Chapter 3

Personal epistemology: Theoretical perspectives

Introduction

Chapter 1 has provided a synopsis of the two main constructs of this study, namely epistemological beliefs and perceptions of education. The present chapter presents an extensive account of personal epistemology, the wide area of research that comprises the concept of epistemological beliefs. Beginning with a concise background to the discipline of personal epistemology (Section 3.1), the chapter proceeds as follows: Section 3.2 delineates the two main research orientations within this discipline, namely the developmental paradigm and the beliefs system paradigm. Thereafter, these approaches are reviewed in sections 3.3 and 3.4, respectively. In consideration of the parallelism between cognitive development and epistemological development, Section 3.3 starts with an abridged account of Piaget’s (1950) cognitive development theory and, subsequently, reviews the most representative models within the epistemological development paradigm, specifically the ground-breaking framework put-forth by William Perry (Perry, 1970), the ‘Epistemological Reflection Model’ (Baxter Magolda, 1992), the ‘Argumentative Reasoning Model’ (Kuhn, 1991), and the ‘Reflective Judgment Model’ (King & Kitchener, 1994). Educational implications of each of these models are highlighted. The review of the epistemological beliefs system paradigm (Section 3.4) considers the features, the issues, and the strengths of this approach, in the format proposed and restated by its pioneer, Marlene Schommer (Schommer, 1990, 1994). In acknowledgement of the most recent developments in personal epistemology theorising and research, Section 3.5 summarises two of the emerging paradigms: the ‘Epistemic Metacognition’ paradigm (Hofer, 2004), and the ‘Epistemological Resources’ paradigm (Louca, Elby, Hammer, & Kagey, 2004). The content of the chapter is summarised in Section 3.6.
3.1 Background

Personally held beliefs about the, structure and stability of knowledge, and about the source and justification of knowing, currently coined \textit{personal epistemology} (Hofer, 2002, 2004; Hofer & Pintrich, 2002) have been found to exert influence on individuals' cognitions and behaviours in knowing and learning. The underlying assumption has been that in learning circumstances, notably in the formal education context, where individuals are systematically confronted with the need to acquire new knowledge, the way in which they perceive and embark on the process of knowing is, to some extent, influenced by their beliefs about knowledge, knowing, and learning. Thus, it has been established that personal epistemology is the study of how individuals develop a conception of knowledge and knowledge acquisition, and how they use that conception to understand the world (Hofer, 2002). Accordingly, learners holding 'naïve beliefs' - those who view knowledge as a set of accumulated facts, are more likely to approach learning in a passive way. Conversely, those holding 'sophisticated beliefs' - the ones perceiving knowledge as an integrated set of constructs, will, more probably, approach learning in a way deemed active (Perry, 1970; Ryan, 1984; Schommer, 1990). Those opposite beliefs about knowledge and knowing (i.e. the 'naïve' versus the 'sophisticated' beliefs) are thought to affect in divergent ways the extent to which learners make meaning out of new information they may receive, being epistemological sophistication seen as a good predictor of learning related aspects, such as comprehension (e.g. Schommer, 1990, 1994) and also of conceptual change (e.g. Qian & Alvermann, 1995; Qian, 2000). Building on that premise, Hofer (2004) has posited that personal epistemology “\textit{is not as esoteric as it may sound but rather an aspect of metacognitive awareness that is often activated in the knowledge construction process}” (p.43). Owing to the foregoing, personal epistemology has become an area of growing interest in educational research, with far reaching implications for teaching and learning practices. Nevertheless, as observed elsewhere (Hofer & Pintrich, 1997), research programmes on personal epistemology have been pursued from diverse disciplinary perspectives (e.g. developmental psychology, educational psychology, higher education, mathematics and science education), using disparate methodology and, consequently, yielding diverse frameworks and a diffuse terminology. Actually, due to the diversity of theoretical assumptions on the nature of the construct, along with different focus and models, the very construct has known diverse labels, \textit{inter alia}, 'epistemological positions' (Perry, 1970); 'epistemological
beliefs’ (Schommer, 1990, 1993); ‘argumentative reasoning’ (Kuhn, 1991); ‘epistemological reflection’ (Baxter Magolda, 1992), ‘reflective judgment’ (King & Kitchener, 1994); ‘epistemological theories’ (Hofer & Pintrich, 1997), ‘epistemic beliefs’ (Bendixen, 2002), ‘epistemic metacognition’ (Hofer, 2004), and ‘epistemological resources’ (Louca, Elby, Hammer, & Kagey, 2004). Accommodating the foregoing perspectives under a quite neutral umbrella label, that of personal epistemology (Hofer, 2002, 2004; Hofer & Pintrich, 2002) has, to some extent, contributed to mitigate the effect of the rather bewildering labels assigned to the same core concept.

3.2 Personal Epistemology research: An overview

Theoretical positions and research trends in personal epistemology research have focused on and explored particular aspects of the complex nature and wide scope of the intrinsic elements of the construct. Conceptualising personal epistemology either as a developmental process or as a system of beliefs remain the most common and quite well established research paradigms in this subject. The developmental paradigm is qualitative and, generally, a one-dimensional approach. It considers personal epistemology to be a rather coherent and unified structure that evolves during an individual’s bodily and cognitive development, through a succession of distinct stages. On this regard, epistemological development resembles cognitive development as conceptualised by Piaget (1950). In view of that, personal epistemology research under the developmental paradigm is oriented towards the description of the evolving stages of personally held beliefs about knowledge and knowing. Conversely, the beliefs system paradigm, which is quantitative in its nature, is a multidimensional approach. It regards personal epistemology as consisting of a relatively stable system composed of a number of subcomponents, termed belief-dimensions. These are supposed to be relatively uncoordinated, hence not developing necessarily in synchrony. In view of those characteristics, this paradigm is primarily concerned in identifying specific belief traits (dimensions) that characterise an individual’s views of knowledge and knowing. Complementarily, this paradigm has explored relationships of the hypothesised dimensions of personal epistemology with other learning-related cognitive constructs, such as comprehension and conceptual change.
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The present study was concerned in identifying the belief-patterns of a specific target group, namely the Mozambican high school students. Consistent with that aim, the study has adopted the beliefs system paradigm. On account of that, the review of the beliefs system paradigm constitutes the bulk of this chapter. However, in recognition of the pioneering status, theoretical and educational relevance of the developmental paradigm, this is reviewed beforehand.

3.3 The Developmental Paradigm

According to earlier reviewers (e.g. Hofer & Pintrich, 1997; Moore, 2002), the developmental paradigm to personal epistemology represents the genesis of a systematic research movement in this field. Owing to his seminal studies on cognitive and ethical development of college students, William Perry (Perry, 1970) has been recognised as the pioneering researcher within this paradigm. Meanwhile, it has also been suggested that the actual roots of the developmental paradigm in personal epistemology research are to be traced back to the work of Jean Piaget [1896 – 1980] (Hofer & Pintrich, 1997; Hofer, 2004). Two main reasons seem to sustain that view. On the one hand, it is assumed that Piaget's studies constitute a benchmark for the understanding of human cognitive development and genetic epistemology (Piaget, 1950). On the other, Perry’s positions of epistemological development are deemed to have been inspired by Piaget’s stages of human cognitive development, to which they parallel. In view of that, prior to a review of Perry’s (1970) Scheme of Intellectual and Ethical Development, Piaget’s theory is briefly revisited.

3.3.1 Cognitive development as a path theory to epistemological development: A summary of Piaget’s theory

In her handy book Children’s Minds, Margaret Donaldson (Donaldson, 1978) proposes Piaget’s theory to be regarded as a symbiosis of his professional interests as a zoologist and an epistemologist. Such view appears as to congruently account for Piaget’s concern in studying and describing both the process through which humans (in their capacity of animals) learn to adapt to the environment – a zoologist perspective, and how knowledge grows and develops along that adaptation process – an epistemologist perspective. Succinctly, Piaget’s overall aim was that of understanding the process of concept attainment at different stages of children’s chronological growth. In other words, on the one hand, Piaget
was concerned in understanding how children’s concept attainment progresses from ‘less’ to ‘high’ complex concepts. On the other hand, he was interested in understanding the role of the individual child in that process of concept attainment. To that end, in his studies, Piaget (1950) adopted the ‘clinical method’, consisting specifically in observing and interviewing children while engaged in problem solving activities. From that corpus, the development of elementary physical, mathematical, and logical operations (concepts) from early childhood up to adolescence were described and analysed. Thus, Piaget’s theory was formulated by discerning that children of different ages do noticeably use different forms of reasoning to solve an assigned problem. Consequently, Piaget concluded that children do construct knowledge through their active interaction with the environment, and that their cognitive development progresses through sequential stages. These are outlined in Table 3.1 as will be elaborated later in this chapter, this sequencing of stages of cognitive development very much resembles the sequencing of the stages of epistemological development in personal epistemology research.

Table 3.1. Piaget’s stages of development (Table adapted from Child, 1986, p.147)

<table>
<thead>
<tr>
<th>Stage of development</th>
<th>Mental age range in years</th>
</tr>
</thead>
<tbody>
<tr>
<td>I  Sensory-motor</td>
<td>0 - 2</td>
</tr>
<tr>
<td>II Pre-operational</td>
<td></td>
</tr>
<tr>
<td>(A) Pre-conceptual</td>
<td>2 - 4</td>
</tr>
<tr>
<td>(B) Intuitive</td>
<td>4 - 7</td>
</tr>
<tr>
<td>III Concrete operations</td>
<td>7 - 11½</td>
</tr>
<tr>
<td>IV Formal Operations</td>
<td>11½ onwards</td>
</tr>
</tbody>
</table>

For Piaget (1950), cognitive development is reflected by and assessed through the progressive nature and the quality of concept attainment revealed by a child. Such process is thought to depend upon three factors: (i) the child’s biological maturation, (ii) the activities in which the child is engaged, and (iii) the acculturation process the child is submitted to through education (Child, 1986). Conceptual growth throughout the hierarchical stages is thus seen as occurring in the interaction of those factors, whereby, once actively searching for solutions to a given problem (i.e., attempting to adapt to the demands of the environment), the child
activates his schemata\textsuperscript{38} and organizes new actions into new schemata, through \textit{assimilation} and \textit{accommodation}\textsuperscript{39}.

Critics of Piaget’s theory (e.g. Donaldson, 1978; Brown & Desforges, 1979; Modgil & Modgil, 1982) have highlighted two major shortcomings. At the conceptual level, Piaget’s postulate on egocentrism in early childhood is deemed overstated, on the grounds that “we are all egocentric through the whole of our lives in some situations and very well able to decentre in others”. Therefore, “children are not at any stage as egocentric as Piaget has claimed” (Donaldson, 1978, p.25 and p.58). Methodologically, criticism is centred at Piaget’s reliance on verbal introspection, a method considered inadequate for dealing with very young children. Despite those flaws, Piaget’s theory has been of indisputable relevance in education and in personal epistemology theory, as discussed next.

3.3.1.1 Implications of Piaget’s theory for education and for personal epistemology

Education is about stimulating and facilitating learners at different stages of their lives to acquire, understand and apply knowledge. Apart from concrete facts, knowledge includes generalisations or concepts. The implication and relevance of Piaget’s theory for education is that it provides a framework that enlightens on the structural relationship between children’s physical growth and the corresponding development of concept-formation in their minds. For that reason, Piaget’s theory has turned out to be a fundamental tool for curriculum planning and for teaching, mostly at the primary level of formal education.

At the curriculum planning level, Piaget’s theory unfolds the need to adequate school contents to pupils’ stages of cognitive development. Provided that cognitive development is understood as a cumulative and a hierarchical process, whereby lower-order schemata need to be established and consolidated first so that the higher-order ones can be built upon, Piaget’s theory sustains that curriculum design has to ensure that concrete or lower-order abstract contents are first introduced and consolidated

\textsuperscript{38} - Piaget uses this term to refer to past actions organized into distinct patterns of behaviour.

\textsuperscript{39} - In Piaget’s theorising, \textit{assimilation} and \textit{accommodation} are complementary steps in the process of adaptation. \textit{Assimilation} is described as the process of incorporating new perceptions, either to make those perceptions fit into existing schemata, or to form new schemata, making the unknown recognisable. \textit{Accommodation} is then the effort to fit an existing interpretive framework or behaviour into the new situation or environment (Donaldson, 1978, p.132).
before the more abstract ones are dealt with. The implications of Piaget’s theory for teaching are clear: instruction ought to be learner-centred. The concept of learner-centeredness assumes that learners are the key players of their learning, on the grounds that the building-up of schemata (the actual concept-formation process) or meaning-making can only happen if the learners, as meaning-builders, undertake actual tasks at the concrete and at the symbolic levels. Hence, Piaget’s contribution may be regarded as foundational of the modern constructivist learning paradigm (e.g. Von Glasersfeld, 1996; Fosnot, 1996; Vermunt, 1998).

To ascertain the theoretical relevance of Piaget’s theory – which may sound somehow trivial at the present time, it is essential to keep in mind that the theory was developed in a context in which epistemology was still split and noticeably dominated by two major trends. On the one hand, the empiricist assumption sustaining that knowledge was a mere reflex of the reality, attained through sensorial experiences; and on the other hand, a standpoint maintaining that knowing was an innate ability. In proposing that knowledge is constructed by the individual knower, and that cognitive development is a gradual and standardised process, Piaget not only offered a third alternative to the dichotomised debate, but also, and above all, laid the groundwork to personal epistemology theorising, particularly under the developmental paradigm (Perry, 1970). Explicitly, the tenets of Piaget’s theory have paved the way to the understanding that an individual’s perception about knowledge is an evolutionary process. In other words, like cognition, epistemological development occurs through hierarchical stages, being the earliest one characterised by a belief in absolute knowledge, hence in ‘right’ and ‘wrong’ answers. At the latest stage, different answers or opinions come to be perceived as resulting from factors such as different assumptions or judgments. An elaborated discussion on that is included in the following sections.

3.3.2 The advent of the epistemological development paradigm: Perry’s Theory

As already alluded to, contemporary personal epistemology research movement is understood to have had its starting point on Perry’s (1970) studies on undergraduates’ intellectual development. Undertaken during the 50s of last century, those studies were intended to describe how undergraduate students make meaning of their educational experiences. The outcomes yielded a heuristic *Scheme of Intellectual and Ethical Development*, also interpreted as a ‘scheme of the abstract structural
aspects of knowing and valuing’ (cf. Hofer & Pintrich, 1997, p.90). Methodologically, Perry’s longitudinal studies were based on periodic interviews with several cohorts of college students at Harvard University, over a period of four years per cohort. The interviews were designed and conducted in a manner to elicit students’ free expression of their views and feelings about the curricula, the lecturers, the lecturing process, and the whole educational environment at college. Perry’s (1970) conjecture was that personality differences would offer plausible explanation of why students responded in markedly different ways to the diversity of experiences they were subject to through their college years. However, contrary to that expectation, the outcomes strongly indicated that the different ways of perceiving and judging educational experiences reflected different stages of development of students’ beliefs about the making of meaning. Owing to that, it has been assumed that Perry (1970) was the first researcher to provide empirical evidence to the fact that the making of meaning by college students was rather an evolving developmental process than a reflection of their personality (Hofer & Pintrich, 1997).

Specifically, Perry (1970) realised that, over time, there was a qualitative progression in the ways in which students could perceive, organise and make judgments about facts, events and situations related to the array of their educational experiences. Thus, he argued that epistemological and ethical development is an ongoing qualitative reorganization of the making of meaning through progressive stages. Perry (1970) labelled those stages as positions and, similarly to Piaget (1950), he posited that the positions represent a standardised sequence of hierarchical and integrated structures. Nine positions were discerned and categorised into four clusters: ‘dualism’, ‘multiplism’, ‘contextual relativism’, and ‘commitment within relativism’. While the first three clusters are seen to pertain most directly to intellectual development, the last one (‘commitment within relativism’) is regarded as mainly related to ethical development, as it focuses on aspects such as responsibility and engagement.

The dualistic level comprises the first two clusters of positions, corresponding roughly to the freshman period. The inability to perceive uncertainty was found to be the most distinctive feature of students’ cognitive development at this level. Information therein provided by most of them was interpreted as reflecting an absolutist (right/wrong) view of facts and events, suggesting a perception of knowledge as consisting of simple and unchanged facts. Furthermore, at this level, students would
perceive knowledge as something delivered by unfailing external sources (e.g. teachers, experts, textbooks), perceived as ‘knowledge authorities’. In view of its educational relevance, it is worth to lay emphasis on the most likely attitudes of the students at this critical stage of epistemological development. These are teacher dependency and superficial learning. By reason of that, students at this level are hardly capable of going beyond the notes taken from teachers during classes, or go above mere acts of comparing and contrasting clear-cut facts and situations. In addition, given their distinctive epistemological characteristics, students at the dualist level of epistemological development are more likely to be confused or even hostile in learning situations in which they are confronted with uncertainty or with a multiplicity of viewpoints. They may even become helpless when asked to solve problems in the absence of or without the teacher’s assistance.

The multiplism level comprises positions 3 and 4 and it is seen as the turning point towards relativism. Students at this level were identified and described as those beginning to recognise diversity, both in the form of multiple opinions about a particular subject or issue, and in the multiplicity of perspectives or contexts from which issues and arguments can be analysed and understood. That is, students had begun to conceive of knowledge in a multiplistic way, thus conceding that apart from absolute truths, there were those things that could not be known with certainty. Nevertheless, students at this level were reported to still manifest the belief that an ‘absolute truth’ is knowable as long as ‘right knowledge authorities’ are engaged in its search. In other words, although students would admit and perceive uncertainty, they would regard it as something temporary or just as an error committed by a ‘wrong knowledge authority’.

At the contextual relativism level (positions 5 and 6) a major shift in epistemological thinking could be observed, as students revealed to portray full awareness of uncertainty and of the complex character of knowledge. Reportedly, owing to that, students at this level could reveal the capability of realising that there is no absolute certain answers to all questions. In confronting multiplicity at different steps of their learning process, students at this level of intellectual development could realise and understand that knowledge is uncertain and conjectural, subject to several and sometimes diverging interpretations. In becoming capable of realising that truth is related to personal and relative interpretation of experiences, students no longer believed in absolute truths. More importantly, students
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at this level of epistemological development would also reveal to conceive of knowledge as personally and actively constructed, thus triggering a shift in their view of the teacher: from an omniscient authority, supposed to deliver knowledge, to a resource person with specific expertise to share. The faculty of making comparisons, contrasts, and supportive arguments was also found quite developed amongst those students. Consequently, they also revealed the capability of developing and applying critical and analytical reflection regarding information they would receive or situations they would face. Along with that, Perry (1970) argues that contextual relativist students can relate and apply knowledge acquired in a certain context to other contexts. On the whole, relating, applying and contrasting knowledge, as well as making logical and coherent judgments are the main cognitive processes that are thought to develop and consolidate at the contextual relativism level of epistemological development.

3.3.2.1 Limitations and criticism of Perry’s model
Reportedly, Perry acknowledges limitations to his own model of intellectual and ethical development (cf. Hofer & Pintrich, 1997). Those limitations are inherent to methodological and conceptual shortcomings of the two studies from which his model was built. At the methodological level, weaknesses pertain to three aspects: the sample, the researchers and the validation of the results of the studies. Subjects were male and recruited from one single college, casting doubts on whether that sample was fairly representative of American college students, a condition that would legitimise the generalisation of the findings of the within the North American context. Secondly, it has been observed that in Perry’s studies the objectivity may have been undermined because of the involvement of the same researchers in the interviewing process and also in the abstraction of the model. Finally, the overall validity of the model is also questioned on the basis that the results were validated only in relation to the data from which the model was yielded.

At the conceptual level, the lack of a clear description of the epistemological development from the relativistic level onwards has been identified as one of the limitations of Perry’s model. A possible cultural bias is another concern around Perry’s studies. Moore (as cited in Hofer & Pintrich, 1997, p.93) has questioned whether the answers provided by Perry’s respondents yield a true structural and development trajectory or just constitute an artefact of the contextual socialization process, based on
North American (Western) liberal arts education. This observation may sound too rigorous under the assumption of a universality of human cognitive development. However, it holds some true given that, after all, educating is inherently a process of acculturation. As observed by Hatano and Miyake (1991), even when educational researchers’ ambitions are to find universal aspects that are applicable across cultures, the experimental setting of their studies will, ultimately, be cultural specific.

It can be added that a further conceptual limitation of Perry’s (1970) model - extensive to subsequent developmental models, is related to the very assumption of unidimensionality of personal epistemologies. As Schommer (1990) pointed-out in her ground-breaking hypothesis in favour of a multidimensional conceptualisation of epistemological beliefs, personal epistemologies are too complex to be captured in a single dimension.

3.3.2.2 Implications of Perry’s model for Teaching and Learning

Perry’s scheme of intellectual development did not explicitly explore relationships between epistemological development and learning. Therefore, *per se*, the model is not primarily a teaching and learning framework. However, it is a useful tool towards that end, for in describing the epistemological perspectives that characterize college students at the different levels of intellectual development, the model gives hints into the methodological aspects to be observed and safeguarded in teaching and learning, so to meet students’ aptitudes and attitudes for embarking in meaningful and effective learning.

Though one cannot assume neither a pure homogeneity in a group of students of a certain age range, nor a rigid standardised progression in their careers, it is commonly expected that youngsters who timely access formal education and progress normally will be in their college years when aged between 17 and 25. It can, then, be established with a great deal of certainty that college students, in general, fit into the period ranging between the ‘dualistic’ and the ‘relativistic’ levels of epistemological development. Understood in that way, Perry’s model has contributed fundamental insights into the ways college students perceive knowledge and learning. This is an important indicator for planning and conducting

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40 - This aspect of Perry’s theory has been appraised by Moore (2002) in the following terms: “Perry’s work underscores the notion that the most powerful learning, the learning most faculty really want to see students achieve as a result of their experiences with classes/curricula, involve significant qualitative change in the way learners approach their learning and their subject matter” (p.19).
teaching, as well as for the deepening of the understanding of the learning processes, particularly students’ approaches to learning. In virtue of that, Perry’s (1970) model has inspired subsequent influential educational research, for instance research on learning styles and learning strategies (Marton & Säljö, 1976a, 1976b).

To summarise the implications of Perry’s (1970) model for teaching and learning, it can be said that it calls for more student-minded and student-centred instruction, especially during the freshman period at college (also during high school years). Generally, the freshman period falls within the dualistic level of epistemological development and it is deemed critical, as students are not fully aware of uncertainty and, therefore, tend to take knowledge for granted, as long as it is delivered by teachers and other sources (e.g. textbooks, experts) perceived as unfailing. For those reasons, the model proposed by Perry (1970) can be regarded as a useful framework for raising teachers’ awareness to students’ propensity for perceiving themselves (and act) as passive recipients of knowledge, purportedly handed down by pretence omniscient authorities.

3.3.3 Subsequent models within the developmental paradigm

Stemming from Perry’s model, other developmental-oriented epistemological models have been proposed. Conceptually, those models share Perry’s (1970) basic idea of a cognitive development progression from an absolute knowing to a knowing that is relative and contextually bound. Methodologically, those models resemble that of Perry (1970) in the sense that most of them are also based upon longitudinal interview-studies. In some cases, individuals were continually interviewed far beyond the time span of their college years (Baxter Magolda, 1992; King & Kitchener, 1994), with the aim of delving into epistemological stances in real life situations and assess the extent to which real-life experience contributes to the refinement of the already acquired epistemic assumptions, or even to the emergence of new ones. According to Hofer and Pintrich (1997), post-Perry developmental models can be categorised into two broad research lines. One line treads on Perry’s path and is oriented towards the pursuit and expansion of the investigation of individuals’ progressive perceptions of their educational experiences (e.g. Baxter Magolda, 1992, 2002). The second research line embarks on new interests, markedly that of studying the influence of epistemological assumptions on individuals’ thinking and reasoning. Argumentative skills
(Kuhn, 1991) and reflective judgment (King & Kitchener, 1994) are amongst the cognitive processes studied in relation to individuals’ epistemological development. The following sections consist of summaries of post-Perry most representative epistemological development models.

### 3.3.3.1 The Epistemological Reflection Model

The Epistemological Reflection Model, developed by Patricia Baxter Magolda (1992, 2004) was drawn from longitudinal interview studies that, contrary to those of Perry (1970), involved gender-balanced samples (51 females out of an initial sample of 101 university students). Two distinctive periods were considered in the study: the ‘during college’ period, lasting for around 5 years, and the ‘after college’ period, lasting for about 7 years. The age range of the subjects varied from 18 to 30 years old. Owing to the characteristics of the sample (in terms of gender and age range), the model could offer a wider portrait of epistemological development, covering adolescence and adulthood, as well as gender-related reasoning patterns. Data collection method included an intensive annual open-ended interview and the completion of a questionnaire (The Measure of Epistemological Reflection) by each participant, yielding rich data from which college and post-college experiences were interpreted. The grounded theory methodology (cf. Glaser & Strauss, 1967; Strauss & Corbin, 1994) was used to analyse the interview responses, allowing categories of themes and patterns in epistemological assumptions to be identified. Baxter Magolda’s (1992) interest was to assess the extent to which epistemological assumptions (‘ways of knowing’) would affect the interpretation of educational experiences, at several stages of epistemological development.

The outcomes of the study allowed for two qualitatively different types of ‘ways of knowing’ to be identified, namely the relational ways of knowing and the impersonal (or objective) ways of knowing. The former are open, flexible, connected and responsive, while the later are logical and disconnected. Baxter Magolda (1992, 2004) observed that individuals portrayed these ways of knowing along four progressive positions, labelled as: (i) **absolute knowing** (receiving or mastering knowledge patterns), (ii) **transitional knowing** (interpersonal and impersonal patterns), (iii) **independent knowing** (inter-individual and individual patterns), and (iv) **contextual knowing** (integrative knowing).

**Absolute knowing** is a position in which knowledge is likely to be viewed as certain, like in Perry’s (1970) dualistic position. The ‘receiving pattern’ in
this position corresponds to the relational way of knowing (students’ preference for a supportive environment for accumulating information), while the ‘mastering pattern’ stands for the objective or impersonal way of knowing (students active interaction in the classroom). In the transitional knowing position students are more likely to believe in uncertainty in some areas of knowledge, especially those in which they believe truths are yet to be discovered, hence resembling students’ types of perceptions of uncertainty in Perry’s (1970) multiplism position. The relational (interpersonal) way of knowing in this position is portrayed through students’ effort to combine their own opinions to those of others. Conversely, the objective (impersonal) way of knowing is expressed through thinking processes. Independent knowing is a position that parallels Perry’s (1970) contextual relativism position, in which individuals are characterised by their likelihood to perceive that most knowledge is uncertain and tentative. Thus, individuals’ characteristics in this position included their engagement in independent and critical thinking, as well as by judgments based on their own perspectives. Yet, the relational (inter-individual) way of knowing could still be observed in this position, namely through some individuals’ tendency to focus on other’s viewpoints. According to Baxter Magolda (1992, 2004), the two ways of knowing (relational and objective) are combined in the last position – the contextual knowing, which is rather equivalent to Perry’s (1970) commitment to relativism. Thus, a contextual knower is an individual that can easily face learning environments that involve open discussions by portraying his and others’ perspectives on a given issue. Reportedly (Baxter Magolda, 2004, p.37), contextual knowing is a less common position amongst undergraduate students.

In Baxter Magolda’s studies, gender-related reasoning patterns could be identified in the first three positions, with more women than men using the ‘receiving’, the ‘interpersonal’ and the ‘inter-individual’ patterns of knowing, respectively. Nevertheless, the author makes no claim to generalise suchfinding, as she acknowledges limitations to her own model (Baxter Magolda, 2002). One of these limitations derived from the fact that the study was based on a predominantly White sample (only 3 out of the 101 subjects were from the so-called ‘minority populations’). Furthermore, subjects were from one single university, namely the Miami University in Ohio. Nevertheless, it has been argued that the gist of the Epistemological Reflection Model has contributed to the enrichment of the assumption that epistemological development is socially constructed, context-bound, fluid, and constituted by multiple realities. In Baxter Magolda’s (2002) words,
“The meaning we make of our experiences depends partially on our initial epistemic assumptions, partially on the nature of dissonance we experience when we encounter other with different assumptions, and partially on the context in which dissonance occurs” (p.91).

As observed along the foregoing discussion, the positions proposed by Baxter Magolda (1992, 2004) do mimic those of Perry (1970) with regard to the underlying perspectives about the progression of knowing. The added value in Baxter Magolda’s model is the description of the different ways of knowing between male and female individuals, with females portraying typically more relational ways of knowing than their male counterparts. These ways of knowing are more dependent on inter-individual relationships than on abstraction.

3.3.3.2 The Argumentative Reasoning Model
The emergence of Kuhn’s (1991) Argumentative Reasoning Model was prompted by the specific interest in exploring the association between individuals’ real-life thinking (expressed through argumentative reasoning skills on complex problems) and their epistemological understanding, whereby the latter was conceptualised as “the coordination of objective and subjective dimensions of knowing” (Kuhn & Weinstock, 2002, p.127). Subjects consisted of cohorts of around 40 respondents each, including both male and female individuals of wide range age (from teenagers to individuals in their 60s). These were individually interviewed in their ‘natural’ settings (e.g. home, school and workplace). The aim was to elicit subjects’ argumentative reasoning on selected real-life problems, specifically problems with no definitive solution, such as the reasons behind unemployment and the relapse into criminal activities by convicted criminals, once released from prison. Argumentative-type answers to those problems were found impregnated with epistemological stances, such as certainty, multiple viewpoints, expertise, and proof, thus sustaining the hypothesised connection of reasoning to epistemological assumptions. Additionally, Kuhn’s (1991) model establishes three condensed categories of progressive epistemological views, namely absolutists, multiplists, and evaluative which, ultimately, are similar in nature and in content to those set-forth in Perry’s (1970) model. In exploring argumentative reasoning on complex real-life problems, and by involving participants across a wide age range and with diversified experiences, Kuhn’s (1991) study pushed personal epistemology research beyond the classroom (formal teaching and learning) environment. Even though, Kuhn’s theoretical model
remains of notable educational relevance, as it surmises that for the sake of fostering individual epistemological growth, formal education ought to provide frequent and diversified opportunities for students to exercise reasoning skills, through argumentation.

### 3.3.3.3 The Reflective Judgment Model

The Reflective Judgment Model (King & Kitchener, 1994) was gradually built and refined upon the outcomes of a series of longitudinal ‘think-aloud’-like interview-studies, involving over 1700 individuals for a period of around 10 years. This time span covered the college years; the pre-college time (the high school years), as well as the post-college years (when subjects were already in the labour market). In the interview sessions, subjects were asked to respond to ill-structured problems, specifically problems for which clear-cut or unambiguous solutions would not be applicable (for instance, questions about the objectivity of the media and questions eliciting assumptions about chemical additives in food). The adoption of ill-defined real-world problems was based on the assumption that these kinds of problems require one’s awareness and knowledge of his personal epistemologies. Interviewees were thus asked to think aloud and verbalise their views on such problems. The answers were analysed based on an inspection of categories of description denoting ‘absolute’ or ‘relative’ judgments about the assigned ill-structured problems. Seven qualitatively different and progressive stages taping the ways in which individuals perceived and judged ill-structured problems were considered. In a fashion similar to that of Perry (1970) - thus shedding a clear parallelism between the two models, the seven stages of reflective judgment were clustered into three meaningful levels of judgment: pre-reflective, quasi-reflective, and reflective. In the pre-reflective level of judgment (stages 1 to 3), individuals are characterised as being unlikely to perceive that for some problems there may no be correct answers. In the quasi-reflective level (stages 4 and 5), individuals portray some awareness to uncertainty, revealing to perceive that one cannot know everything with certainty, while in the reflective level (stages 6 and 7), individuals are found fully aware that knowledge is actively constructed and that it is to be understood contextually (King & Kitchener, 2004). In sum, outcomes from King and Kitchener’s studies confirmed that sophistication in reflective judgment increases with age and education: the older and better educated individuals are, the more they can provide relativistic (quasi-reflective and reflective) judgments (beliefs) about ill-structured problems. Those studies also confirmed that changes in reflective judgment follow a fixed sequence,
thus providing further support to the developmental view of personal epistemologies.
The foregoing can be summed up by saying that the reflective judgment model examines and describes how, in the course of their epistemological development individuals make reasoned judgments about ill-defined problems, i.e. uncertain problems to which ‘right’ and ‘wrong’ answers do not apply. Thus, the educational implications of the reflective judgment model can be summarised in the following few points: (i) the need to show respect for students’ assumptions and judgments, regardless of the development stage they may exhibit, and encourage them to defend their viewpoints (judgments), as well as to analyse those of others; (ii) the pertinence of encouraging students to practice their reasoning skills by confronting them with controversial and ill structured issues, and (iii) the need to equip students with strategies to gather relevant data from which they can make interpretive judgments (King & Kitchener, 2002, 2004).

3.3.3.4 Summary of the developmental paradigm to personal epistemology and its educational implications

Ascribed to the developmental paradigm to personal epistemology, the above surveyed models converge on advocating that, like cognition (Piaget, 1950), personal epistemology is developmental and follows a rather fixed trajectory. Accordingly, individuals ideas about the nature of knowledge and knowing move through predictable, sequenced and evolutionary steps, in which earlier stages of epistemological development are characterised by dualistic, absolutist, even naïve belief in knowledge as certain, simple, and obtained from external authorities. In later stages, knowledge comes to be perceived as relative, contextual, and attainable through the learner’s active process of re-evaluation. Succinctly, from the developmental paradigm to personal epistemology, knowledge is perceived as continually developing and knowing is regarded as coordinated with justification (Hoffer, 2004). With a general heuristic framework inspired from Piaget’s cognitive development theory, the development paradigm to personal epistemology has mostly adopted interview-based longitudinal studies as its research instrument. Perry (1970), the pioneering researcher within this paradigm conceived personal epistemologies as ‘positions of intellectual development’, while his followers have adopted other labels, depending upon the particular psychological process by mean of which they observed and assessed epistemological development, such as ‘ways of knowing’. (Baxter
Magolda, 1992, 2004); ‘argumentative reasoning’ (Kuhn, 1991), and ‘reflective judgment’ (King & Kitchener, 1994). Common in both the cognitive development theory (Piaget, 1950) and in the developmental paradigm to personal epistemology is the understanding that individual’s ability to co-ordinate the objective and the subjective aspects of knowing is an evolutionary and sequential process. Thereupon, the educational implication of both theories can jointly and succinctly be spelt-out as follows: Personal cognition and personal epistemology are developmental. Personal development (i.e. cognitive, affective, epistemological and moral development) is the aim and concern of education. Education is, therefore, a process to be conducted in a sequential, paced, and constructivist way, so that it can comply with the nature of both cognitive and epistemological development, and thus foster the progression towards more sophisticated cognitive operations and epistemological stages.

3.4 The Epistemological Beliefs System Paradigm

3.4.1 The inception of a multidimensional perspective of personal epistemology

As indicated at the outset of the chapter, the second major paradigmatic approach to personal epistemology is the so-called epistemological belief system paradigm. Its inception originated from the conviction that the one-dimensional description of epistemology, embedded in the developmental paradigm, could not capture and account properly for the complex nature of personal epistemologies. Thus, the epistemological beliefs system paradigm adopts a multidimensional view and has primarily sought to identify the underlying dimensions of an individual’s beliefs scheme about knowledge and knowing. Pioneered by Marlene Schommer (Schommer, 1990), this paradigm coins personal epistemologies as a ‘system of more or less independent beliefs’, wherein ‘system’ encapsulates the view that there is more than one dimension to consider. ‘More or less independent’ conveys the assumption that an individual may be sophisticated in some beliefs but not necessarily sophisticated in others, implying a fluid theory, whereby the belief dimensions do not necessarily develop in synchrony.

As discussed earlier in Chapter 2, the notion of epistemology embraces the nature, source, and limits of knowledge. Elaborating on that very notion,
Schommer (1990) conceptualised epistemological beliefs as encompassing, on the one hand, beliefs about the nature and justification of knowledge, thereupon establishing belief dimensions related to the structure, certainty, and source of knowledge. On the other hand, and stepping rather beyond the strict scope of epistemology, Schommer posited two complementary belief components related to the learning process: the dimension on the control and the dimension on the speed of knowledge acquisition. Consistent with and drawing from that theoretical outline, Schommer (1990) has thoroughly defined epistemological beliefs as “a set of relatively independent beliefs about the structure, source, and certainty of knowledge, as well as the source of control and speed of knowledge acquisition” (Schommer, 1990, p.498). Hence, she proposed a framework comprising five hypothesised belief-dimensions, argued for in the following terms:

Beliefs about the nature of knowledge are too far complex to be captured in a single dimension. I propose that there are at least five dimensions: the structure, certainty, and source of knowledge, and the control and speed of knowledge acquisition (Schommer, 1990, p.498).

Those dimensions, viewed as existing on a continuum, as well as their typical labelling and statement (from a naïve perspective) are as follows:

The dimension addressing the Structure or Complexity of knowledge (Simple Knowledge): ‘Knowledge is simple rather than complex’.
At one end of the continuum, the learner views knowledge as discrete facts, while on the other extreme he views knowledge as contextual and relative.

The dimension about the Stability or Certainty of knowledge (Certain Knowledge): ‘Knowledge is certain rather than tentative’.
At one end, the learner views knowledge as representing absolute certainty and truth. At the other end of the continuum, the learner is aware that knowledge cannot be absolute and definitely true, as it is continuously evolving.

The dimension about the Source of knowledge: (Omniscient Authority): ‘knowledge is handed down by authority’.
At one end of the continuum, the learner tends to see knowledge as external to him and as a monopoly of authoritative sources. At the other end, the learner comes to see knowledge as being intrinsic to him, once requiring him to actively construct it, in social interaction.

The dimension on the **Control** or Ability to learn (*Fixed* or *Innate Ability*): ‘The ability to learn is innate rather than acquired’.

Perceiving the ability to learn as a special and preset gift of selected ones is learner’s perception at one end of the continuum, while at the other end he is more likely to perceive that there are no innately gifted learners.

The dimension accounting for beliefs about the **Speed** of knowledge acquisition (*Quick Learning*): ‘Learning is quick or not at all’

At the one end of the continuum, the learner tends to perceive learning as necessarily a quick process. At the other end, he reveals awareness to the fact that, in the main, learning is a gradual process.

Schommer (1990) tested her hypothesis by developing and administering to junior undergraduate college students a 63-items Likert-type questionnaire - the *Schommer Epistemological Questionnaire* (SEQ). To characterise epistemological beliefs under the above listed dimensions, SEQ items are stated in either the negative or in the positive extremes (e.g. “when I study I look for specific facts”; “The really smart students don’t have to work hard to do well in school”). Respondents rate the statements according to their degree of agreement within a range of numbered and progressive options, from ‘strongly disagree’ (1) to ‘strongly agree’ (5). Such a methodological procedure is meant to accommodate the presumption of epistemological beliefs as a continuum between extremes, implying an hierarchical sequence of points (numbers), each one reflecting the attached value to the belief implied. Thus, for instance, the belief on the **certainty of knowledge** is presumed to range from ‘knowledge is absolute’ to ‘knowledge is constantly evolving’. Likewise, the belief on the **control of learning** is supposed to vary from ‘the ability of learning is genetically predetermined’ to ‘the ability to learn is acquired through experience’. Meanwhile, for data analysis in Schommer’s (1990) pioneering study and
in the subsequent ones (e.g. Schommer, 1993; Schommer et al., 1992), the 63 items were clustered into 12 subsets, assumed to be parts of the five dimensions. These 12 subsets of items were then taken as variables (instead of the actual 36 items) and entered into a factor analysis procedure. A four-factor solution was extracted, yielding four of the proposed five dimensions, namely ‘Simple Knowledge’ (structure of knowledge) ‘Certain Knowledge’ (stability of knowledge), ‘Innate Ability’ (control of learning) and ‘Quick Learning’ (speed of learning). The proposed dimension ‘Omniscient Authority’ (source of knowledge) was not extracted. This typical 4-factor solution pattern was replicated in Schommer’s subsequent studies (e.g. Schommer, 1993; Schommer, Crouse, & Rhodes, 1992; Schommer & Walker, 1995; Schommer, Calvert, Gariglietti, & Bajaj, 1997).

3.4.2 Features of the Epistemological Beliefs System Paradigm

Basically, the epistemological beliefs system paradigm as initially proposed by Schommer (1990) and pursued by several subsequent researchers (e.g. Jehng, Johnson, & Anderson, 1993; Qian and Alvermann, 1995; Chan, 2002; Strømsø & Bråten, 2003; Cano, 2005) distinguishes itself from the developmental paradigm by the following characteristics: (a) the addition of beliefs about learning, (b) the identification of distinct beliefs, (c) the consideration of asynchronous development, (d) the introduction of belief nomenclature, and (e) the introduction of quantitative assessment (Schommer-Aikins, 2004). Lately, moderating her claim about extreme epistemological beliefs, Schommer-Aikins (2002, 2004) has proposed epistemological beliefs to be portrayed as frequency distributions rather than as continuums. Yet, this way of accounting for epistemological beliefs still needs further elaboration and empirical validation.

3.4.3 Issues, strengths and implications of the Beliefs System Paradigm

Since its inception (Schommer, 1990), the multidimensional approach to personal epistemology has flourished and has attracted many researchers worldwide. Some of them (e.g. Strømsø & Bråten, 2003, Qian & Alvermann, 1995) have adopted Schommer’s (1990) original epistemological questionnaire, while others have opted for slightly modified versions (e.g. Jehng, Johnson, & Anderson, 1993; Jacobson, Jehng, & Maouri, 1996). Other researchers have even devised alternative instruments (e.g. Schraw, Bendixen, & Dunkle, 2002; Buehl, Alexander, &
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Murphy, 2002). All in all, the outcomes have not been very consistent, neither in terms of the number of dimensions, nor in what concerns the nature of the dimensions extracted. Theoretical and methodological aspects of this approach have been pinpointed as to explain those inconsistent outcomes, thought to derive from both the shortcomings and strengths of this approach. In the following, those aspects are addressed. Thereafter, the educational implications of the beliefs system paradigm will be spotted.

3.4.3.1 Issues
Concerns raised at the beliefs system approach to personal epistemology include conceptual and methodological issues. At the conceptual level, strong concern has been manifested with regard to two of the dimensions proposed by Schommer (1990) and pursued by many researchers, namely the speed of knowledge acquisition and the ability to learn. Those concerns have been raised on the grounds that these dimensions do not pertain to the epistemological territory (e.g. Hofer & Pintrich, 1997; Rozendaal, Brabander, & Minnaert, 2001). The argument put-forth by these and other reviewers is that the ability to learn and the speed of learning pertain to beliefs about learning and intelligence, respectively. The speed of learning is additionally seen as possibly reflecting a perception of the difficulty of the learning process and, at most, as indicating a common expectation concerning learning, but in no way representing beliefs about knowledge or knowing. Putting it succinctly, Hofer and Pintrich (1997) observe: “A belief about what knowledge is and how it can be described is not the same as a belief about how quickly one might go about learning” (p.109). Rozendaal, Brabander, & Minnaert (2001) go further to establish validity criterion for classifying beliefs as epistemological. Accordingly, beliefs about the nature of knowledge and beliefs about the nature of knowing can only be considered epistemological if they are relevant to the validity of knowledge. Furthermore, Rozendaal and his co-researchers argue that the apparently closer semantic proximity between ‘nature of knowing’ and ‘nature of learning’ is too significant to be neglected. On that basis they sustain that beliefs about learning should not be put under the umbrella of epistemological beliefs, given that “not all beliefs about learning are necessarily epistemological. Whether they are, depends on the extent to which a specific belief about learning is relevant to the validity of knowledge” (Rozendaal et al., p.3).

In recognition of and in reaction to that, Schommer (Schommer-Aikins, 2002, 2004) has come to acknowledge a theoretical distinction between
epistemological beliefs and beliefs about learning and ability. Yet, she observes that the complexity of epistemological beliefs hardly can be captured by models that rely on the purely epistemological strands. Thus, she argues that beliefs on the control and speed of knowledge acquisition, supposedly related to implicit theories of intelligence (Hofer & Pintrich, 1997) should not be conceptualised separately from beliefs about knowledge and knowing as, in her view constitute and important link to epistemology, once they embed the idea of ‘absolute vs. contextual knowing’, inherent to an epistemological framework.

Admittedly, the controversy around the epistemological validity of the dimensions ability (to learn) and speed (of knowledge acquisition) remains unsettled for lack of both conclusive conceptual clarity and systematic confirmatory empirical support. Meanwhile, it is equally true that empirical evidence is also needed to sustain the postulate that beliefs on the control and speed of knowledge acquisition (beliefs about learning) are related to implicit theories of intelligence. That is what apparently can be concluded if we consider, for instance, the findings reported by Strømsø and Bråten (2003) and by Bråten and Strømsø (2004) with reference to their correlational studies on epistemological beliefs and implicit theory of intelligence amongst Norwegian students. In point of fact, these researchers found no evidence that belief-dimensions related to the speed and to the control of knowledge acquisition correspond to constructs connected to that of implicit theories of intelligence. They explain: “Apparently, there is a difference between asking students directly about how modifiable they think intelligence is and asking them about the speed of learning and the ability to learn” (Strømsø & Bråten, 2003, p.13). Furthermore, they found these constructs operating in parallel but with different impact in relation to certain students’ learning attitudes. Specifically, epistemological beliefs were found to play more important roles in goal setting than implicit theories of intelligence (Bråten & Strømsø, 2004). Thus, though from the theoretical viewpoint beliefs about knowledge and knowing and beliefs about intelligence belong to distinct conceptual areas – thereby the legitimacy to question the inclusion of beliefs about learning in an epistemological framework, the claim that beliefs about intelligence and learning are not related to beliefs about knowledge still needs empirical validation.

If a rather simplistic approach can be taken to tackle this fundamental conceptual issue, one could restrict the scope of epistemological beliefs to its underlying ontological assumption, which is centred on the nature of
knowledge and knowing, as strictly bound to an individual. Obviously, under such approach beliefs about learning would not be accommodated in an epistemological framework. The question then arises as to whether such a conceptualisation of epistemological beliefs would capture what empirically seems to be people’s perception about the nature of knowledge and knowing. As already discussed in Chapter 2, contemporary philosophy sustains an epistemology that conceives of the nature of knowledge and knowing as a dynamic process, culturally and socially determined. To that argument, one could add that knowledge and knowing have become intricate with formal education. This reinforces the suggestion that assumptions about learning and teaching are implicit in modern conceptions of epistemology. So, if the conceptual issue of epistemological beliefs under analysis is to be tackled taking into account such a broader conception of epistemology, then the inclusion of the debatable dimensions (i.e. ability and speed of learning) in an epistemological framework would sound legitimate. Then, the question would eventually be to consider the need to re-conceptualise the construct of epistemological beliefs, as it has been so far understood since its inception (Schommer, 1990). However, that endeavour is beyond the scope of this study. For that reason, though aware of that crucial definitional issue, which challenges the terms in which the epistemological beliefs system paradigm has been hitherto known and approached, our premises in the present study have been generated on that basis and the outcomes are interpreted accordingly. Putting it in other words, we mean that, in general, we have followed previous researchers’ footsteps, but operating in an ‘atypical’ cultural context, as far as personal epistemology research tradition is concerned. It was in view of that that the chief concern of the present study was that of spotting likely specific epistemological traits, purportedly determined by the cultural context of the targeted group of the study.

At the methodological level, two main issues have been recurrently raised on Schommer’s (1990, 1993; Schommer et al., 1992) studies. Firstly, the extent to which the Schommer Epistemological Questionnaire (SEQ) items are representative and relevant as indicators of beliefs about knowledge has been questioned. That questioning is mostly motivated by the ambiguity of the wording of some items. Additionally, once there are items that happen to be phrased in a second-person format and others even in a third-person format, reviewers have observed that it is rather difficult to determine whether a respondent’s answers actually refers to his personally held
epistemological beliefs or the attempts to gauge out a supposedly generalised perceptions of what others’ beliefs might be (Hofer & Pintrich, 1997; Clarebout, Elen, Luyten, & Bamps, 2001). The second methodological issue is related to the factor-analytic procedure employed in Schommer’s studies (Hofer & Pintrich, 1997; Rozendaal, Brabander, & Minnaert, 2001; Clarebout et al., 2001). As referred to previously, in Schommer’s research the 63 questionnaire items were clustered into 12 related subsets and these were treated as the variables of the study and, consequently, entered as such in factor analysis processing. Such a procedure, justified by Schommer as a way of mitigating statistical incongruities and side effects of her modest sample size (Schommer-Aikins, 2004), has cast doubts on whether the same factor-solution would have been yielded if the actual 63 items were entered as variables. As a matter of fact, in a number of subsequent SEQ-based studies conducted not only in the USA but also elsewhere and applying item-based factor analyses, the factor-structure reported by Schommer (1990, 1993; Schommer et al., 1992) could not be replicated. For instance, in Qian and Alvermann’s (1995) study, the hypothesised dimensions of certainty of knowledge and simplicity of knowledge merged into one factor (‘Simple-Certain Knowledge’) and only the other two theoretical dimensions (‘Innate Ability’ and ‘Quick Learning’) could be extracted. Dissimilar factor-solutions to those of Schommer (1990, 1993) and Schommer et al. (1992) were also reported by Schraw, Bendixen, and Dunkle (2002) in a SEQ-based study in which the 63 items were again individually entered as variables in the factor-analysis procedure. Out of the five factors extracted, Schraw et al. (op cit.) found that only two (‘Certain Knowledge’ and ‘Innate Ability’) did correspond to those reported by Schommer (1990, 1993; Schommer et al., 1992). The remaining three factors were labelled as ‘Certain Knowledge 2’, ‘Integrative Thinking’, and ‘Incremental Learning’. A further example of inconsistency in factor-solutions is to be found in Hofer’s (2000) study. Though considering only those SEQ-items (n=32) that had loaded in Qian & Alvermann’s (1995) 3-factor solution, Hofer (2000) not only extracted a different number of factors but also found that none of the four factors she had extracted could be labelled according to the dimensions originally hypothesised by Schommer (Schommer, 1990, 1993; Schommer et al., 1992). It is worth highlighting that problems in replicating factor structures in epistemological beliefs have been not only reported in studies applying SEQ or SEQ-based instruments (e.g. Jehng, Johnson, & Anderson, 1993), but also in those studies adopting alternative instruments (e.g. Schraw, Bendixen, & Dunkle, 2002; Buehl, Alexander, & Murphy, 2002).
Furthermore, slippery factor extraction has also been reported in studies undertaken in Europe (e.g. Clarebout et al., 2001; Cano, 2005) and in Asia (e.g. Youn, 2000; Chan & Elliot, 2000, 2002; Youn, Kim, & Yang, 1999; Youn, Yang, & Choi, 2001). Apparently, certainty of knowledge and simplicity of knowledge (dimensions related to the nature of knowledge) appear to be the two dimensions that have been quite systematically extracted (sometimes associated to each other as a single factor) by most of the epistemological questionnaires. It appears, then, that inconsistency in factor structure is on account of the slippery nature of the concept of epistemological beliefs, rather than on the instruments used or factor extraction procedure.

In sum, the identified penumbra areas of the epistemological belief paradigm can be summarised as follows:

i. **At the conceptual level:** The framework sustaining the conceptualisation of epistemological beliefs has not been consensual, specifically for including beliefs about intelligence (belief in fixed ability) and beliefs about learning (belief in quick learning), ‘foreign’ to an epistemological construct. Additionally, the elicitation of actual epistemological beliefs by summing up respondents’ agreements with a number of statements is deemed de-contextualised and intricate. Besides that, some of the statements appear less clear and even ambiguous as to the beliefs they aspire to draw out;

ii. **At the methodological level:** With reference to Schommer’s (1990) model, the theoretical construction of subsets of items (and their use as variables in the processing of the responses via factor analysis) has been questioned. Besides that, and given that there has been recurrent inconsistency in factor-solutions (even when item-based factor analyses are adopted), concern has been raised on the overall method. It seems though that the source of the problem is to be found in the very nature of the construct.

### 3.4.3.2 Strengths

The epistemological beliefs system paradigm has noticeably gained hold in personal epistemology research both in the USA (e.g. Jehng, Johnson, & Anderson, 1993; Hofer, 2000; Buehl, Alexander, & Murphy, 2002) and elsewhere, namely in Europe (e.g. Lonka & Lindblom-Ylänne, 1996; Stømsø & Bråten, 2003; Dahl, Bals, & Turi, 2005; Cano, 2005), and in Asia (e.g. Lee as cited in Chan & Elliot, 2004; Mori, 1997; Youn, Yang, & Choi,
2001; Lin, 2001; Chan, 2002; Chan & Elliot, 2002). Though variations have been reported in the belief dimensions extracted in different cultural contexts, and even within a single cultural setting (see, for instance Clarebout et al., 2001), the multidimensional structure of epistemological beliefs seems to generally hold also in non-western cultures, namely in China (Hong-Kong and Taiwan), in Korea and in Japan. Despite some disputable conceptual and methodological aspects, discussed in the previous section, the beliefs system paradigm seems to have stood, thanks to its fundamental strong points: the easiness in which studies under this approach can be conducted and replicated, and the far reaching nature of a multidimensional approach to personal epistemology in itself. Next, we elaborate on these aspects:

Practicability of epistemological belief studies
Data collection under the epistemological beliefs paradigm rests, on the whole, in administering a paper-and-pencil epistemological questionnaire. On the one hand, this has been regarded as a weakness of this approach, for it de-contextualises personal epistemology (Louca, Elby, Hammer, & Kagey, 2004). However, on the other hand, it has been taken as a strong feature of the epistemological beliefs system approach once epistemological questionnaires are handy, quick and easy to answer to by the respondents, as well as easy to process by the researcher. That makes it feasible to conduct studies involving large samples of subjects. Importantly, once questionnaire-based, epistemological beliefs studies can be easily replicated with a high degree of uniformity, and can also be used in between-subjects as well as in within-subjects designs, allowing relatively more reliable comparisons to be made concerning several theoretical aspects, such as dimensionality (e.g. Hofer, 2000; Rozendaal et al., 2001) and domain-specificity of epistemological beliefs (e.g. Jehng, Johnson, & Anderson, 1993; Lonka & Lindblom-Ylänne, 1996; Hofer, 2000; Buehl, Alexander, & Murphy, 2002; Strømsø & Bräten, 2003). This is not the case with interview studies on personal epistemology (typical under the developmental paradigm), which are difficult to replicate, for they require extremely well trained individuals to score and reliably interpret interview data.

Widespread scope of epistemological beliefs studies
Being epistemology such a multifaceted construct, approaching individuals’ beliefs about knowledge and knowing from a multidimensional perspective allows a closer scrutiny of the underlying
theoretical components of this construct. Moreover and above all, in allowing a trait-like outlook of individual differences in personal epistemologies, the multidimensional approach to personal epistemologies and its inherently quantitative data collection procedure (through a questionnaire) and the respective statistical data processing techniques (chiefly factor analysis, correlation and regression analyses), have boosted the generalisation of correlation studies, potentially appropriate for the examination of relationships between personal epistemologies (epistemological beliefs) and learning related aspects, and between epistemological beliefs and academic performance. A ground-breaking study on that direction was conducted by Ryan (1984) and consisted in the examination of the influence of individuals’ epistemological beliefs on reading comprehension. Ryan (1984) working hypothesis was that one’s text comprehension would reflect his conception of the desired outcome of the reading process. In turn, this conception “will reflect the individual’s implicit epistemological beliefs – his or her understanding of the nature of knowledge and the learning process” (Ryan, 1984, p.248). Grouping undergraduate students into two broad categories, drawn from Perry’s (1970) scheme, namely fact-oriented (or dualistic) and context-oriented (or relativistic), Ryan (op cit.) asked them to describe the criteria upon which they would decide whether they had or not attained comprehension of a piece of text. Outcomes indicated that most fact-oriented (dualistic) students would assume to have understood the text just by finding themselves able to recall facts reported in it. Conversely, context-oriented (relativists) students would refer to connections among ideas and to their ability to apply their knowledge as the criteria to assume text comprehension. Though Ryan’s interest was around exploring text comprehension as related to beliefs about the structure of knowledge (which represents just one of the conventional five dimensions in contemporary epistemological beliefs frameworks), the study and its outcomes were of paramount importance in disclosing the usefulness of quantitative techniques in allowing the examination of the relatedness of personal epistemologies to comprehension, which is a crucial aspect of learning.

In contemporary epistemological beliefs studies, relationships between epistemological beliefs and cognitive processes, such as text interpretation and comprehension have been explored further (e.g. Schommer, 1990; Schommer et al., 1992; Kardash & Scholes, 1996). Other studies have examined the impact of epistemological beliefs on academic
achievement (e.g. Schommer et al., 1992; Schommer, 1993; Cano, 2005), while others have studied epistemological beliefs in relation to other relevant aspects related to learning, such as motivation (e.g. Hofer, 1999; Maggioni & Riconscente, 2003; Chiu & Tsay, 2003), learning approaches (e.g. Cano, 2005), and the use of learning strategies (e.g. Schommer et al., 1992; Dahl, Bals, & Turi, 2005). In sum, from the epistemological beliefs system approach, belief-traits (dimensions) stand as predictors of both behaviour (e.g. motivation, learning approach, and learning strategies), and outcomes (e.g. comprehension, conceptual change, and achievement), the reason why this approach does boast a certain predictive power regarding individuals’ likelihood to behave and perform in a particular manner in learning situations.

Finally, a further strong point of the epistemological beliefs system paradigm is to be found in its suitability for cultural considerations around identified epistemological traits. For instance, due to their intrinsic social/cultural load, epistemological beliefs dimensions such as ‘omniscient authority’, ‘innate ability’ and ‘certainty of knowledge’ have allowed apparently sound interpretations inspired from sociological theories. For instance, unlike in Western societies (e.g. Schommer, 1990, 1993; Strømsø & Bråten, 2003), most of the studies on epistemological beliefs undertaken in Asia have quite consistently extracted the dimension omniscient authority (e.g. Youn, 2000; Lin, 2001; Chan & Elliot, 2002). The extraction of this dimension and, particularly, the occurrence of naïve beliefs on authoritative sources of knowledge have been interpreted as associated to ‘high power distance’ relationships which, according to sociological frameworks (e.g. Hofstede, 2000; Singelis, 1994) are a cultural trait that characterises Asian societies in general. A discussion of these aspects will be resumed and expanded in Chapter 7.

3.4.4 Summary of the epistemological beliefs system paradigm and an overview of its educational implications

Basically, the tenets of the epistemological beliefs system paradigm are rooted on two chief assumptions: Firstly, that personal epistemology consists of a small number of relatively stable and independent belief-dimensions about knowledge and learning, being learning understood as an operational process towards knowing. Secondly, that those belief-dimensions are orthogonal and do not necessarily develop in synchrony.
Complexity, certainty and source of knowledge, as well as control and speed of knowledge acquisition are the conventional belief-dimensions in this paradigm. Under the surmise of their stability and context boundlessness, these belief-dimensions lend themselves to be surveyed through Likert-type epistemological inventories. Inconsistency in the number and nature of belief dimensions that have emerged out of empirical studies has remained a perennial issue in this paradigm. Theoretical and methodological issues are seen to underlie those inconsistencies. Yet, the acknowledged conceptual significance and the practical and far-reaching methodological procedures of this paradigm have sustained its continued use in personal epistemology studies. As a result, outcomes with clear educational implications have been gathered. In conceiving of epistemological beliefs as an aspect of individual trait (and so of individual differences), and in operating with a corpus consisting of data suitable to inferential statistics, this paradigm has enabled correlation analyses to be performed. Thus, relationship between the hypothesised belief-dimensions and other cognitive and metacognitive constructs (e.g. comprehension, conceptual change and motivation), as well as with academic achievement, have been examined and established.

The implications and educational benefits of the epistemological beliefs system can be discussed further by considering the relationship of epistemological beliefs to constructive learning. From a constructivist viewpoint, learning is an active process of meaning construction carried out by the learner himself (Von Glasersfeld, 1987, 1996; Fosnot, 1996). Construction of meaning is a process largely influenced by what the learner already knows and that he, explicit or implicitly bears in new learning situation (Von Glasersfeld, 1996). That learner’s a priori knowledge is not confined to factual and formal knowledge. It includes also categories of informal knowledge, of which beliefs about the nature of knowledge and learning (epistemological beliefs) are an important component.
3.5 The emerging paradigms

Despite the theoretical soundness of the developmental approach to personal epistemology and the empirically appealing character of the epistemological beliefs framework, these two paradigms have not stood as the last and definitive approaches to personal epistemology research. Acknowledging the strengths and limitations of these two paradigms, attempts have been made either to refine each of them (e.g. Hofer & Pintrich, 1997; Schommer-Aikins, 2004; Hofer, 2004), or to integrate them into comprehensive frameworks (Bendixen & Rule, 2004), or even to devise rather innovative paradigms (Louca, Elby, Hammer, & Kagey, 2004). That endeavour has resulted in what we term the emerging paradigms in personal epistemology research. A synopsis of two of those budding paradigms is here provided.

3.5.1 The epistemic metacognition paradigm

Proposed by Hofer (2004), the epistemic metacognition paradigm is built on the core aspects of personal epistemology, namely the nature of knowledge and the nature of knowing. Yet, this paradigm is characterised by two particular features. Firstly, it incorporates elements of the beliefs system paradigm (Schommer, 1990) and those of the epistemological resources paradigm (Louca, Elby, Hammer, & Kagey, 2004). However, its orientation is towards mitigating the de-contextualisation of personal epistemology, which stands as one of the shortcomings of the beliefs system paradigm. The second aspect concerns an innovative conceptual understanding of personal epistemology as an aspect of metacognition (knowing about knowing). Specifically, this paradigm perceives personal epistemology as consisting of two broad metacognitive dimensions. One dimension refers to an individual’s understanding of knowledge, congregating beliefs about the certainty and simplicity of knowledge. The second dimension pertains an individual’s understanding of knowing, encompassing beliefs about the sources of knowledge and justification for knowing. In view of its basic features, the epistemic metacognition paradigm sustains that the study of personal epistemology should be contextual (e.g. on-task). Furthermore, it advocates for the use of research methodologies that are appropriate to the study of metacognition (e.g. think-aloud protocols). As a matter of fact, the paradigm has been proposed based on a on-task (web search) think-aloud study on personal epistemology.
According to its proponent, the relevance of the epistemic metacognition paradigm lies in its suitability for opening up the possibility of integrating multiple perspectives of the construct, that is, to see personal epistemology as:

A set of beliefs, organised into theories, operating at the metacognitive level. Such theories develop in interaction with the environment, are influenced by culture and education and other context variables, operate at both the domain-general and domain-specific level, are situated in practice, and are activated in context (Hofer, 2004, p.46).

Concerning educational outcomes, the epistemic metacognition paradigm proposes they should be regarded as a result of a contextual and dynamic process of learning and knowledge building, influenced by the learner’s metacognitive monitoring of his epistemological beliefs, resources, and theories.

### 3.5.2 The epistemological resources paradigm

Building rather marginally the rigid conventional roots of personal epistemology (e.g., the nature of knowledge and knowing), the epistemological resources paradigm (Louca, Elby, Hammer, & Kagey, 2004) regards personal epistemology as consisting of epistemological resources. These are defined as “units of cognitive structure at a finer grain size than stages, beliefs, or theories” (Louca et al., 2004, p.58). Purportedly, each individual has a host of epistemological resources, which are thought to be less stable than the belief-dimensions but context specific and likely to enable the individual to perceive forms, sources, stances and other knowledge related aspects. Thus, according to the context, the individual evokes particular epistemological resources that seem appropriate.

Classroom observation, combined with extended task-based clinical interviews, is the proposed data gathering methodology within the epistemological resources paradigm. These methodologies are seen to possess the potential to allow the gathering of “finer grained data of students’ context-sensitive views about knowledge” (Louca et al., p.67). Proponents of this paradigm sustain that its relevance is to be understood from its likelihood to raise awareness to the influence of contextual variables in the process of accessing/evoking epistemological
resources into a particular learning situation. Arguably, this lends the epistemological resources paradigm to be more useful in informing and guiding classroom practices.

The above described and other emerging paradigms appear to provide richer and valuable outlines on how the complexity of the construct of epistemological beliefs and other related constructs and variables could be brought together into research designs. Of particular relevance in those new paradigms is the recognition that personal epistemologies are context bound, which paves new grounds for more informed and comprehensive insights into still ill-known aspects of the construct, and to educational practices, in particular. Nevertheless, in general, the basis for the propounding of those paradigms has been the outcome of single studies, thus casting doubts on their validity and generalisation. The same applies to other innovative and/or integrative models, supposedly leading to more accurate and comprehensive personal epistemology research. However, some of those models bear the demerit of remaining at the theoretical level, as they have not yet been empirically tested to ascertain on their applicability (e.g. Schommer-Aikins, 2004; Bendixen & Rule, 2004). The point is that, though theoretically compelling, thanks to their conceptual soundness, those complex models on personal epistemology seem rather unwieldy to be actually put into practice. Subscribed to a conventional paradigm - the epistemological beliefs system approach and, consequently, bound to its general shortcomings, the present study aims just at providing inputs from an African context, which could be added to the ongoing debate within the dynamic field of personal epistemology.

3.6 Summary

Epistemological beliefs, the main construct of the present study, has been found to be a specific paradigm within personal epistemology. This is a broad area of research on individuals’ beliefs about the nature and stability of knowledge, and about the source and justification of knowing. Surveying personal epistemology literature, the chapter has discussed chief developments within this area. Piaget’s cognitive development theory was reviewed as the inspiring source to the inception of personal epistemology research by William Perry (Perry, 1970). Perry’s studies and some of the subsequent ones (e.g. Kuhn, 1991; Baxter Magolda, 1992; King
& Kitchener, 1994), albeit using different terminology, are categorised to share common methods and goals, namely interviews to describe how individuals’ epistemologies develop along with their cognitive development. Thus, the epistemological models proposed by these theorists are seen to pertain to the developmental paradigm. This is an approach that advocates that personal epistemology evolves in one-dimensional, fixed, and sequential stages, being the earlier ones characterised by dualistic and absolutist beliefs about knowledge, and by the idea that knowledge is delivered by external sources (authorities). Later stages are seen related to a perception of knowledge as relative, contextual, and attainable through the individual’s active process of reasoning.

The epistemological beliefs paradigm, adopted in this study, has been reported to have been pioneered by Marlene Schommer (Schommer, 1990) to pursue the view that personal epistemologies are too complex to be captured by one single dimension. In view of that, this paradigm proposes that personal epistemologies are composed of a system of relatively independent beliefs, which can be accounted for through a quantitative approach. Those are the beliefs about the source, the structure and the certainty of knowledge, as well as the beliefs about the control and speed of knowledge acquisition. The chapter has discussed the issues behind such approach, which are both conceptual and methodological. Conceptual issues derive from the inclusion of beliefs about the control and the speed of knowledge acquisition, which are debatable as epistemological dimensions. Methodologically, two main issues are raised.

Firstly, the recourse to a pencil-and-paper kind of inquiry adopted in this paradigm is seen to de-contextualise and undermine personal epistemologies. Secondly, concerns have been levelled at data processing criteria, on the basis of inconsistent outcomes that have been found in adopting either clusters of items or the individual items as variables in the factor analysis procedure. The practicality and the widespread scope of the beliefs system approach were also discussed as its strong suit. Specifically, the chapter has highlighted that, owing to its methodology, epistemological beliefs studies can withstand large samples and can be reliably replicated. Utmost, epistemological beliefs studies allow for the examination of relationships between belief-dimensions and a number of learning related aspects, such as comprehension, concept change, motivation, strategy use, and academic achievement.

Finally, the chapter has acknowledged recent contributions in personal epistemology that have suggested more comprehensive models to be
adopted, as to accommodate and explore the vast aspects inextricably linked to personal epistemologies. Individuals’ cultural context is one of those aspects and it happens to be the main guiding assumption of the present study.