T in the secondary schools. The policy therefore provides the teachers the fundamental reason for their existence to serve the nation.

Teachers should not be unduly disturbed about the students in their classes. They are the materials for the teachers to mould and to be turned into scientifically and technologically competent citizens for the country. However an understanding of the types of students in the class is imperative to enable the teachers to know where to begin in teaching the students. Actually it helps the teachers to plan and strategize the teaching approach and to bring the students forward from where they are to where they should be. This is an imperative aspect in the implementation of the 60:40 policy at the secondary schools.

The success or failure in the implementation of the 60:40 policy hinges heavily on the teachers. It is the number and the quality of the scientifically trained students that eventually count for any country. The experience of implementing the Nullfield Science programme in England in the 1960s provides a good example of the imperative role of teachers to make a policy comes true.

The 60:40 policy is accepted as the vehicle for the country to generate more scientists and technologists and to enable the country to attain the position that is economically comparable with the developed world. For example the Malaysia's Economic Annual Report from 1965 – 2006 emphasized that the development of human resource in S and T is imperative for the nation's industrialization process. In 1991 the 60:40 policy has been accepted as the prerequisite or the cornerstone for the country to

achieve the status of a developed nation by 2020. The policy is therefore still very valid today.

5.5.2 Economic Growth

The 60:40 policy is imperative for Malaysia to participate fully and adequately in any scientific and technological development programme to enhance its economic growth. This is because the government can no longer based solely on the size and quality of its natural resources for the long term economic growth. It is the country's ability to develop its important resources. Industrial success required a combination of raw materials, technology and human skills. For example, countries like Japan, South Korea, Taiwan and Singapore initially depended on acquiring raw materials, technology and skill from overseas. Over the years they concentrated on education emphasizing in particular on mathematics and technological education to improve on the quality of their workforce, work practice and on investment in research and development. Today these countries without natural resources except their human resources have achieved economic success based on productivity growth. These countries have created critical masses of scientists and technologists. The 60:40 policy is to create the scientific and technological manpower for the economic growth in the long term.

5.5.3 Investment on Human Resource

Education has been recognised as an investment for the well-being of a nation and that human capital investment leads the way to more productive economies. The type and quality of education indicate the type of products and services that can be offered in a country.

In most countries the emphasis is on S and T education because as it is said by a teacher that 'everything we do has S and T in it'. Therefore increasing the number of

people who are educated in S and T will make the country more prepared to face the external forces of change as well as to contribute the expertise for the technological progress of the country. A high level of human resource development enhances the pace of the country's economic development through the acceleration of productivity growth. To achieve productivity growth requires the expertise and technological skills to utilise the tangible assets and the ability to add value to the activities in the production process to create quality products and services to meet the needs of the market and to achieve competitive advantage. The 60:40 policy encourages the investment of human resources in the S and T education.

5.5.4 Knowledge Workers

In industrialised countries like Japan, United States and the Western European countries such as Britain, France, Germany, Belgium, Holland, Italy and the Scandinavian countries, their workers are very knowledgeable – they are known as the k-workers. They have acquired the knowledge and skills especially in the science and technical fields that are critical to organisations. They continue learning and improving on their knowledge, skills and creativity. They help to push forward the growth and wealth creation of their countries.

For Malaysia to become a k-economy, it needs to have the k-workers to provide the intellectual capital to meet the challenges of globalization and to attract foreign direct investment (FDI) into the country. S and T education has become the source for the creation of k-workers. The 60:40 policy is established for such human resource development in the schools and other educational institutions in the country. This will eventually lead to the fact that the effective management of the k-workers is more important than the efficient control of physical and financial assets for a developing country like Malaysia. This is because the human resource is the most important asset of

organisations and the country. Therefore the implementation of the said policy should be given greater importance and justification for the creation of k-workers. This also implies greater investment in the education system for the development of S and T professionals and technocrats in the country.

5.5.5 Multinational Enterprises in Human Resource Development

Multinational enterprises are interested in the skills and experience that they can gain from the education of a country. Companies that are engaging in research and development prefer to locate their operations in countries with high skilled workers. Countries without or with little natural resources like Japan, Hong Kong, South Korea and Singapore have very active and innovative economic sectors because they relied heavily on their human resources to bring about scientific progress.

With foreign direct investments coming into the country more job opportunities will be created for the employment of k-workers. The employers believe that the k-workers improve their financial potentials because they have a definite positive mind, flexibility and adaptability and the receptiveness to new idea and knowledge. The employment of k-workers will contribute to economic competitiveness for the companies.

The 60:40 policy is expected to bring about a paradigm shift in the development of the human resources in the schools and institutions of higher learning towards the S and T fields. Science and technology are the prerequisites for economic productivity in many sectors of the economy. The knowledge of science and technology is relied upon to bring about the development of new technologies and new products and improvements of existing products. The policy is directing the development of a pool of scientists, professionals and technologists who have the knowledge, skills and expertise in diverse areas to contribute to the economic development of the country. It is asking the country to be prepared with the necessary human resources for the

development of high technological industrial sector to make Malaysia a modern industrialised nation comparable with the developed world.

5.5.6 National Competitiveness

Malaysia is fortunate to have the natural resources to sustain its economic growth over the years. However these natural resources alone are not adequate to sustain the economic development in the long term. The country must have the capability to utilise its natural resources to the best advantage in terms of competitive sustainability. This means that the country must be able to preserve and treasure its available resources and use them in the way that every dollar counts. Every business organisation in the country must be able to add values to the chain of activities to convert the raw materials to finished products rather than export the raw materials and then import the finished goods. Adding values to the production activities mean reducing the cost of production and concurrently improving the quality. The ability to add values to the chain of production activities requires the necessary scientific and technological expertise, competency and skills and the creation of core competencies to attain competitiveness. When the businesses are able to attain competitive advantages, then the nation will attain the competitive advantage over its neighbouring countries. This means a better economic growth and sustainable competitive advantage.

The 60:40 policy indeed plays this important role to improve the economic environment by encouraging more scientists, experts and technocrats to be available for the needs of the country.

5.6 Management Implications

The 60:40 policy is nothing unless it is effectively implemented. Implementation of the policy is linked to other factors that are within the school and those that are outside the

school. The policy has defined goal i.e. to have 60% of the students in the secondary school studying S and T education. Literally, the school is to *develop the strategy* to reach that goal which includes aggressive teaching and learning approaches to attract new students, motivating them and sustaining their interest to further their study in S and T areas at the higher level. It includes good team management and the flexibility of leadership styles to meet different situations and developments in the education system. The school has a lean structure which is likened to a learning organisation for the creation and management of an S and T learning culture. It needs a good leader to bring about the successful management and institutionalisation of a scientifically oriented culture. It also needs the support of MOE, the parents and the local community. Three fundamental issues are highlighted here:

(1) Selecting Strategy and Design

The head teacher together with the subject heads in the school should seek to formulate the strategy that is congruent with the objectives, the external environment and internal characteristics of the school. They need to come out with a strategy that is responsive to a dynamic, growing environment where creativity is more important than efficiency. The choice of strategy will affect the internal organisation characteristics. For example the selected strategy will require the use of the discovery/enquiry approach to the teaching of S and T based subjects and the moving away from the traditional expository approach. The strategy will require teachers to be constantly experimenting and learning. It will require a flexible structure for strong horizontal coordination even though such a structure is generally seen in schools. Such a structure tends to support teachers to be creative and risk taking, to value research and to bring about creativity and innovativeness over efficiency and standard procedures (Daft, 2004, pp. 63-64).

(2) Establishing an appropriate Control System

A major problem encountered in the implementation of the 60:40 policy is the inadequacy of an appropriate system of control and evaluation. This is manifested by the fact that 96% of the teachers are not confident that the said policy will come true. There is no clear measurable instrument (standard) to show to the teachers how the said policy is to be achieved within a certain time frame (such as on a yearly basis). As a consequence there is no appropriate means for teachers to be responsible and accountable for the implementation of the policy. This has indirectly affected the teachers' perception of the true value of the said policy.

The 60:40 policy is liked a vision to be achieved in the long term. It has first to be structured into real and measurable terms as objectives for control purposes. This implies that an objective should be achievable when the policy is being implemented by the teachers. The objective in the sense is a standard designed to be achieved within a certain time frame and is to be used to compare with the actual outcome. If the actual outcome has indicated a deviation from the standard then appropriate remedial actions can be taken to ensure that the implementation of the policy is done successfully. Different objectives are set to cover different areas of achievements such as financial aspects, students' achievements in activities and class tests and programmes used.

The education system practised the top-down approach where rules, regulations and directives contained information about a range of behaviours expected of the teachers come down from the top to the teachers. The 60:40 policy is handed down to the schools to be implemented without further consideration of the necessary system of control and evaluation. This form of traditional control does not work well in organisations like the schools where shared values and beliefs, commitment, team work and trust prevailed. It cannot work where things are changing rapidly as seen in the education system, that as a consequence rules and regulations are not able to specify

every correct behaviour. The kind of control to be used on the teachers should be based on individual values, goals and standards in order to induce them to change to be in line with the school's values and goals. This meant that the head teacher in a school has to be a good and strong leader to clarify boundaries within which teachers have to exercise their own knowledge and discretion. Bearing in mind that teachers are leaders in their own right and they work in teams in carrying out their school activities, strong team leaders are needed to get team members to successfully implement the said policy. This implies that schools will have to set their own objectives from the policy statement and the systems for control and evaluation for the implementation of the said policy. It also implies that the teachers have to be given the opportunity to learn about strategy management. The advantage of the schools establishing the objectives and the control systems for the implementation of the said policy will enable the teachers to become co-owners of the objectives and more responsible and accountable for implementing the said policy.

(3) Implementing the Strategy and achieving the Policy

All the above management preparatory procedures are necessary before implementing the said policy. These procedural steps are to ensure the direction the school management should be taking to achieve the policy and how the policy will be achieved.

In the actual implementation of the policy the senior teachers will act as the champions of change and they help to build the culture where other (new) teachers will be receptive to the new strategic initiatives. If the strategy is well implemented then the school will meet its goals and thereby the said policy. However a poor implementation of the strategy will impede success.

Some suggestions as to why implementation of a strategy will fail:

- Implementation required more time than planned.
- Major problems may not be anticipated.
- Poor coordination of activities.
- Problems arose due to uncontrollable external factors.
- Inadequate leadership and direction.
- Teachers were not capable enough.
- Implementation tasks were not properly defined.
- Information system was not adequate.
- Inflexibility and adaptability of implementers.

Therefore the management requirements for the implementation of the 60:40 policy involve developing the required strategy, good leadership, an appropriate culture and a congruent structure, and the need for creative, intelligent, flexible and adaptable implementers.

5.7 Recommendations

This second part of the chapter provides five recommendations or suggestions for improving the implementation of the 60:40 policy in the secondary schools.

5.7.1. Centralization of S and T Schools

Certain schools in a district can be selected to operate fully as S and T schools with classes from Form 4 to Upper Six. This is to overcome the inadequacy of facilities and teachers and to encourage more students to take up the study of S and T. It also enables other advantages to be achieved such as better planning, coordination and collaboration, and most of all coming out with the necessary strategies as effective means of

implementing the policy and improving the control system. It is expected that all these changes will facilitate the implementation of the 60:40 policy.

5.7.2. Supply and Demand for S and T Education

The 60:40 policy has been developed by the top people but implemented by the schools. This follows the top-down process. This situation can be looked at as "an intervention into the school system" to create a supply of S and T students (Abhijit V. Banerjee & Esther Dufia, 2011)**.** This has not been very useful because the students are not taking up the study of S and T in the schools. This can be substantiated by the fact that after 46 years since its inception in 1967, only 30% of the students in the secondary schools are in the science stream while 70% are doing arts and social sciences. There is a widening strategic drift between the desired outcome and the achieved outcome.

Looking from the demand side a different picture appears. Parents know the benefits of education. If the benefits are high enough, enrolment will automatically go up without government intervention. The school enrolment is sensitive to the rate of returns to education.

The demand side is less controllable than the supply side in the sense that it is more divergent than the convergent state of the policy makers. At the demand end it involves stakeholders such as the parents, students, teachers, book publishers, textbook writers and the community at large. This is because the rate of returns from education is decided by the immediate market. Parents and students are very much influenced by the conditions existing in the market than what will exist in the future. If the market does not provide employment opportunities for citizens with skills in S and T capabilities and salaries better than other jobs, it will not stimulate students to take up the study of S and T.

Education is viewed as a form of investment with the expectation of getting back in the form of increased earnings in the future. Parents do the investment and children get the benefits, sometimes later with the hope that they will have better lives and with the expectation that their educated children will take care of them when they are old.

Those who value science and technology education will want their children to study them at the schools and will go all out to help their children to get educated in S and T. The research study has shown that rich parents and poor parents want their children to study S and T education in the secondary schools. These parents expect the rate of returns to be better than the education in arts and social sciences in the hope that their educated children will have better lives as professionals in the fields of S and T and attain handsome earnings.

There are also parents who will encourage their children to do arts and social sciences which are considered to be less difficult. These poor parents are afraid that if their children have difficulty in studying S and T and they themselves are not able to help them then their children will have problems. Both will eventually suffer if their children do not do well in their studies and cannot find reasonable jobs. Parents are also in the state of dilemma with regard to their children's education. This should not happen if the education system and the economic state of the nation attain strategic fit i.e. create certainty of economic path that leads to creation of demand for the particular type of education to be taken up by the students.

The suggestions for encouraging more students to study S and T are as follows:

1. Government can offer money to poor families but with the condition that their children attend school regularly. They get more money if their children are in secondary school than in primary school and even more money if they are studying S and T subjects. The payments should be treated as a compensation for wages lost when their children go to school instead of working.

2. Another approach is to provide scholarships to good students to study S and T in secondary schools.
3. The certainty that the students who study S and T in the secondary schools will be able to follow the courses they are interested in at the institutes of higher learning.
4. When in the schools the students should encounter intrinsic motivational forces that can endure them to continue to do S and T studies at the secondary school and then proceed to continue their studies at the college or university. The teachers and parents are instrumental in these intrinsic motivational influences on the students through their constant support and encouragement and teacher's creative approach to teaching, demonstrations and visits to places can excite the students to continue explore and discover the concepts of S and T on their own.
5. The Government has to stimulate economic development in the establishment of high skill technology industries and scientific agricultural activities in the country. This is to create the demand for S and T skilled workers. This will provide further impetus and strong encouragement for students to take up the study of S and T education at the secondary schools and to pursue their studies at the higher level.

5.7.3. A Systems Approach

Earlier the idea of a mixed method (i.e. a combination of top-down and bottom-up perspectives) has been discussed for the implementation process. However this simplistic lateral view of the implementation process is inadequate because the implementation of the policy involves events that are more complicated. This calls for a more inclusive model such as the systems approach. This systems approach is one of the management theories adopted from biology in the 1950s. It considers organisation

systems as open systems in the sense that organisations receive inputs from their external environments and provide outputs back into that environment.

A system is envisaged as a group of interacting, interrelated and interdependent parts that form a complex and unified whole with a specific purpose. As shown in Figure 5.3, the parts are made up of the subsystems such as teachers, parents, students, schools, planners, community, audio-visual aids, learning programmes and government departments and the ministry. The important idea is that the parts form a network of subsystems, and the subsystems are interacting in a larger system, if not they are only a bunch of things or a collection of parts. Together they make up a transformation system, because it transforms inputs (the 60:40 policy) into outputs (implementation outcomes).

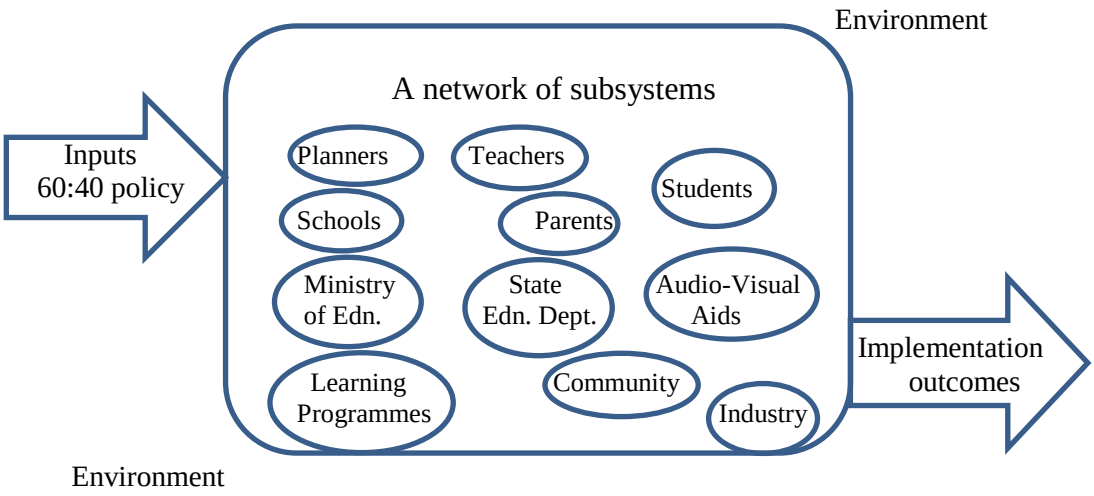

Figure 5.3: A Systems Approach for Implementation of 60:40 Policy

This systems approach helps to provide a whole new way of looking at things as well as the understanding of the complex patterns of actions and reactions in the implementation of the policy. It enables us to recognise how things, people and events relate to each other. It helps to anticipate the emergent consequences of actions. It also helps to make better decisions and create stability. It has feedbacks so that corrective actions, where necessary, can be taken to stabilise the system. By using the systems

approach for the implementation of the policy it is possible to see the world very differently to the extent of fostering awareness of other systems and subsystems. As a consequence it helps to move from a transactional position to an intentional or creative (transformational) one, leading to designing systems that produce sustainable results in the policy. Therefore it shows that the whole of the system behaves in a way which is greater than the sum of its parts and this is synergy. Thus, this systems approach ensures a more effective, efficient and advantageous way to implement the said policy.

For the systems approach to work effectively and efficiently it requires a control system to ensure the implementation of the said policy. It can also serve to enable the teachers to really feel that the policy is imperative and urgent through constant reminders and regularly being informed of the achievements of the policy among the schools. This is to create a sense of competitiveness in achieving the said policy. This must be done with a missionary zeal to motivate the teachers to develop a sense of belonging, team work and responsibility to achieve a common objective, interest and understanding in implementing the said policy. It ensures the establishment of accountability, responsibility and transparency (corporate governance) by the implementers and those who developed the strategy. It also calls for appropriate parenting advantage to be exercised by the policy makers and to provide the necessary supports to strengthen the schools by ensuring the development of capabilities and core competencies among the teachers to sustain the implementation of the said policy.

5.7.4. Spiral curriculum for S and T Education from Primary to Secondary Schools

The concept of preparing students for S and T studies at the secondary school level is best be one that is a continuation of the curriculum in the primary school level. The issue should be centred on how to make science a dynamic and integral part of the

primary school curriculum. How it can make the child aware of the impact, as well as the social and economic aspects and values of science and technology on society. Early immersion of the child in understanding science studies in the primary school and then through the lower secondary school level (a duration of 9 years) should help the child to solve problem critically and creatively, but not through memorization of facts. By the time the child comes to Form 4 he has already developed the scientific attitudes and skills to study S and T subjects. Science should not be studied through the fear of difficulty but through the sense of joy and discovery and reflection as well as to challenge one's creative intelligence. This should be the aspiration in the school's science curriculum at the primary and secondary levels as well as to institutionalise in the child the spirit of discovery and lifelong learning.

The curriculum for science should not become too easy, for it will not challenge the intellectual level of the students and the learning of science will become boring to them.

There is a need then to examine whether the process of teaching-learning science is through the process of a spiral curriculum and is taught to the child according to his level of intelligence (Jerome S. Brunner, 1960). Therefore it requires a trained, experienced and creative teacher as well as an environment conducive (such as the school) for the teaching and learning of science to take place in the spiral process. A curriculum for S or T subject must not be too high a level to begin with. It is to provide a greater flexibility to begin teaching from intellectual levels of the students. This gives the teachers a greater allowance to start teaching from the lowest level of the students' ability in the class. Teachers are to take into consideration the other more capable students and create the time to bring the other students to their level. Teachers must be capable to create learning programmes to meet the needs of individual students.

In other words if S or T is taught to the child from an early stage and he has learnt it just like how he is taught to fish he will continue fishing and be a critical and creative

person and live a happy life. What is needed is a creative and experienced teacher to teach the child how to study S or T and he will continue to study S or T for the rest of his life.

5.7.5. Recognition of the Teachers

The teachers are saying that there are conflicts with the policy makers because of clashes of ideas and values. This shows that the subsystems are not integrated in order to enable the large system to work in a holistic approach to implement the 60:40 policy. The teachers belong to one subsystem in a larger system but they are on their own and carrying on their businesses in the way they know best. They are implementing the 60:40 policy without really knowing fully its intrinsic values. They look for financial incentives and other means of motivation. They are not going to change their attitudes, values and beliefs easily without being given the opportunity to know and understand the policy. Generally people are afraid of the unknown as well as disliked uncertainty and ambiguity surrounding change. The teachers may even perceive their lacking of skills for a new situation (Barbara Senior, 2002, p.252). It is more logical to provide incentives such as promotion, appreciation, praises and training that will encourage and motivate them to be better S/T teachers. In a way these incentives can make them to become more creative and to improve their performance.

The current situation has evolved over the years on the basis that the teachers and the policy makers are at two different poles. The two subsystems are not coordinated and collaborated for the whole system to work. Teachers play the crucial role in the implementation of the said policy but they have not being taught in some honest way to get them to understand the said policy and it objectives. Teachers have expressed disappointment that they have heard so little about such an important policy over the years in their teaching career and never have the opportunity to meet the policy makers.

Many teachers have reached the opinion that it is not feasible to implement the said policy and as a consequence they do not give much importance to it.

Teachers have to be given the recognition and dignity as the policy implementers. The top people especially the policy makers should come down to meet and talk with the teachers and encourage them to count the policy as their own and to work with the teachers as a team. With the participation and support of the teachers and that of the policy makers, together they will form the team to develop the best strategy to implement the policy. When teachers are co-owners of the strategy they become more responsible and accountable. It is also important that teachers' perception and understanding of the said policy need to go through a cultural orientation. Things can even move fast if there are incentives to motivate them. It is necessary that teachers who are the implementers be in the state of confidence to implement the policy.

5.8 Conclusion

The conclusion of the findings with respect to the implementation of the policy at the three selected secondary schools relates to three primary aspects. These three aspects have contributed to the slow and uncertain state of the implementation of the policy at the secondary schools. The first aspect is the absence of team effort between the policy makers and the implementers. It gives rise to the delinquent state of the implementation process and thereby creating the state of uncertainty among the implementers in their efforts to implement the policy. The other primary aspect is the development of poor strategy which is an imperative step in the strategic planning process, for the implementation of the policy. The development of the strategy is done unilaterally by one party, the policy makers devoid of the participation of the implementers in the education system and this approach has created many pitfalls in the implementation of the policy at the secondary schools. A bilateral involvement of both parties would

enable a thorough exploration of the many factors both external and internal including extrinsic and intrinsic values that influence the implementation process to achieve the objectives of the policy. The strategy must also fit the structure and culture of the schools for the smooth implementation of the policy. The consequence to the absence of these two primary aspects leads to the creation of the third aspect which concerns the teachers who are the implementers of the policy. Teachers are left in the void to implement the policy which they know little about and without parenting guidance. As a consequence they face uncertainty and become uncommitted. They are not motivated to put in their best effort to take responsibility and accountability for the achievement of the objectives of the policy. They do not develop the intrinsic values to be committed to a policy of which they have not been properly acquainted with. They have not being *properly trained to meet the requirements for the implementation of the policy*. They are not able to create conducive environments and circumstances to challenge the intellectual needs of the students in order to encourage them to study S and T subjects at the schools and continue to do so at the higher institutions. On the other hand, they are in fact, the key resources to the implementation of the policy because the success or failure of the policy depended on them.