CHAPTER THREE
LITERATURE REVIEW

This chapter is a review of literature relevant to the reported study. As the aim of this study is to develop theory about TESOL teachers' perspectives on SMK for planning and teaching, it is situated within the larger program of research on effective teaching. Therefore, in addition to the survey of literature specifically related to SMK, literature on effective teaching in general is necessary since the ultimate goal of the study is to contribute towards a better understanding of what aspects of teachers' 'thinking' needs to be taken into consideration when developing programs aimed at making teachers more effective in the classroom. Accordingly, this chapter comprises three main parts. The first part consists of a selective survey of studies that investigated factors believed to have contributed towards effective teaching. Part two examines the studies that investigated the role of SMK on teachers' effectiveness in helping students learn in the classroom. This is followed by a review of TESOL research that explored effective teaching and studies on SMK in TESOL.

A Review of Literature on Effective Teaching

Research into factors that contribute towards teaching effectiveness has had a long history, and has been both prolific and extensive. According to Medley (1982), the first reported study on teaching effectiveness in America was conducted in 1896. Since then, thousands of studies on the subject have been carried out in America alone. An indication of the massive amounts of work on this subject can be seen in the overviews of literature provided by scholars such as Barr (1948), Domas and Tiedeman (1950), Morsh and Wilder (1954), Getzels and Jackson (1963), Dunkin and Biddle (1974), Brophy and Good (1986), Shulman (1986a), and Good (1996), to name only a few.

Owing to the vastness and the diversity of the studies on teaching effectiveness, undertaking a comprehensive overview of all literature concerning teaching effectiveness and accommodating them in neat, well delineated categories within a comprehensive framework does not appear possible. Various scholars have offered a number of ways in which the studies might be classified. However, these overviews are, by necessity, selective and only studies that fit the criteria set by the individual scholars have been included. Good's (1996) overview, for example, examined only observational and interview studies undertaken after 1960. The studies he reviewed were organised under several headings: teacher personality, teacher-proof curriculum, interest in naturalistic settings, teacher behaviour, teacher behaviour and time allocations, teacher cognition and student mediation. Harris (1998) adopted a multi-perspective review whereby studies reviewed were placed under five broad categories, namely, teaching behaviour, teaching skills, teaching styles, teaching models and teacher artistry. Finally, the studies reviewed by Getzels and Jackson (1963) were all statistical and experimental studies published in American journals. The studies they reviewed were organised under seven categories including attitudes, personality factors, teacher traits, cognitive ability and projective techniques.

The survey of literature on teaching effectiveness for the present study must also be selective. For the purpose of this study, focus has been placed on the major research traditions that dominate the different periods of time from the start of the 20th century. These are research on teacher personality, research on teacher behaviour and research on teacher cognition.

Teacher personality

Early studies into teaching effectiveness were centred on the belief that the personality of a teacher plays a significant role in determining the success of classroom teaching (Levis, 1987). A good teacher is believed to be born with the innate skills desirable for teaching. Training only serves to enhance those traits (Coultier, 1987). As Getzels and Jackson (1963, p.506) view it, "the educational impact of an Ichabod Crane or a Mark Hopkins, of a

Mr Chips or a Socrates, is surely not due solely to what he knows, or even to what he does, but in a very real sense to what he is."

It is, therefore, not surprising that the bulk of research prior to the inception of observational research of the 1960s was focussed on teacher personalities (Good, Biddle and Goodson, 1997). Research efforts were concentrated on identifying and measuring those characteristics that were considered to be present in effective teachers. However, these studies appeared to have been fraught with both methodological and conceptual problems. Medley (1987a) was of the opinion that early research on teacher traits did not have clearly defined concepts on effective teaching, valid instruments to measure effective teaching, proper research designs and proper procedures for data analysis. In consequence, none of the early studies made lasting contributions to knowledge on effective teaching (Medley, 1987a).

A similar opinion was expressed by Getzels and Jackson (1963) who carried out an extensive survey of studies between the 1950s and the early 1960s. Specifically, Getzels and Jackson (1963) identified three major areas of weakness. The first was the failure of researchers to define the particular aspect of personality they were studying or measuring. Being explicit about the phenomenon being studied was essential as 'personality' is complex and multifaceted and has several meanings attached to it. The second weakness was the indiscriminate use of instruments by researchers who appeared to have used whatever instrument was available rather than the most appropriate for their study. The third weakness concerned the criterion of effectiveness vis-a-vis teacher personality. Because this was usually determined by ratings by various population groups such as principals, supervisors and students, the data were subjective and variable. The solution to use a more objective criterion such as pupils' gain was proposed but this was also problematical in that such a criterion could only be set within the framework of school objectives or the psychological context in which the pupil functions (Getzels and Jackson, 1963).

In addition to these weaknesses, there were other specific problems such as the tendency to treat teachers (e.g., young and old, male and female, elementary and high school, and mathematics or English.) as a homogeneous group and ignoring differences in teaching situations (rural or urban, upper-class or working class, Missippi or California). Another problem was the lack of theory which led to the development of hypotheses that oversimplified teacher personality and the teaching situation. This, in turn, led to inappropriate methodology and conclusions that made little sense either from a psychological or sociological perspective.

Thus, despite the massive efforts to understand and measure teacher personality during that period, very little new insight was shed on the phenomenon or the relationship between teacher personality and effective teaching. Most of the findings of the studies were pedestrian or the reiteration of the self-evident. For example, the findings of studies would affirm the fact that friendly, cheerful, sympathetic teachers were deemed to be good teachers while the opposite was true of bad teachers (Getzels and Jackson, 1963). Nevertheless, a brief summary of the work done in the first 60 years of the 20th century is necessary as they provide an insight into the issues that concern educators, and shed light on some of the practices that are still continued today (Medley, 1987a)

According to Medley (1982), the first published study on effective teaching in the United States was by Kratz who investigated elementary school children's perceptions of characteristics of good teachers. A large group of elementary school children was asked to recall the best teacher they ever had and to attempt to describe how that particular teacher was different from the rest. The descriptions were collated and a list of characteristics distinguishing effective teachers from non-effective teachers was compiled from those descriptions. For the next 50 years, studies similar to the Kratz study were carried out on different populations of people such as experts, educators and teacher educators. One such study was the Commonwealth Teacher Training Study reported by Charters and Waples (1929). It was carried out on professional educators who ranked adaptability, considerateness, enthusiasm, good judgement, honesty, and magnetism as the most important traits in the making of an effective teacher. These findings were similar to the

ones found by Kratz in his study (Medley, 1982). In both these studies, no attempt was made to find out if teachers with perceived desirable traits were actually successful in helping their pupils to learn more than teachers with undesirable traits.

A study by Hart (1936) attempted to discover if a distinction existed between a likeable teacher and an effective teacher as defined by learning gains made by students. First, Hart asked some high school students to list the characteristics of teachers they liked best. Next, the students were asked if the teachers they liked best were the same as those from whom they learned the most. Those who answered negatively were then told to describe the ways in which the effective teachers differed from those they liked best. Four characteristics most frequently mentioned emerged. These were that effective teachers made greater demands on students, had more teaching skills, had greater knowledge of the subject matter and lastly, had better discipline. No distinction was made between personality traits and teacher competencies in these studies (Medley, 1982).

Closely related to studies that sought to identify desirable personal traits for teaching were studies which evaluated teachers and student teachers for the possession of certain traits including innate skills and abilities. Studies based on the use of rating scales were devised for this purpose (Medley, 1987b). The first teacher rating scale reported was by Boyce (1915) in the *Fourteenth Yearbook of the National Society for the Study of Education.* Although rating scales were very popular, they did not appear to have been useful since attempts at validating teacher ratings with student achievements failed to show any significant results (Medley, 1987a).   Barr (1935) attempted to correlate student achievements with supervisors' ratings of teachers and found no correlation existed. Subsequent attempts were made by others with the same results (e.g. Hellfritz, 1945; Anderson, 1954; La Duke, 1945; Jones, 1946). As recent as 1982, Medley (1982) carried out a search of ERIC and was unsuccessful in locating any studies that attempted to validate those ratings.

During the 1950s and early 1960s, studies on teacher personality focussed on investigating attitudes, values, interests, favoured activities, adjustments, needs, personality factors and

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cognitive ability of teachers (Getzels and Jackson,1963). A popular belief prior to the 1960s was that attitudes could be used to predict and explain social actions (Ajzen, 1996). In education, attitude studies were thought to be important in predicting teachers' relationship with their pupils and in their satisfaction with teaching as a profession.

Attempts at understanding more about the personality of teachers also led to research in teachers' ability to adjust and their needs. The Minnesota Multiphasic Personality Inventory (MMPI) was used extensively by researchers in education for this purpose (Getzels and Jackson, 1963). Originally designed to test psychological disturbance in psychiatric patients, the MMPI was used to investigate the relationships between teachers' psychological make-up and a variety of issues such as whether teachers as a group could be differentiated from other vocational groups. It was also used in attempts to identify the correlates of teaching success and to develop teacher prognosis scales for effective teaching.

In general, studies using projective techniques revealed inconsistent results. However, an interesting discovery made in a large number of these studies was that a large proportion of teachers or student-teachers in their study population was shown to be maladjusted (e.g., Cooper and Lewis,1951; Blair,1946; Alexander, 1950). According to Getzels and Jackson (1963), this challenged certain naïve assumptions that linked positive psychological health with teaching behaviour. In this respect, projective techniques had "probably done more to unsettle prematurely stable conceptions regarding teachers than to uncover consistent empirical relationships" (Getzels and Jackson, 1963, p.565).

In the effort to relate teacher personality to effective teaching, attempts were also made by researchers to examine the cognitive abilities of teachers as it was reasoned that "teaching should attract persons of relatively high intelligence and further, that within the profession itself differences in intellectual ability should be related to success or effectiveness" (Getzels and Jackson, 1963, p.570). As a group, teachers were found to score higher in intelligence tests than the general population (Wolfe, 1954; Clark and Gist, 1938; Learned and Wood, 1938). However, when compared with other professional groups, teachers and

student teachers ranked near the bottom (Wolfe, 1954; Lieberman, 1956). Unfortunately, as with all other studies on teacher personality, the findings in this area were also not definitive.

In summary, studies as carried out up to the early 1960s failed to establish a firm link between teacher personality and teaching effectiveness (Gage, 1963; Getzels and Jackson, 1963). As Gage (1963, p. 118) observed, "these studies …yielded disappointing results: correlations that (were) non-significant, inconsistent from one study to the next, and usually lacking in psychological and educational meaning". Thus, although great efforts were made to identify teacher personality traits that could be used by school superintendents and teacher trainers to employ teachers or improve teacher-training courses, not much insightful knowledge was revealed (Good, 1996). This led to researchers questioning the early assumption that there was such a thing as a personality for teaching and to look elsewhere for an answer to effective teaching.

Process-product research
According to Gage (1963), the lack of success in teacher effectiveness studies by the 1960s prompted researchers in the field to seek ways to improve on the research paradigm. Mitzel (1957) proposed a schema containing four variables or classifications of information that he felt had to be present in a study of teacher effectiveness. These were teacher variables (teacher personality, teacher training factors), environmental variables (school location, size, organization, community economic factors etc.) and pupil variables (attitudes, interests, abilities etc.), teacher behaviours (inside and outside the classroom and in the community), and changes in pupil behaviour (in subject matter knowledge, social skills, appreciation of democratic values, attitudes etc.). Mitzel believed that the search for teacher effectiveness would be most productive if it was to focus on teacher behaviour in the classroom (Gage, 1963).

What is known as process-product research dominated investigation of teaching effectiveness in the 1970s (Harris, 1998). Its goal was "to estimate the effects of teachers' action or teaching performances on pupil learning (McDonald and Elias, 1976, p.6).

Process-product research was based on the assumption that differences among teachers in the way they organised their teaching, the methods and materials they employed, and the manner in which they interacted with their students would have different effects on how much children learned.

Process-product research was carried out mainly through a series of classroom observations over a period of time with the researchers using either observational category systems or rating systems to monitor the teachers in action. Category systems were low inference activities which were specific, denotable, relatively observable events such as praise, criticism, and question. Rating scales, in contrast, were high-inference measures that relied on the rater's judgement of intangible qualities such as warmth, clarity and class cohesiveness (Rosenshine and Furst, 1971). At the end of the observation period which was usually the year, students' achievements were measured primarily through standardised achievement examinations. The behaviour of teachers (process criteria) was then correlated with student performance (product criteria) and those behaviours that correlated positively with students' test performance were put forward to be part of teaching effectiveness (Shulman, 1992).

Several reviews of process-product research have been undertaken over the years. They include Rosenshine (1971), Rosenshine and Furst (1971, 1973), Dunkin and Biddle (1974), and Brophy and Good (1986). Rosenshine (1971) found in the early studies he reviewed that certain teacher behaviours correlated consistently with pupil achievement. However, these correlations were seldom of statistical significance, and in cases where they were, the significance was only marginal or moderate. Notwithstanding this, the fact that there was consistency in the findings was encouraging.

Overall, early studies in the process-product paradigm showed that strong criticisms of students had a negative effect on their achievement gain. Warmth, a businesslike orientation, enthusiasm, organization, variety in materials and academic activities, high frequencies of clarity, structuring comments, probing questions and focus on academic activities were positive traits and behaviours that correlated with good results by students.

On the other hand, non-verbal expressions of approval, use of student ideas and the amount of teacher talk were not found to have an impact on pupil performance. Finally, mixed results were obtained for verbal praise, difficulty level of instruction or of teacher questions and the amount of student talk.

These early studies contained weaknesses especially in the area of methodology and interpretation of data (Rosenshine and Furst, 1971). However, by the time of the review of process-product research carried out by Brophy and Good (1986), many of the early methodological problems had been solved and findings in the early correlational studies had been validated by experimental studies. The studies reviewed by Brophy and Good (1986) were major programmatic studies such as the Canterbury studies conducted by the University of Canterbury in New Zealand, the studies by Flanders and his associates and studies by Jane Stallings and her colleagues.

Based on the review of these major programs, Brophy and Good observed a consistent finding that the quantity and pacing of instruction played a major role in maximising student achievement. The quantity of instruction was influenced by the opportunity to learn which, in turn, was dependent upon a number of factors. The first was the teacher's definition of his/her role. If the teacher emphasised academic instruction as his/her main role, he/she was likely to allocate more time to such activities. The second was efficient management of class time to ensure maximum engagement of students. The third factor was the use of class activities that were of an appropriate level of difficulty. Student achievement was also affected by the manner in which information was presented by teachers. According to Brophy and Good (1986), information-giving could be grouped into three categories – structuring, soliciting and reacting.

Although findings in process-product research indicated that the discrete teacher traits described above were applicable across all teaching situations, the researchers concerned were careful to point out that the context of instruction was important. In fact, there were some instances in which the context suggested the type of teacher behaviours that were desirable (Brophy and Everston, 1976; Solomon and Kendall, 1979). Grade level played an

important part in determining some types of teacher behaviour. Brophy and Good (1986) stated that teachers in the early grades were more effective when they spent more time on instructing students in desired routines and procedures. It was also more important in the early grades for overt participation of students and the giving of praise and symbolic rewards. In the upper grades, lessons could be run on a more academic and impersonal manner. Class management was usually done through the teachers' expectations of students and their ability to be accountable for their own actions. Positive reinforcement was demonstrated, not through praise, but by an interest and respect for students' contributions.

Another contextual variable was socio-economic status (SES). SES was a term to represent "a complex of correlated cognitive and affective differences between sub-groups of students" (Brophy and Good, 1986, p.365). In their review of literature, Brophy and Good (1986) found that low-SES students needed more control and structuring from their teachers. More feedback, redundancy, more review, practice and lower level questions were found to be necessary. Low SES students were also more likely to require warmth and greater encouragement from their teachers in order to achieve. Overt responses were also important as was the acceptance that the students' call-outs. Teachers' intentions and objectives for the lessons also played an important part in determining effective teacher behaviours. What teachers did in the class was influenced by what they intended to achieve in a particular lesson.

Process-product research was successful where teacher personality research had failed. It had shown through replicated studies and field experiments that certain instructional behaviours of teachers in the classroom had an impact on student learning (Good and McCaslin, 1992). Higher student achievements were recorded in classes where certain teacher behaviours were more frequent (Shulman, 1986a). According to Medley (1982), it was the first time in eighty years of research in teacher effectiveness that clear-cut useable findings were obtained.

Nevertheless, Brophy and Good (1986) cautioned against the indiscriminate use of these findings in the classroom. They believed that even when a positive correlation was firmly established between a teacher behaviour and student achievement, it should not be taken to mean that maximising that particular behaviour would yield better results. For instance, it did not mean that the three-second waiting time between teacher question and student response should be applied at all times. Furthermore, a distinction had to be made between positive correlations of behaviours that occurred frequently and those that took place rarely. The context within which the behaviours were displayed, and their patterns of relationship with other forms of teacher behaviour and with student behaviour, were also important in the interpretation of process-product findings. In short, context had a role in determining the types of teacher behaviour that were desirable.

Brophy and Good (1986) also pointed out that caution in interpreting the findings was necessary because the studies were carried out in naturalistic environments. All the studies were conducted in the traditionally taught classrooms, not those that offered alternate approaches to learning. This meant that the generalisations on teacher behaviour were probably applicable to this particular learning-teaching environment. Also the findings reflected the practices of the time in a certain location, that is, North America. What might have been advocated in North America might have already been practised in other countries.

In addition to these limitations, other criticisms were levelled at process-product research. One was the lack of theory (Doyle, 1987; Shulman, 1986a). According to Shulman (1986a), the focus of these studies was centred on what worked rather than why they worked. Even when causes were sought, it was a search for what caused certain behaviours rather than why certain factors were associated with certain behaviours and why some behaviours flourished under certain conditions while others did not.

Another problem was the manner in which process-product research study teacher behaviours. These behaviours were treated as discrete elements that could be singled out for study. From the findings, the behaviours that correlated favourably with student

achievement were then synthesised to become a new pattern of teacher behaviour advocated in teacher training (Gage, 1978). According to Gage and Garciona (1981), there was little evidence in several experimental studies to show that teachers trained to produce these desirable behaviours adhered more faithfully to the composites than teachers in the control groups. Additionally, not all the trained behaviours correlated positively with student outcomes in experimental studies.

Finally, Shulman (1992) criticised process-product research on grounds that they had a narrow focus. Research in this paradigm was interested only in the way teachers behaved. No attention was paid to teachers' intentions or their cognitions. Shulman felt that the central element to the teacher was teacher thought which was missing in process-product research.

Teacher cognition

Research in teacher cognition is a relatively new field that began in the 1970s (Calderhead, 1996; Clark and Peterson, 1986; Shavelson and Stern, 1981). It came about mainly as a result of a recognition of the shortcomings of process-product research which, as pointed out by Shulman (1992), was focussed on the behaviours of teachers to the exclusion of other aspects. In the 1974 National Conference on Studies in Teaching, convened in the USA by the National Institute of Education, Panel 6, chaired by Shulman, argued that:

> It is obvious that what teachers do is directed in no small measure by what they think. Moreover it will be necessary for any innovations in the context, practices, and technology of teaching to be mediated through the minds and motives of teachers. To the extent that observed or intended teacher behaviour is "thoughtless', it makes no use of the human teacher's most unique attributes. In so doing, it becomes mechanical and might well be done by a machine. If, however, teaching is done and, in all likelihood, will continue to be done by human teachers, the question of the relationships between thought and action becomes crucial.
> (Report of Panel 6, National Conference on Studies in Teaching, 1975, p.1)

The Panel further argued that it was necessary for researchers to study how teachers perceive and define their professional responsibilities and situations if they were to understand, predict and influence what teachers did. They viewed teachers as professionals

who had to constantly use their training and specialised knowledge to fulfil their teaching responsibilities. Teachers, they argued, are not technicians merely skilled in performing functions according to prescriptions. Teachers are required to exercise judgement and make decisions regarding the learning and development of their students (Clark and Peterson, 1986). To understand teaching, it is essential to examine this aspect of teacher life.

The arguments of the panel resonated well with the intellectual mood of the day. According to Calderhead (1996) and Shulman (1986a), cognitive psychology was already established in America and with it was the belief that people constructed their own reality and responded to it in their own individualistic way. Several of the theories and research methods derived from cognitive psychology research were used to investigate teacher thinking. Additionally, the call for research into teacher cognition came at an opportune time when educationists were frustrated with the lack of success of costly, ambitious curriculum projects intended to change the teaching and learning processes in the classroom. These projects were premised on the one-time belief that a well-constructed curriculum, not the teacher, was the key to student learning (Calderhead, 1996).

A review of literature on teacher cognition has been carried out by a number of scholars including Clark and Peterson (1986), Shavelson and Stern (1981), Shulman (1986a), Calderhead (1996) and Good (1996). Calderhead (1996) divided research on teacher cognition into two large classes – those that examined the thinking of teachers before, during and after teaching, and teachers' knowledge and beliefs. The earliest research into teacher thoughts was focussed on planning and decision-making. According to Jackson (1968), teaching can be divided into three phases - preactive, interactive and postactive. Crist, Marx and Peterson (1974) hypothesised that qualitative differences existed in the type of thinking teachers did before class, during class and after the lesson is over. Calderhead (1996) observed that since then, there have been several studies focussing on one of these phases and these have provided some understanding into how and why teaching looks and works the way it does.

Research on preactive teaching has found that teachers engage in planning at different levels. Clark and Yinger (1979) observed that teachers engaged in at least eight types of planning during the course of an academic year. These were weekly, daily, long range, short range, yearly and term planning. In addition there were also unit and lesson planning. Unit planning referred to units of content that teachers planned. Of these eight types of planning, the most cited by teachers was unit planning, followed by weekly and daily planning (Clark and Yinger, 1979). These types of planning were described as being nested in one another. Planning at each level determined the planning at other levels and, as such, was closely linked with each other (Clark and Yinger, 1987).

Planning was also found to take place more often at an informal level and much of it happened at odd moments when teachers reflected on how things had gone and what needed to follow. McCutcheon (1980) called this mental planning. Another feature of teacher planning was its creative nature. Sardo-Brown (1988) and Yinger (1980) reported that teachers did not plan in the prescribed way, where the procedure was to proceed from translating aims and objectives into learning activities. Instead, they tended to identify the problems that could arise in teaching and then proceeded to find strategies to solve the problems. Planning often involved teachers creating ideas and drawing on their knowledge of teaching to produce classroom activities.

Yet another feature of planning was that it was knowledge-based. When teachers planned, they did so on the basis of their knowledge of a number of areas – subject matter, classroom activities, children (their interests, abilities and developmental levels), teaching, school conventions, and instructional materials. The planning carried out also had to provide room for flexibility to accommodate unexpected events and responses. Calderhead (1996) was of the opinion that in both of these aspects of planning experienced teachers had the advantage over novice teachers.

Finally, teacher planning was dependent upon a practical and ideological context. McCutcheon (1980) found that the expectations of the school influenced the way a teacher

planned. Similarly, John (1991) observed that teachers of different subject matter planned differently and this was based on their view of the subject. The student teachers of mathematics he studied planned in a sequential manner because they viewed mathematics as a body of knowledge and skills that was hierarchically structured. On the other hand, student teachers of geography did not all share the same view of their subject and, consequently, did not share the same approach to planning.

Teachers' interactive thoughts

Research on interactive thought investigated teachers' decision making and thought processes while teaching. In regard to the question of the frequency of decision-making in interactive thought, conflicting reports have been given. According to Clark and Peterson (1986), findings on the frequency of decision-making during class were mixed. On the one hand, Forgarty, Wang and Creek (1982), found that teachers made at least one interactive decision every two minutes. On the other hand, MacKay and Marland (1978), Lowyck (1980), and Peterson and Clark (1978) found that teachers' decision-making while teaching did not occur as frequently as thought. However, Clark and Peterson (1986) suggested that this discrepancy might have been due to the way decision-making was being defined. In the group of studies that reported frequent decision-making, the researchers took the view that any teaching act was the result of a decision and one was made every time a teacher made a conscious choice to carry out a certain action. In the other group of studies that reported less frequency in decision-making, an action was only counted as the result of a decision in situations where a teacher felt that a lesson was not going well and he/she had two or more alternative courses of action from which to select. While Clark and Peterson (1986) reported mixed findings on this issue, Calderhead (1996) stated that teachers made few decisions in the classroom. He did not, however, provide an elaboration for his assertion.

Studies were also undertaken on the antecedents of teachers' interactive decisions. Clark and Peterson (1986) reported studies where the antecedents which originated from the teachers themselves or the environment were more frequent than those that stemmed from students' behaviour. Some of these antecedents included a decision on whether to respond

to a student question, which student to help, what teaching technique to use, and how to use the time left in the lesson. Antecedents of this nature constituted slightly more than half of all the circumstances that resulted in a decision. Where students' behaviour was concerned, they related to unacceptable classroom behaviour such as inattentiveness and disruption, unacceptable response to work and a lack of understanding of instruction.

Another area of research on interactive thought was focussed on the content of teacher thought in the classroom. Clark and Peterson's (1986) review of six studies found that most of the teacher's time in the classroom was focussed on the learners on matters such as whether they understood, were behaving attentively or were being silly. The amount of time spent on this was between 39% and 50%. Following this were thoughts on instructional procedures and instructional strategies (between 20% to 30% of the time). The subject matter or content of the lesson occupied only a small amount of teacher thinking in the classroom (5% to 14%).

Teachers' postactive thoughts

More recently, attention has also been turned to postactive thoughts of teachers. According to Calderhead (1996), research in this area has been focussed primarily on teacher reflections in the belief that reflection helps improve the quality of teaching (Calderhead, 1987). Three types of reflection have been identified, namely, technical, practical and critical. Technical reflection refers to reflection on matters relating to the meeting of certain criteria such as whether students were actively engaged in specified tasks. Practical reflection concerns the ends to which their classroom actions lead and whether these ends are moral or ethical. Finally, critical reflection questions the ideological and material contexts in which the actions take place. At the time of review, Calderhead (1996) reported that the studies carried out in teacher reflections were still superficial.

The second branch of study on teacher cognition, namely, knowledge and beliefs, has the most recent history of all. Included in this class of studies are those on craft knowledge,

subject matter knowledge, personal practical knowledge, case knowledge, and theoretical knowledge. In this particular part of the literature review, subject matter knowledge will not be discussed as it will be given detailed treatment in the next section. However, all the other types of teacher knowledge research will be mentioned briefly here so as to provide an idea of where research in subject-matter knowledge is situated within the scheme of teacher effectiveness research.

Teacher knowledge

As mentioned above, one type of teacher knowledge that has been explored is that of craft knowledge. Craft knowledge refers to knowledge that teachers gain through experience in teaching. It is the knowledge that allows teachers to use certain strategies, tactics and routines in their classroom practice. It is sometimes known to as the 'wisdom of practice' (Shulman, 1987). Research in craft knowledge has been mainly in the study of expert and novice teachers. A researcher in this area is Berliner (1988) who proposed five stages in the development of expertise. The first stage is the novice stage, characterised by a knowledge of rules, procedures and skills which are free of context. Novice teachers tend to be inflexible and rational in behaviour. The second stage is called the advanced beginner stage. Here the teachers feel relaxed enough to be more flexible in their application of rules and they begin to link present actions with their past experiences (Schempp, Tan, Manross and Fincher, 1998). The next stage is the competent stage where the teachers are able to make conscious choices about what is to be done in class and to have enough control over their own teaching so as to self monitor and modify their actions in class to achieve their chosen goals. The competent stage is followed by the proficiency stage where they are able to view their teaching in a more holistic manner and where they have a developed sense of how things are and what needs to be done. The final stage is the expert stage, which is characterised by fluency and automaticity. At this stage, the teachers have full control of the teaching situation (Calderhead, 1996). Berliner (1988) is of the opinion that while most teachers can achieve the competent stage after three or four years of teaching, only a modest number would ever achieve proficiency and even fewer would reach the stage of the expert.

Several studies carried out include the study of Schempp *et.al.* (1998) which found differences between novice and competent teachers. Novice teachers tended to provide external attributes to their students' learning difficulties while competent teachers held themselves responsible. Novice teachers justified their selection of content on tradition and authority as teachers, while competent teachers' justification was based on logic and technical considerations. Novice teachers felt that they knew most, if not all, that they needed to know to teach, while competent teachers felt that they had much to learn. Finally, class organisation for novice teachers centred around subject matter activities while competent teachers made their choices based on students' needs informed by students' performance in on-going assessments.

Novice teachers and expert teachers were found to have different concepts of good teaching. In a study comparing the differences between novice and expert teachers, Kagan and Tippins (1992) found that novice teachers and experienced teachers who watched the same videotape on three teaching episodes interpreted the video in different ways. Good teaching, according to novice teachers, was defined in terms of fun, children's involvement and affective features of classroom interaction. On the other hand, experienced teachers saw good teaching in terms of lesson structure and teaching strategies. In yet another study, Swanson, O'Connor and Cooney (1990) examined the ways by which novice and expert teachers solved hypothetical problems concerning classroom discipline. The researchers found that novice teachers concentrated on finding solutions while the expert teachers spent more time in defining and representing the problem.

According to Calderhead (1996), craft knowledge of teachers is strongly shaped by their personalities, past experiences and views of teaching. For example, Elbaz's (1983) study of one English teacher in a high school showed that her view of her work was influenced by her ideas of children and the subject. Similarly, Clandinin (1986) found that the three primary teachers he studied developed metaphors of thinking that were based on their past experiences. These metaphors shaped the knowledge they developed and had some control over the way they approached various teaching tasks.

Another kind of research into teacher knowledge is studies of case knowledge. Case knowledge is knowledge which teachers gain through the handling of important events, episodes and people, which equipped them to deal with new situations, or new problems. Following Schon's (1983) argument, scholars undertaking research in case knowledge of teachers believe that like other professionals, teachers approached their work of identifying and solving problems by comparing the new problem with past cases they have handled. Based on their analysis of similarities and differences between the new situation and their understanding of past cases, they would decide on a response that they felt was most appropriate.

Another type of teacher knowledge is theoretical knowledge. Theoretical knowledge in teaching concerns those theories and concepts that are useful for teachers to carry out their daily work as teachers. It includes knowledge of curriculum development, children learning and development, and the organisation of the school. According to Book, Byers and Freeman (1983), student teachers do not often see the relevance of the theoretical units in their curriculum in preparing them to be teachers. Studies have been conducted on the transfer of theoretical knowledge into practice (Eraut, 1985).

Teacher beliefs

In addition to studies that explored the various types of teacher knowledge, a great many studies were carried out on teacher beliefs. According to Calderhead (1996), there are five main areas in which teachers hold beliefs related to teaching. These are beliefs about learners and learning, beliefs about teaching, beliefs about subject, beliefs about learning to teach and beliefs about self and the teaching role. In regard to beliefs about learners and learning, Anning (1988) found that the classroom activities devised and the way behaviours of children were interpreted were influenced by teachers' implicit theories of children's learning. Furthermore, these beliefs also influenced teachers to promote certain types of classroom interaction more than others. The activities, the type of talk and the questions that arose in the class of a teacher who believed that learning was best achieved through the active involvement of children would be different from those of a teacher who believed that learning was best done in a quiet, disciplined environment. Where beliefs of learners are

concerned, Levine and Wang (1983) discovered that certain features of the children influenced teachers' behaviour towards them. Some of these features include a perception that the children are trying hard (Peterson and Barger, 1984), personal characteristics of the children (Rohrkemper and Brophy, 1983) and children's attractiveness (Ritts, Patterson and Tubbs, 1992).

Research on beliefs about teaching focussed mainly on student teachers' perceptions of what teaching entails. Teachers have different beliefs about the nature and purpose of teaching Calderhead (1996). Calderhead (1988) and Russell (1988) both found that student teachers at the beginning of their training course often held the view that the function of teaching was to inform and the function of learning was to remember what has been told. Studies on change of student attitudes after undergoing a teacher-training course found that student teachers at the commencement of their course believed that class control, which included the maintenance of order and discipline, was paramount. Their beliefs became more liberal during training but they reverted to their old position when they started work. Lacey (1977) suggested that this could have been due to the culture of schools, which stressed the importance of control.

In terms of beliefs about subjects, Smith and Neale (1989) found that the beliefs teachers held of the nature of the subject and what it meant for children to know the subject determined the orientation of the teachers towards the subject. In science, they found four orientations to teaching and learning (discovery, process, didactic/content mastery, conceptual change) that were related to the teachers' beliefs. Calderhead (1996, p.720) observed that studies in this area have shown teachers to "have very limited to very eclectic views of their subject and that in some cases their ideas about their subject vary from one context to another".   Elbaz's (1983) study of an English teacher revealed that the same teacher had mixed beliefs about the subject. In one class, English was viewed as a creative and meaning-making exercise while in another lesson, English was seen as a system of linguistic rules to be mastered.

Research on teachers' beliefs about learning to teach has shown that most teachers, including experienced ones, hold simplistic ideas of what is required for a person to become a teacher (Calderhead, 1996). They believed that learning to teach was best achieved through getting practical experience in the classroom. Furthermore, good teaching was seen as a result of personality and some class management techniques, which could be learnt through observation of other teachers at work (Calderhead, 1988). In this respect, their ideas were not different from the assumptions of early researchers who investigated teacher personality.

The last type of research on teacher beliefs is on the perception of self and the teaching role. From Calderhead's (1996, p.720) comments about the links between personality and the way teachers conducted themselves as teachers, teacher personality appears to continue to be seen as a factor that influences teaching despite the failure of early research to establish the link between the two. In recent studies, perceptions of self shape the way student teachers and teachers see their teaching role and carry out their classroom activities (Calderhead and Robson, 1991; Johnston, 1992; Ball and Goodson, 1985).

Overall, there is disagreement over the relationship between teachers' beliefs and their classroom practices. While the studies reported above have found that their beliefs play a significant role in teacher actions in the classroom, there are some other studies that point to the contrary. For example, Galton, Simon and Croll (1980) found that what teachers said they believe in was not supported by what they did in the classroom. Regardless of contradictory findings, research in teacher beliefs and other aspects of teacher cognition is useful in that it provides insight into the complexity of teaching.

Review of Literature on Subject-matter Knowledge

As a field of inquiry in education, SMK has a relatively short history. It came onto centre stage in 1985 in America at the American Educational Research Association Meeting when Shulman (1986b) urged the research community in education to turn its attention to the

SMK of teachers. Since then, there has been a number of studies that researched SMK and pedagogical content knowledge (PCK). These include the work of Grossman (1989) on English literature, Hashweh (1987) on biology, Ball (1991) on mathematics, Marks (1990) and Carlsen (1991) on science, Gudmunsdottir (1991) on English, and Wineburg (1997) on history. Before embarking on a detailed discussion of SMK research from the mid-1980s, this part of the literature review will briefly deal with early research where SMK of teachers was studied.

Early studies on SMK

Although the focus on SMK in educational research only began in the 1980s, there were earlier studies that touched on SMK. Hart (1936) in this study, had students list SMK of teachers as one of four main criteria of an effective teacher. Unfortunately, no follow-up studies were done to determine the exact relationship between SMK of teachers and what students learnt. Neither were there studies to uncover what specifically teachers with good SMK did in their teaching that earned them the label of being effective (Ball, 1991).

During the 1960s and 1970s, SMK was also investigated as one of a number of variables in process-product research. As mentioned earlier, process-product research aimed to study systematically those teacher traits and classroom behaviours that researchers believed made an impact on students' academic achievement. SMK of teachers came under the category of presage variables, which included teachers' formative influences (e.g. social class, age and sex), the teachers' training experiences (e.g., university education, teacher training and teaching experience), and such teachers' personal characteristics as teaching skills, intelligence, motivation and personality.

In the process-product studies, the SMK of teachers was measured by the number of courses in the subject a teacher had taken in his/her university study, the grades he/she obtained, and his/her scores in standardised tests. In these studies, the link between teachers' SMK and attitudes and their students' academic achievement in the subject was found to be weak. Begle and Geeslin (1972) analysed the data of the massive National Longitudinal Study of Mathematical Abilities that involved 112,000 students from over

1,500 schools in 40 states. They found that a positive relationship between teacher background characteristics and student achievement existed in less than 30 per cent of the cases. In addition, Begle (1979) examined the results of the study and discovered that in only 20 percent of the cases was there any positive correlation between teachers' SMK and students' mathematics scores. Interestingly, he also noted a negative correlation in 15 percent of cases. Begle concluded from his review that if SMK of teachers was at all important, it was so only up to a certain point (Grossman, Wilson and Shulman, 1989). This led him to suggest that it might be more rewarding to shift the focus of teaching research to observable generic teacher behaviours such as pacing, questioning, waiting time and explanation.

Similarly, Byrne (1983) carried out a review of 30 such studies and found that only seventeen studies showed a positive relationship between the teachers' SMK and students' achievement. However, unlike Begle (1979), Byrne (1983) was of the opinion that the poor results could have been caused by the narrow way in which the relationship between teachers' SMK and students' achievement had been defined. SMK, Byrne maintained, had to be measured in more than just the number of units in the subject which the teacher had studied, his/her test scores and grades. Shulman and Quinlan (1996), in reviewing the research undertaken prior to the 1980s, also made the observation that process-product research had "ignored the role of subject matter as a central feature of teaching and learning" (p.409). In consequence, Shulman (1986b) called for a focus on SMK in research in teaching. In response to this call, a series of studies was conducted in different disciplines on how teachers' knowledge of subject-matter played a crucial role in the way the subject was approached by the teacher and how this approach influenced the manner in which it was taught in class.

Research on SMK of teachers from the 1980s onwards
Current studies on teachers' SMK are focussed directly on the phenomenon and how different levels of knowledge of the subject matter impact on the quality of the teachers' work. Following criticisms of the simplistic definition of SMK in early studies, the concept of SMK was redefined whereby the complex nature of SMK is acknowledged. This has

brought about research that requires researchers not only to observe teachers but also to probe into their minds in attempts to uncover the reasons for certain actions and decisions. To carry out such research, researchers in education employ methods of data collection from other disciplines such as cognitive psychology, human problem solving, social anthropology and the humanities. Some of the methods borrowed from these areas of study include simulations, commentaries, concept mapping and repertory gridding, ethnography and case studies, and narratives (Calderhead, 1996). These different methods have been used to investigate qualitative differences in teaching between the knowledge of novice and experienced teachers, and between teachers knowledgeable in a subject and those who are not.

Conceptualisation of SMK

The notion of SMK is no longer limited merely to the length of time spent on learning the subject or the grades obtained in the subject, although both these factors could serve as observable indicators of a teacher's subject-matter knowledge. One way of defining SMK which has been adopted by Shulman and his colleagues(1989) was derived from Schwab's earlier model of structure of a discipline (1964, 1978). Schwab saw SMK as being made up of two types of structures[1], namely, substantive and syntactic structures. According to Schwab, substantive structures are those "conceptual devices, which are used for defining, bounding, and analysing the subject matter" (Schwab, 1978, p.246). These structures are not static but are revisionary in character. This means that concepts are constantly being refined and reformulated as more is learnt about them.

Another characteristic of substantive structures is that they may be pluralistic. Schwab (1964) maintained that in some subject disciplines, several competing sets of structures might be in existence at the same time. This is especially the case with the social sciences and humanities. For example, there is more than one body of knowledge in sociology, economics, English or anthropology. In the study of human personality, there are two competing bodies of knowledge. One bases its conception of personality on the analogy of

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[1] Schwab used the term 'structure' synonymously with 'structure of knowledge' and for the purpose of this study, the meaning of 'structure' is kept.

the body and views personality as a composition of psychic organs. Another conceives personality as the relationship that the self establishes with other people. Similarly, in sociology, the functionalists base their study of society on the analogy of the workings of the body where each part plays a role in making the whole society works. On the other hand, critical theorists study society from the vantage point of a dominant group seeking to control the rest of society by all means known to it.

Syntactic structures, on the other hand, are the "way(s) of discovery and proof (and the ways of) determining the route or pathway by which the discipline moves from raw data through a longer or shorter process of interpretation to its conclusion" (Schwab, 1964,p.14). Each subject discipline has its own methods of enquiry, patterns of discovery and verification of new information. Discovery and proof for biology is different from that of history, for example. In the former, experimentation and observation may be needed to understand a phenomenon while in the latter, the route to discovery may require archival searches and first person accounts of events. Thus, how one goes about acquiring new knowledge, inferring and interpreting it, and the evidence one admits depends on the subject discipline (Schwab, 1964).

Grossman, Wilson and Shulman (1989) elaborated on this definition and produced a model of SMK that comprised four dimensions. These are content knowledge (facts, concepts, and procedures), substantive knowledge, syntactic knowledge and beliefs about the subject. In Grossman, Wilson and Shulman's conceptualisation of SMK, content knowledge is what is generally understood as subject matter by the lay person. This can roughly be interpreted as the contents of textbooks and it comprises factual information, organising principles and central concepts. For example, content knowledge in European history will include knowledge of the Renaissance, the Reformation, the various revolutions, the causes and the results of important events on the European continent. Content knowledge in ESL may include knowledge of grammar rules, what is involved in the writing of academic essays, giving oral presentation, and what is appropriate language in various contexts. Content knowledge is not something that is independent of substantive or syntactic structures. In

fact, it is the product of enquiry that is guided by both substantive and syntactic knowledge of the specific subject disciplines.

Grossman, Wilson and Shulman (1989) defined substantive knowledge in the same way as Schwab. It means the knowledge of "paradigms or frameworks within a discipline that guide the focus of inquiry, dictating in many ways, the questions researchers ask and the directions they pursue" (p.29). According to the authors, this knowledge is usually learnt in teachers' undergraduate or graduate study where they are exposed to various structures of the discipline. For example, in English, students may be made aware of the theoretical perspective (e.g., postmodernist, feminist) used by various critics in interpreting literary works. In the study of TESOL, students are exposed to different theories of language and language learning that have culminated in the various offerings of teaching methods (e.g. suggestopedia, the silent way, the communicative approach).

Syntactic knowledge refers to the "canons of evidence that are used by members of the disciplinary community to guide inquiry in the field. They are the means by which new knowledge is introduced and accepted into the community" (Grossman, Wilson, and Shulman, 1989, p.29). The knowledge of syntax of a discipline is usually acquired at graduate level study when teachers have to learn to carry out their own inquiries. This knowledge includes how claims are introduced, evaluated and admitted or rejected as new knowledge by members of that disciplinary community (Wineburg, 1997).

Finally, beliefs, while not part of the structure of a discipline, are seen to be so closely intertwined with the three dimensions of SMK that Grossman, Wilson and Shulman (1989) consider them to be a fourth dimension. Beliefs[2] are seen to be different from knowledge in that they are more difficult to investigate and they are subjective, drawing more on the affective aspect of human nature. Furthermore, beliefs are disputable and do not necessarily satisfy the canons of evidence of the discipline. There are different types of beliefs. One relates to the content of the subject. Beliefs of this kind influence the way the

classroom activities are organised. The second type of beliefs relates to the teachers' orientation towards the subject matter. This impacts on their judgement of what they think is important for their students to know and their decision on how to going about teaching it. According to Grossman, Wilson and Shulman (1989), beliefs about a subject matter are as influential on the teachers as are their beliefs on teaching and learning.

State of teachers' knowledge of subject matter

According to Ball and McDiarmid (1990, p.438), "philosophical arguments and common sense support the conviction that teachers' own subject matter knowledge influences their efforts to help students learn their subject matter". If teachers have a poor understanding of their subject matter, or if they have misconceptions about certain topics, it is likely that their misconceptions will be passed on to their students. It is, therefore, important that teachers have the necessary SMK to interpret and deliver the school curriculum in the manner that it was intended. To be able to do this, teachers need to have a sound knowledge of not just the content of the subject, but also the substantive and syntactic structures of the areas that they are expected to teach.

There have been several studies undertaken to determine the level of knowledge of teachers *vis-à-vis* the subjects they teach. These studies investigated the SMK of both novice and experienced teachers. In general, the findings have shown that teachers' existing knowledge of their subject matter is limited (Ball and McDarmid, 1990; Sanders and Morris, 2000; Bennett and Carre, 1993).

In the United Kingdom, Moriarty and Sanders (1996) found that teacher trainees who scored a Grade C in mathematics in their General Certificate of School Education (GCSC) had difficulties with even very simple mathematical concepts. Similar observations were made by researchers in the Leverhulme Primary Project headed by Bennett and Carre (1993). They found that student teachers only had basic knowledge of primary level mathematics, science and English on their entry into the Postgraduate Certificate Course in

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[2] Grossman, Wilson and Shulman (1989) acknowledge that beliefs are accepted as part of knowledge in philosophy. However, for the purpose of their model, they are treating knowledge and beliefs as two entities

Education (PGCE). In science, many had misconceptions about certain fundamental science concepts. These misconceptions were no different from those held by children. In addition, 'able' 11-year old students outperformed the majority of the student teachers on questions where a comparison was possible (Carre, 1993). In mathematics, Carre and Ernest (1993) observed that most student teachers' knowledge of the topics they were likely to teach was elementary. Furthermore, a lack of understanding of both the substantive and syntactic structures of the subject was also evident. For example, only 20% of the group were able to supply an acceptable answer to the question on naming the different branches of mathematics and how they were related to each other. In English, Wray (1993, p.54) examined the scores which the student teachers obtained and declared that they did not have an extensive knowledge about language. Only 23% and 30% of the group could identify pronouns and adverbs respectively. In addition, they lacked the meta-linguistic knowledge to explain processes they went through to produce a piece of writing although all of them were able to write well.

The findings on the state of knowledge of experienced teachers in Britain were similar to those of novice teachers described above. The Department of Education and Science (DES) identified in 1985 that teachers' lack of knowledge of elementary science was the greatest barrier to any improvement in primary school science. Studies on primary school teachers' understanding of certain science concepts revealed that most teachers held views about science that were a mix of "intuitive beliefs and half-remembered textbook science from their school days, sometimes with incorrect or imprecise use of scientific language" (Bennet and Carre, 1993). In two national surveys (Wragg, Bennet and Carre, 1989; and Bennett, Wragg, Carre and Carter,1992), it was reported that experienced teachers were not confident about their knowledge in certain areas of their subject matter. In mathematics and English, approximately 50% of the teachers surveyed believed that they had sufficient knowledge of their subject to teach it. However, less than a third of the teachers of music, science and technology felt that their existing knowledge of their subject was adequate for them to teach competently. They felt that they needed in-service training or help from colleagues in order for them to carry out their duties.

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even though the distinction between the two are not clear.

The situation in the USA seems to be similar to that in Britain. According to Ball and McDiarmid (1990), plenty of evidence is available to support the claim that prospective elementary and high school teachers have little understanding of the content, substantive and syntactic structures of their subject matter. For example, in a longitudinal study carried out by the Centre for Research on Teacher Education in the USA, 252 prospective elementary and high school teachers filled a questionnaire and were interviewed about certain mathematical concepts. The researchers found that the majority of the people studied did not show any firm understanding of the subject. Although they could do the sums, they were unable to explain the mathematical concepts behind the procedures they used (Ball and McDiarmid, 1990). Reporting on the same study, Borko and Putnam (1996) added that while the majority were able to perform the steps for fractions correctly, only 20% of elementary trainee teacher and 38%of high school trainee teachers were able to identify the correct meaning of division of fractions.

As in the case of Britain, experienced teachers in the USA also appeared not to have a firm grasp of the subject matter they had to teach. Fennema and Franke (1992) found uneven knowledge of mathematics of a primary school teacher in their study. While she was very adept at addition and subtraction, she was less knowledgeable on fractions and this was evident in her class instructions. Krajcik, Layman, Starr and Magnusson (1991) assessed middle school teachers' SMK on temperature and heat energy through a series of semi-structured interviews before and after their two intensive three-week workshops. They found that their participants held several incorrect or incomplete views of the topic before the workshops. After the workshops, although most teachers became more knowledgeable of the topic, they were still unable to understand the more difficult concepts of heat energy.

In a study by Smith and Neale (1991), teachers were found to share with their students many of the misconceptions in the topic on light and shadow. Further, they did not have a coherent model for understanding and talking about the topic. After undergoing an intensive four-week summer program, their understanding on light and shadows appeared to have improved somewhat. However, Smith and Neale (1991) were cautious in their interpretation of the results as they observed that the teachers stuck to activities that they

themselves had done in the workshop. Smith and Neale believed that the teachers knew what to expect and as they had done them before, they knew the procedures well enough to ensure success. In addition, the teachers were observed to continue having a number of weak or incorrect conceptions about light and shadows and throughout the year they were being studied, they had to tussle with some of the concepts related to the topic.

Sources of SMK

According to Ball and McDiarmid (1990), there are three main sources from which teachers learn their SMK, namely, at school, at university and while teaching. Ball and McDiarmid (1990) are of the opinion that the SMK which teachers learnt at school played a central role in their own teaching because the type of content they had to teach was probably similar to what they had studied at school. It was also likely that their understanding of those topics was drawn mainly from their study at school since study at university concentrated on the acquisition of deeper understanding of a narrower range of topics. For example, teachers who major in English study literature at university but are expected to teach grammar, essay-writing and spelling as well as part of their work. By the same token, science teachers usually specialise in one subject such as biology, physics or chemistry at university but their work as teachers frequently requires them to teach beyond their area of specialisation. Thus, the extent of the content knowledge of some topics they have to teach is probably limited to what they have learnt at school.

A problem associated with this is the fact that the majority of people leaving high school have been found to have only basic knowledge in many of the school subjects. Dossey, Mullis, Lindquist and Chambers (1987, p.41), commenting on the outcome of the National Assessment of Educational Progress of 1986 in mathematics, concluded that American high school students left school with only basic whole-number computational skills and were not likely to be able to "match mathematical tools to the demands of various problem situations that permeate life and work". Similar, though possibly more varied, results were obtained for science, social studies and writing (Ball and McDiarmid, 1990). Additional to a lack of knowledge of school leavers is the narrow view students held of what was meant by knowing a particular subject. Ball and McDiarmid (1990) reported that many students

equated the learning of mathematics with memorising rules and formulae, the study of history with remembering dates and names, science with reading texts and carrying out laboratory experiments based on instructions given in textbooks, and writing with spelling, grammar and a five-paragraph essay. One can conclude from this that while knowledge acquired at school plays an important part in teachers' knowledge of a subject, it is likely that many teachers have not mastered the concepts they are expected to learn as stipulated by the school curriculum.

In terms of what SMK is acquired at university, there has been little research undertaken to ascertain the actual knowledge that undergraduates gain from their courses. Only in two subject areas (physics and mathematics) has there been research carried out to determine student learning. In both these subject disciplines, the findings have not been positive. In physics, McDermot (1984) and Champagne, Gunstone and Klopfer (1985) made the observation that undergraduate students, including those in their second year, had difficulty in understanding the concepts in mechanics. Many students, for example, had naïve conceptions about force and motion. In mathematics, several studies conducted in the 1980s revealed that science and engineering graduates were unable to represent correctly simple algebraic relationships between two variables (e.g. Clement, 1982; Clement, Lochhead and Monk, 1981). Ball's own doctoral study found that mathematics majors had frequent problems in "making sense of division of fractions, connecting mathematics to the real world, and coming up with explanations that go beyond restatement of rules" (Ball and McDiarmid, 1990). Schoenfeld (1985) noticed that the students he observed could solve mathematical problems fairly easily but had to struggle to find an answer as to why their solutions worked. Ball and McDiarmid (1990) claimed that more and more evidence is coming out to show that both mathematics and physics students including those who opt to study teacher training, can produce work that satisfy the requirements of their course without having a conceptual understanding of their subject matter.

In addition to teachers acquiring SMK in their undergraduate study, they also receive some more subject matter instruction during their teacher training. Findings of research on the learning gains made by students in pre-service teacher training programs are mixed (Borko

and Putnam, 1996). In the Teacher Education and Learning to Teach (TELT) program (Borko and Putnam, 1996), scholars who have studied the gains made by students found that only a few students had improved understanding of mathematics and about the nature of mathematics. The majority of the students continued to view mathematics as a body of rules and no improvement was observed of their understanding of mathematical concepts. Similar findings were made by Carre (1993). Carre and Ernest (1993), Borko *et.al.* (1992) and Eisenhart *et.al.* (1993), who studied the change made by pre-service teachers' knowledge of mathematics in the Learning to Teach Mathematics project.

On the other hand, improvements in teachers' SMK were reported by Lederman and Gess-Newsome (1991) who investigated pre-service secondary school teachers' SMK in biology. The improvements noticed were not drastic as the students still did not have a coherent structure for thinking about biology. Nevertheless, at the end of their university course, they had learnt more terms and there was better integration of certain concepts. In mathematics, Simon and Blume (1994) found that the pre-service teachers in the Construction of Elementary Mathematics (CEM) project showed better understanding in a number of areas. From their observation, they believed that pre-service teachers' understanding of the nature of mathematics and their ability to solve mathematical problems would improve through courses that focus in depth on a small number of topics. Improvement in knowledge of music was also noted by Bennett, Carre and Dunne (1993) in the Leverhulme Primary Project. The PGCE student teachers entered the course with very little knowledge of music but a marked improvement was noticed on completion of their year of training.

The final source from which teachers learn their SMK is their own discovery as they teach the subject. Ball and McDiarmid (1990) believe that learning through teaching is fairly common although little is known about the phenomenon. One project that examined teachers' SMK while teaching was the Knowledge Growth in Teaching program run by Stanford University in the 1980s. The project traced the development of 12 teachers through their teacher-preparation year. Grossman, Wilson and Shulman (1989) observed that the participants in this study experienced greater understanding in their subject-matter

through their teaching and preparation to teach. The participants reported that they often had to review their materials to ensure that they understood the materials well enough to be able to teach it, and on many occasions, they had to learn content that they were not familiar with. For example, English teachers had to teach works that were new to them and mathematics teachers had to deal with topics they had learnt only at high school.

Some teachers acquire new SMK through the textbooks they use (Wineberg, 1987; Ball and Feiman-Nemser, 1988). In Wineberg's study, the teacher began her teaching of social studies from the perspective of physical anthropology, her major at university. However, as she progressed, her approach became much broader as she became influenced by the textbooks she was using. In the study by Ball and Feiman-Nemser (1988), the teacher originally dismissed the approach used by the textbook in the teaching of numeration and place value in mathematics. The rejection was due to her lack of understanding of the conceptual essence of the topic she was teaching. However, by working through the textbook, she gained an understanding that was not there when she started teaching the topic.

Ball and McDiarmid (1990) point out that learning from textbooks has its problems as it has been discovered that textbooks have been known to misrepresent facts. History textbooks, for instance, deal mainly with events of significance to the dominant groups while being silent about the history of minority groups and women. In elementary mathematics, Stodolsky (1988) found that concepts and procedures were often poorly developed. Similar problems exist with textbooks on science. Thus, teachers who learn from textbooks may be learning the wrong thing and by teaching it, they are perpetuating misconceptions.

Effects of SMK of teachers on planning and classroom teaching
Borko and Putnam (1996) carried out a review of studies on knowledge and beliefs about subject-matter as part of their review of research on the learning of teachers. Contrary to findings made by early researchers, a positive correlation was found between the teachers' depth and breadth of SMK and the way they carried out their teaching in class. The

differences were noticeable in three key areas of teaching – orientation towards the subject, planning and interactive teaching. These will be discussed below.

Teachers' orientation towards their subject

Orientation, according to Grossman (1991), is a basic framework which one uses to organise knowledge about the subject. The framework is drawn from both the substantive and syntactic structures of the subject. In addition, orientation is also founded on teachers' beliefs (Smith and Neale, 1989). Teachers' orientation towards a subject plays an important role in teaching as it determines the goals for instruction, the planning of teaching activities, the types of questions teachers ask in the classroom and the type of interactive teaching that occurs (Grossman, 1991). Grossman's (1991) study of two novice English literature teachers with different orientations towards literature found that both teachers' decision on how to approach the teaching of a text, and the actual teaching itself were influenced by their orientation to the subject. The impact of teachers' orientation towards the subject they are teaching is not confined to novice teachers alone. Grossman and Gudmundsdottir (1987) found that experienced teachers' curricular decisions and classroom teaching were also influenced by their orientation.

Ball and McDiarmid (1990) contend that in some instances, the orientation of the teacher could have a negative effect. This can happen when teachers are assigned to teach a subject which is different from their major at university. For example, Wilson and Wineberg (1988) observed that when graduates from disciplines other than history were asked to teach history, they all used the disciplinary perspectives of their undergraduate study in their approach to plan and teach the subject. Thus the anthropology major teacher and the political science major teacher used their knowledge of their own discipline to organise and structure both their own knowledge and that of their classes (Borko and Putnam, 1996). According to Wilson and Wineberg (1988), the use of different disciplinary lenses occasionally led to the skewing and misrepresentation of content.

In summary, teachers' orientation towards the subject they are teaching has an important role to play in guiding students in what they learn, what they see as important and how they

seek evidence of proof to substantiate their claims. Teachers' orientation is likely to be influenced by their major at university and when the major is different from that which they have to teach, there is a tendency to use perspectives developed in their undergraduate disciplinary specialisation to shape what they know and dot not know. This may not be appropriate.

Effects of teachers' SMK on their planning

Differences between more knowledgeable and less knowledgeable teachers have been observed in the way they carry out their planning and interactive teaching. Overall, teachers with greater SMK organised and planned their teaching differently from those with less knowledge. They tended to stress the conceptual, problem-solving and inquiry aspects of their subject while teachers with superficial knowledge of the subject were found to adhere closely to the textbook emphasising facts, rules, and procedures. For example, Ball's doctoral study on prospective teachers' knowledge and reasoning in mathematical pedagogy found that among student teachers with a deep knowledge of mathematics, there was a greater emphasis placed on conceptual explanations and frequent connections drawn among the topics in the curriculum. Wilson's findings concurred with those of Ball's in her doctoral study of history pre-service teachers (Borko and Putnam,1996). Similar findings were also reported by researchers in the Knowledge Growth in a Profession project. Pre-service teachers studied in the project displayed the same kind of behaviour as those in the studies by Wilson and Ball in that more knowledgeable student teachers of mathematics were likely to view problem solving as central to teaching. They devoted more time to explaining why certain procedures did or did not work, presenting materials in an abstract form, and engaging students in problem-solving activities. The same was noticed of science teachers whose background in scientific research appeared to have influenced their emphasis on scientific inquiry in their teaching (Borko and Putnam,1996).

In matters specifically related to planning, Grossman, Wilson and Shulman (1989) noted that when confronted with unfamiliar topics, novice teachers tried to avoid teaching them altogether. However, if avoidance was not possible, they tended to a place heavy reliance on the textbook and adhere closely to their detailed lesson plans. This was well illustrated

in the study by Hashweh (1987). He observed three biology teachers and three physics teachers in their planning and teaching of topics both within and outside their sphere of expertise. Hashweh (1987) noticed that when two of the experienced biology teachers with minimal physics knowledge were asked to plan a physics lesson on systems that make work easier, they uncritically followed the structure in the textbook. In contrast, the three physics teachers and another biology teacher who knew the topic well rejected the structure of the chapter. However the biology teacher was unable to offer an alternative structure while all three physics teachers were able to produce a structure which related the topic to an important conceptual scheme in physics. By the same token, the physics teachers were unable to understand the theme of a biology chapter on cell energy. Hashweh's (1987) study demonstrated that knowledgeable teachers would reject a meaningless theme and were able to detect a subtle theme. They would also follow the structure in the textbook only if that structure coincided with their SMK content and approach.

In making decisions on the types of activities to include in their teaching, Hashweh (1987) noticed that knowledgeable teachers modified the activities to fit in with their prior knowledge and approach. In the planning of the same physics chapter mentioned above, two of the physics teachers made a decision to discard the activities on gears as they felt that they were not necessary for developing the theme they were using. Moreover, they felt that the principles they wished students to learn were adequately covered when teaching them about three other systems in the chapter. In contrast, the biology teachers did not have sufficient understanding of the topic to discard any of the activities as they assumed that the knowledge of all the systems was necessary.

In a study by Sanders, Borko and Lockard (1993), expert teachers were found to be able to present their key concepts in a logical sequence. They also knew how much content to present when preparing for a lesson within the scope of their expertise and they had a lot of resources and materials at their disposal. However, when they were asked to plan a lesson based on content with which they were unfamiliar, they were unsure of how the content fitted together. They had difficulty sequencing their presentation and were unsure of the amount of content they could present. Furthermore, they complained of a lack of materials.

Hashweh (1987) also analysed the teachers preconceptions and knowledge inaccuracies. He concluded that all six teachers who participated in the study had misconceptions and inaccuracies in their knowledge. However, in physics, the greatest number of inaccuracies was found in two biology teachers. As in the case of biology, all the teachers studied had inaccuracies although the physics teachers held more misconceptions and inaccuracies in the subject. These misconceptions appear to be fairly entrenched as Hashweh observed that teachers still maintained them in their plans even when the information in the textbook stated otherwise.

Effects of teachers' SMK on their interactive teaching

The differences between more knowledgeable and less knowledgeable teachers were most noticeable in their interactive teaching. The first difference was in what and how teachers conduct their lessons. Grossman, Wilson and Shulman (1989) found that the depth of knowledge of the novice teachers exerted an influence on what teachers emphasised in class. In mathematics teaching, Marks (1987, cited in Grossman, Wilson and Shulman, 1989) observed that a teacher who was also a doctoral student emphasised the 'whys' of mathematics rather than the 'how-tos'. He was able to tell his students how the topic they were studying fitted into the larger picture of mathematics. In contrast, the teacher who was not a mathematics major kept closely to the book, and drilled students on the algorithms contained in it. Grossman, Wilson and Shulman (1989) asserted that results from several of the studies in the project showed that conceptual explanations were more likely to be emphasised by teachers with depth knowledge of the subject matter.

The second difference between the teaching of student teachers more or less knowledgeable in the topic was in the classroom discourse (Carlsen, 1991). Student teachers with a better knowledge of the topic asked fewer questions and the questions they asked were mainly high order questions. Students in their classes were given a greater opportunity to speak and ask questions. The teachers spoke less and devised activities that were conversationally more risky. A similar observation was made by Sanders, Borko and Lockard (1993) in their study of experienced teachers teaching a subject they knew well. Like Carlsen (1991), Sanders, Borko and Lockard (1993) also noted that teachers who were

unfamiliar with the topic tended to have more teacher talk and more instructional activities that were less risky such as seatwork and group discussions. The researchers noticed that one of the teachers made more use of worksheets when teaching a topic outside of her certification.

The third difference between the two groups of teachers was their ability to control the content direction taken in the lesson. Borko and Livingston (1989), in their study of three student and three expert mathematics teachers, found that novice teachers were in less control of the way their classes went. Once they deviated from the lesson plan, they had difficulty in getting back to the plan.   Conversely, expert teachers displayed the ability to keep to their planned goals for the lesson and were able to use students' questions and comments as a basis for discussions related to the lesson. They were also able to generate problems spontaneously to illustrate or reinforce a mathematical concept. Similar patterns of behaviour were exhibited by the teachers in the study by Sanders, Borko and Lockard (1993). When teaching within their area of certification, the teachers were able to control the flow and direction of the content. They could make a decision on whether to change the direction of the lesson based on student input. However, when they were teaching in an area outside of their specialisation, they were unsure if an activity would work and occasionally experienced difficulty in explaining learning points.

Yet another difference noted was the way class time was being used. In Carlsen's (1991) study of science teachers, he observed that class time was better focussed on the content of the science topic when teachers were knowledgeable about the topic. The teachers were also more likely to give additional information about the topic that was not found in the textbook and links between topics were likely to be highlighted. In this respect, knowledgeable student teachers displayed the same behaviour as the experienced teachers teaching their own subject in Hashweh's (1987) study. In contrast, much time was wasted on anecdotes, stories and announcements unrelated to the topic when teachers were unfamiliar with the subject matter.

In terms of specific points noted between teachers with and without SMK, Hashweh (1987), Carlsen (1991) and Sanders, Borko and Lockard (1993) found that the questions teachers asked reflected their own knowledge. Teachers with subject expertise were able to ask a greater variety of questions that checked for understanding of both the substantive and syntactic aspects of the topic. Frequently, those were higher order questions requiring a synthesis of ideas or the ability to see beyond the concrete. Teachers asking questions in an area outside their expertise tended to seek answers that only required a recall of topic knowledge found in the textbooks. When it came to answering students' queries, Hashweh (1987) found that the teachers had difficulty responding when the content was new to them and they lacked the knowledge of how the different aspects of the topic were interconnected. The same was observed of the teachers in the Sanders, Borko and Lockard (1993) study.

Teachers with greater SMK were found to recognise and capitalise on learning opportunities presented in class. More knowledgeable teachers were better able to interpret students' comments correctly and to recognise students' misconceptions about the topic. On the other hand, less knowledgeable teachers did not appear to have detected students' misconceptions, and in some cases, the misconceptions were reinforced by the teachers themselves (Hashweh, 1987). Teachers with greater SMK were also better at seizing opportunities to discuss concepts related to the discipline that came up by chance. Finally, such teachers were also able to recognise insightful comments made by their students.

From these studies, much has been learnt about the effects of SMK of teachers on teaching. They all appear to support the claim that teachers' SMK play a central role in planning and teaching. Teachers who have deeper knowledge of a subject are able to provide better understanding of concepts to their students than less knowledgeable teachers. Furthermore, teachers with breadth of SMK are able to draw connections between the different topics and with more general topics, thus rendering their teaching more effective (Grossman, Wilson and Shulman, 1989). Teachers with greater SMK are more likely to make use of learning

opportunities, detect poorly articulated themes in textbooks, use class time more efficiently, and asked more higher level questions.

Thus, all these studies suggest that SMK of teachers make a difference to the quality of instruction and planning of teachers. However, all the studies also point to the fact that SMK alone is not enough and that it has to be combined with teachers' pedagogical skills, knowledge of learners, the context and the curriculum in order for it to become a powerful asset. Shulman and his colleagues termed this 'pedagogical content knowledge' (Wilson, Shulman, Richert, 1987). This was illustrated in a study by Holt-Reynolds (1999) who explored the role of SMK in a pre-service teacher's perceptions of skills needed for teaching. Over a period of three semesters, Holt-Reynolds documented the beliefs of a literature major student on the role of a teacher in teaching literature. Holt-Reynolds (1999) concluded from this case study that expertise in SMK was not useful if it was unidentified, unclaimed and untapped. Thus, being able to transform their SMK in ways that allow students to access it is important. However, the concept of pedagogical content knowledge is not without its critics. For example, McEwan and Bull (1991) argued that all knowledge is pedagogic in varying ways. By its nature, subject matter of any discipline is "an expression of a desire to communicate ideas to others …. Differences in within the form and content of various expressions of subject matter reflect an understanding of differences in the backgrounds of potential audiences and the circumstances of the subject matter's formulation" (p.331). Thus, McEwan and Bull believed that Shulman's dualistic theory was not correct.

Review of Literature on SMK in TESOL

A survey of TESOL research literature has revealed that much work has been carried out in the area of teacher cognition as researchers have become increasingly aware of the need to know more about how teachers think, what they know and how they know in order to gain a better understanding of language teaching. However, most of the work that has been undertaken in this tradition has been in areas such as teacher beliefs, decision-making, craft

knowledge, and practical knowledge. Samples of work in these areas have been compiled in several publications of the 1990s. They include Richards and Nunan's (1990) *Second Language Teacher Education*, Freeman and Richards' (1996) *Teacher Learning in Language Teaching*, Richards' (1994) *Reflective Teaching in Second Language Classrooms*, and Richards' (1998) *Beyond Training*. In addition, articles have appeared occasionally in journals such as *TESOL Quarterly*, *ELT Journal* and *Teaching and Teaching Education*, reporting on studies carried out on aspects of teacher cognition in ESL.

Definition of SMK in TESOL

Before going into a discussion of these studies as well as studies specific to the SMK of TESOL teachers, it is necessary to first establish how SMK is defined by people in the profession. This is not a straightforward exercise as scholars in the TESOL field appear to be paying greater attention to what constitutes the knowledge base of TESOL teachers than to what SMK in TESOL means. In fact, in some instances, SMK as a category of knowledge does not exist while in some others it has a different label given to it. Yet in others SMK is given recognition as a type of knowledge of its own. This is evident in the three definitions presented below.

Of the three definitions, the only one that has singled out 'SMK' as a category of knowledge is that by Richards (1998, p.8-9) where SMK in TESOL is defined as:

> What second language teachers need to know about their subject – the specialised concepts, theories, and disciplinary knowledge that constitute the theoretical basis for the field of second language teaching. …Subject matter knowledge refers to what teachers need to know about what they teach …and constitutes knowledge that would not be shared with teachers of other subject areas, or indeed non-teachers.

Included in this SMK are the following subjects: phonetics and phonology, English syntax, second language acquisition, curriculum and syllabus design, discourse analysis, sociolinguistics, analysis of TESOL methods, and testing and evaluation.

This definition appears to have been derived from observations of what is commonly offered in TESOL programs. In fact, Richards (1998) remarked that these subjects are found in different combinations in 50 MA TESOL programs he surveyed. It is interesting to note that Richards (1998) has a separate category of teacher knowledge which he called "Theories of teaching". Within this category is knowledge of the formal theories of teaching and personal theories of teachers, which they develop from a combination of their experience and beliefs. From his brief description, it is unclear how formal theories of teaching are considered to be so distinct from approaches to language teaching that they warrant being put in a separate category. It is also interesting to note that Richards has included curriculum and syllabus design, TESOL methods, and testing and evaluation in his definition of SMK. In this respect, it differs from the conceptualisation of SMK by Grossman, Wilson and Shulman (1989) in which such knowledge is put in a category other than SMK.

Another definition was given by Fradd and Lee (1998). They, however, only mentioned SMK in passing, preferring to label the knowledge base they believe teachers should possess about TESOL as 'Knowledge of Academic Content'. According to Fradd and Lee, the SMK of TESOL teachers should comprise three kinds of knowledge, namely, knowledge of the language acquisition process, knowledge of academic content in subject areas such as mathematics, economics and science, and knowledge of culture and pragmatics of communication. By knowledge of the language acquisition process, Fradd and Lee included knowledge of linguistic, psychological and sociological factors that impinge on language learning and language acquisition. Such theoretical knowledge is thought to be of help in informing teachers' decisions on when to provide feedback, additional practice or contextual support. By knowledge of subject area content, it is meant knowledge of the discourse features and the way language is used in different subject disciplines. For instance, science requires language to hypothesise, observe, describe and justify. Teachers should be able to analyse the language required by the particular subject and help students gain control over the language they require to communicate their knowledge of the subject. Finally, knowledge of culture and pragmatic language use refers to knowledge of those ways of thinking, organising, valuing and communicating that are

similar and different between different groups of people. Fradd and Lee believe that the three areas of knowledge together should form the academic core of TESOL training.

The definition by Fradd and Lee gives prominence to two components that may or may not be present in the content mentioned in Richards' (1998) definition. These are discipline-specific language and culture. Also different from Richards is the fact that they did not include methodology, curriculum and assessment in SMK. Instead, they were placed in a category labelled 'Knowledge of Pedagogy'. In their definition of knowledge, Fradd and Lee spoke of theoretical and practical knowledge. Thus, SMK contained both knowledge of *what* and knowledge of *how*.

The third definition is one by Stack *et.al*. (2001) who are in the process of producing a document on teacher standards for teachers who teach in P-12 education in the United States. TESOL P-12 ESL standards have specified five domains in which TESOL teachers are to be knowledgeable. These are language, culture, instruction, assessment and professionalism (Stack *et.al*, 2001). In the language domain, teachers need to be well-informed in two areas, that is, language as a system and language acquisition. In the culture domain, teachers are to have an understanding of major theories and concepts, and research related to the nature, structure, role of culture, cultural identity and migration. In terms of instruction, teachers are to be able to foster student-centred learning, establish a positive, supportive learning environment, incorporate students' cultures into their lesson designs, teach the macroskills, select a wide variety of materials, and present themselves as appropriate models of English. In the fourth domain, assessment, teachers are to be conversant in issues relating to assessment. This includes understanding the purposes of the assessments and the different types of assessments. Finally, professionalism, the fifth domain, refers to teachers' knowledge of the history of TESOL, their role in providing expert advice to non-ESL teachers, their advocacy for language minority students and their work with colleagues to enhance the learning of NNES students.

As can be noted, no mention is made of SMK. In fact, the authors seem to have avoided using the word 'knowledge', preferring to use 'domain' in its place. While no specific

mention is made of SMK, it appears that the second and third domains are similar to that of Fradd and Lee's (1998) first and second components of academic content knowledge. Thus, to be an effective teacher in P-12, a TESOL teacher is expected to understand the language system, the components of language and the varieties of language. A teacher must also know about how language is learnt and the factors affecting the learning of the target language. In addition, a teacher must be able to turn that theoretical knowledge into practical use by creating an environment that encourages language learning to take place.

The above definitions come from people who are involved in teacher education and people who have been given a mandate to produce a document for the industry. Freeman (1994) argued that this view of what informs good language teaching is prescriptive and can interfere with a systematic understanding of what language teachers know, how they acquire this knowledge and what they do with this knowledge. Freeman (1989) was of the opinion that SMK of teachers as defined by teachers' knowledge of applied linguistics and TESOL methodology was not the same as the 'real' language teaching knowledge which he conceived as encompassing knowledge, beliefs, and perceptions that influence what language teachers know (Freeman, 1994). He believed that disciplinary knowledge which has been used in Second Language Teacher Education to define SMK should only occupy a small part of teacher training (Freeman, 1989). While he did not present a firm definition of TESOL teachers' SMK, he suggested that the answer ought to be derived from examining language teaching within the framework of the teacher who is also a learner, context of school and schooling and the process of teaching.

For the purpose of this study, SMK is treated as separate from methods' knowledge and other kinds of knowledge. This study uses the definition of Grossman, Wilson, and Shulman (1989), which conceptualises SMK as comprising four dimensions – content knowledge, substantive knowledge, syntactic knowledge, and beliefs about the SMK of TESOL. As TESOL is not taught by trained NES teachers alone but by a large number of NNES teachers with varying degrees of proficiency in the language, SMK must also include the idea of language proficiency which is necessary for TESOL teachers in identifying and correcting language mistakes made by their students.

Studies on TESOL teachers' SMK

The issue of SMK in TESOL is just beginning to gain some attention within the community. Issues related to the lack of SMK are reported by scholars such as Richards, Ho and Giblin (1996), and Numrich (1996), Cullen (1994), and Murdoch (1994). Richards, Ho and Giblin (1996) found that the trainees in the CELTA course they conducted in Hong Kong were concerned about their lack of knowledge of English as a subject matter. They had no first degree training in linguistics and they were unsure about how to deal with content questions which students might ask in the class. Numrich (1996) in her examination of the diaries of 26 novice ESL teachers enrolled in a TESOL master's degree program in a university in the United States, found that some of them were unsure of their grammar, and so, like the teachers in the other subject disciplines, made a decision to avoid teaching it. Cullen (1994) observed that the need to focus on language development was felt by the teachers themselves. He related his experience of running a post-graduate diploma course in Bangladesh where 80% of all the students attended language improvement course which was voluntary. In his survey of TESOL teacher trainees in Sri Lanka, Murdoch (1994) found that 89% of students felt that their confidence as TESOL teachers depended on their language competence and more than half the students surveyed wanted 40% or more of their course to be devoted to language work. There have also been calls by practitioners (Basanta, 1996; DeFelice,1998) who feel a need for both NES and NNES TESOL teachers to have greater knowledge of English.

Despite such perceived needs, a search has failed to uncover any substantial body of literature on any aspect of TESOL teachers' SMK. In fact, only very few studies have studied the SMK of TESOL teachers. One study surveyed, namely, Richards, Li and Tang (1998), investigated the effect of SMK of TESOL teachers on a lesson. In this study, three groups of teachers consisting of teachers with literature majors with experience of teaching literature, teachers with literature majors but no experience in teaching literature, and teachers with no literature training and no experience in teaching literature were asked to respond to a short story or a short literary text and a poem. They were also asked how they would exploit the material for a sixth form ESL class. The analysis of data found that teachers with a literature background and teaching experience were able to think about their

lesson from the students' perspective, recognise features such as mood, style, and techniques, present texts in various appropriate ways and incorporate the learning into broader curricular goals. In other words, they were able to present their students with learning opportunities missed by the other groups of teachers. Thus, the findings of Richards, Li and Tang concur with those of Hashweh (1987) and others in other subjects.

The study by Richards, Li and Tang is only a small study that looked at how different groups of teachers exploit literary texts in an ESL class. It did not investigate TESOL teacher's knowledge of the content they have to teach daily which includes their understanding of language, forms and functions in general, and those of English in particular. As Lewis (1993, p191) maintains, "to be an effective teacher of …(a) language you need to be knowledgeable about it, observant of it, and be able to control your own use very precisely". A study that examined the effect of teachers' SMK on their classroom practice was undertaken by Borg (2001). Borg studied how the knowledge about language of two experienced TESOL teachers affected their grammar teaching. One of the teachers, Eric, was a native speaker who had been in TESOL for 15 years. The other, Dave, was a non-native teacher.

Eric had confidence in his knowledge of grammar and this was evident in his handling of grammar instruction. According to Borg, he did not usually have prepared grammar lessons to bring to the class. Grammar was taught on an impromptu basis, and usually as a result of language points that came out from teaching other activities. For example, he would note grammatical errors made by students while they were doing fluency work and then he would draw their attention to it after the fluency activity was over. In handling grammar, he preferred students to discover the mistake themselves and to self-correct. His role was to facilitate discussion and provide guidance and further practice if required. Borg observed that there were times when Eric was not as sure of his grammar. On those occasions, his teaching behaviour was different. He would provide the answer immediately without allowing the students to come to the answer themselves. He would also not encourage discussion.

On the other hand, Dave had little confidence in his knowledge of grammar. Early in his teaching career he was asked a grammar point which he could not answer. Since then he avoided teaching grammar if he could help it. Borg observed that Dave actually taught very little grammar in his class. When he had to, he was usually prepared. Whenever he was asked a grammar question, he took down the query and gave his answer only after he had time to check it with his sources. However, when he felt he could answer the question, he was observed to do so. Borg further observed that Dave had only a limited range of strategies in teaching grammar, which contrasted with the repertoire he had in teaching other areas of English. These observations by Borg are similar to those made by researchers such as Hashweh (1987), Sanders, Borko and Lockard (1993) and Grossman, Wilson and Shulman (1989).

While not highlighted by Borg (2001), a close examination of some data he presented seemed to point to a teaching outcome observed by Hashweh (1987) in his study on experienced teachers teaching within and outside their field of expertise. As mentioned earlier, teachers with poor knowledge of the subject sometimes convey their half-understood concepts to their students. Borg presented the data of one occasion when Dave was asked the difference between 'angered' and 'angry'. After explaining that one was a verb and the other was an adjective, he proceeded to provide further information about some adjectives which could also be adverbs, but the example he gave to demonstrate the point was incorrect. Dave told his students that "angry" in the sentence "I am angry" served the function of an adverb. He further gave another example with "hard" in a sentence of the same pattern.

Andrews (1999) conducted a study on TESOL teachers' explicit knowledge of grammar and grammar terminology in Hong Kong. The study aimed to find out the explicit knowledge of grammar and grammar terminology of four groups of people, namely, NNES TESOL teachers (NNES Ts), NNES prospective TESOL teachers (NNES pre-Ts), NES prospective TESOL teachers with a background in English Studies (NES pre-Ts Eng) and NES prospective teachers with a background in Modern Language Studies (NES pre-Ts ML). Andrews hypothesised that NNES Ts would display greater explicit knowledge of

grammar and grammar terminology than all the other groups, that NNES would fare better than the NES in demonstrating explicit knowledge of grammar and grammar terminology, and that between the NES pre-Ts ML group and the NES pre-Ts Eng group, the former would have more explicit knowledge. 60 people participated in the study. There were 20 in the NNES Ts, 20 NNES pre-Ts, and 10 each in the NES pre-Ts Eng and NES-pre-Ts ML groups.

The groups were given a 60-item test adapted from one by Alderson, Clapham and Steel (1996). It consisted of four sections. The first tested the subjects' knowledge of metalanguage (e.g. getting subjects to select from a given sentence an example of each grammatical category provided). The second section tested the subjects' ability to produce metalinguistics terms. For example, the subjects were asked to state the grammatical term for a part of a sentence that was underlined. Section three was on error identification and correction and section four was to find out the subjects' ability to explain grammatical rules.

The results upheld Andrews' hypotheses. The NNES Ts performed much better than all the groups in all four sections of the test. NNES also did better than the NES and between the two NES groups those whose undergraduate study was in a Modern language outperformed those with an English degree. Two important observations were made by Andrews. First, the NNES pre-Ts performed only marginally better than the NES pre-Ts ML. Andrews remarked that this was both depressing and worrying as the NNES pre-Ts had had 13 years of form-focussed English instruction and yet were unable to perform well in a test that was not demanding. He further reported that in addition to their low-level explicit knowledge, they were also not able to communicate well either orally or in writing. In this respect, his findings appear to concur with those researchers in mathematics and science mentioned earlier that the SMK of pre-service teachers was low.

The second observation Andrews made was that teaching experience was likely to contribute to the acquisition of SMK of teachers in this area of TESOL. This assertion was further supported by the fact that the NNES pre-Ts did not do much better than the NES

pre-Ts ML group, thus suggesting that the formal instruction they received had little impact on their knowledge. Andrews surmised that education could be a contributing factor to the acquisition of SMK, but it was not the determining factor. Finally, Andrews also observed that although this group of teachers outperformed all the other groups, their ability to explain basic errors was not very good. This was a cause for concern as a large part of their work would involve rule explanation.

The above three studies were the only ones that specifically examined the effects of teachers' SMK on teaching in TESOL. There are other studies that do not have SMK as their goal but which provide insights into certain aspects of SMK of TESOL teachers and how they impact on their performance as teachers. In particular, studies on teacher beliefs yield valuable insights into how those beliefs about teaching influence their choice of approach and the activities they use in class. Johnson (1992) conducted a study on the extent to which TESOL teachers' theoretical beliefs about second language learning and teaching influenced their classroom practices. 30 NNES TESOL teachers were asked to participate in the creation of a Multidimensional TESOL Theoretical Orientation Profile. It was found that 60% of the teachers in the study had clear theoretical beliefs.

From the data collected, Johnson identified three approaches to TESOL. These were a skills-based approach, which conceptualises language as comprising the four skills of writing, reading, speaking and listening, a rules-based approach where language is thought of as being a process of rule-governed creativity, and a function-based approach in which the focus was placed in the appropriate use of language in context. As was seen regarding research carried out in mainstream education, TESOL teachers' theoretical beliefs influenced their classroom instruction. The teachers who believed that language was a set of skills spent most time on helping students to improve their macro-skills while the teachers who subscribed to the idea that language was rules-based constantly brought students' attention to the grammatical structures. The teachers following a function-based approach tended to focus on activities that helped students to communicate their thoughts, feelings and needs.

Another study by Woods (1991) also showed that teachers were faithful to their beliefs about the subject in their planning. Woods studied two teachers with two distinct views on teaching. One held a 'curriculum-based' view while the other was student focussed. Woods found that the teacher with a curriculum-based view planned and evaluated her own teaching in relation to her planned curriculum. In contrast, the teacher who held a student-based view of teaching paid close attention to his students' responses and was prepared to change or modify his curriculum in terms of student needs. Both these studies indicate a high degree of consistency between teachers' beliefs and their practices, but there are also studies which show that teachers' beliefs do not always translate into practice. Reasons cited for this include the need to follow the curriculum, the lack of suitable resources, students' ability levels (Duffy and Anderson, 1988), and the need to teach to an examination (Yim, 1993).

These studies appear to be the only ones that provide some insight into SMK of TESOL teachers. As can be seen, the literature in this area is scant. Because of the lack of information on TESOL teachers' SMK, a variety of studies relating to this topic need to be carried out. These studies can be undertaken using a variety of theoretical approaches, including approaches derived from cognitive psychology, historical research and behavioural science. The interpretive paradigm can also be illuminating. This is the paradigm upon which the study being reported in the remainder of this thesis is based.

Interpretive studies are highly valuable as they focus on individuals as creative and active players in the negotiation of meaning. They are based on the assumption that the individuals' perspectives are important determiners of their actions. This study was conducted as an interpretive study focusing on TESOL teachers' perspectives on the SMK necessary for teaching.

Conclusion

This chapter reviewed the literature pertaining to effective teaching with specific attention given to literature on SMK in TESOL. An historical approach was taken as it was felt that perspectives individuals hold are influenced by their experiences and by formal education, as well as by knowledge handed down through commonly held wisdom. The chapter began with a review of studies of teacher personality. The chapter then reviewed studies on process-product, followed by a review of studies investigating research in teacher cognition. The next chapter now will discuss the methodology underlying the study.