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PUBLIC IMAGES OF MATHEMATICS
by
LIM CHAP SAM

Introduction

1.1.Focus of study
This study aims to make a systematic enquiry into the public's images of mathematics and the possible causal factors of influence on the formation of these images. In this study, the term image is defined as some kind of mental representation (not necessarily visual) of something, originated from past experience as well as associated beliefs, attitudes and conceptions. Since an image originates from past experience, it comprises both cognitive and affective dimensions. Cognitively, it relates to a person's knowledge, beliefs, and other cognitive representations. Affectively, it is associated with a person's attitudes, feelings and emotions. (In Chapter 3, I will explain why I classify 'belief' as cognitive rather than affective). Thus the term 'image of mathematics' is conceptualised as a mental representation or view of mathematics, presumably constructed as a result of social experiences, mediated through school, parents, peers or mass media. This term is also understood broadly to include all visual, verbal representations, metaphorical images and associations, beliefs, attitudes and feelings related to mathematics and mathematics learning experiences. Therefore, the main aim of this study is to explore and identify the range of images, beliefs and attitudes towards mathematics as it is perceived by the public (mainly adults).

1.2. Public images of mathematics
It is widely claimed in the literature (see example, Henderson, 1981; Sewell, 1981; Mtetwa & Garofalo, 1989; Frank, 1990; Ernest, 1996) that, negative images and myths of mathematics (and mathematicians) are widespread among the public, especially in the developed countries. Henderson (1981) claims that "the majority of people today are scared of mathematics (and mathematicians) and feel powerless in the presence of mathematical ideas" (p.12). Many people's images of mathematics represent mathematics negatively, such that mathematics is perceived to be "difficult, cold, abstract, and in many cultures, largely masculine" (Ernest, 1996, p.802). Others describe mathematics as "fixed, immutable, external, intractable and uncreative" or "a timed-test" (Buxton, 1981, p.115). Even scientists and engineers whose jobs relate to mathematics "often harbour an image of mathematics as a well-stocked warehouse from which to select ready-to-use formulae, theorems, and results to advance their own theories" (Peterson, 1996).

In addition, there is a widespread conception that public attitudes towards mathematics are largely negative. There is some, albeit limited, evidence to support this. The Cockcroft Report (Department of Education and Science, 1982) reported Brigid Sewell's experience that half of the members of the public she stopped to interview on the street immediately declined and walked away when they learnt it was about mathematics, indicating a negative reaction (Sewell, 1981).
Sixteen years later, this similar trend is still evidenced in an international survey by the Basic Skills Agency (1997) on the numeracy skills of adults in seven countries, namely France, Netherlands, Sweden, Japan, Australia, Denmark and United Kingdom (UK). The UK sample ranks the highest in percentage of outright refusal to answer (13%), while in other countries, the percentage of outright refusal was at most 6%. Indirectly, these results suggest there is a lack of interest in mathematics or a relatively higher tendency of mathematics avoidance among many of the UK adults.

Furthermore, many adults of most Anglo-American countries are not embarrassed to proclaim their ignorance or poor performance in mathematics, unlike on other subjects. Educators attempt to explain this phenomenon through the widespread beliefs or mathematical myths that "learning mathematics is a question more of ability than effort" (McLeod, 1992, p.575) or "there is an inherent natural ability for mathematics" (FitzSimons et al., 1996, p. 768). Thus, many adults accept this lack of accomplishment in mathematics as a permanent state over which they have little control.

Apart from that, some students, in particular students with mathematics learning difficulties (Mtetwa & Garofalo, 1989) and some preservice teachers (Frank, 1990) were also found to hold some common mathematical myths. Some of these myths are 'mathematics is computation'; 'mathematics is difficult'; and 'men are better in mathematics than women'. Even though mathematical myths are not necessarily false beliefs, they are mostly negative and could be harmful in distorting the image of mathematics of the students.

Three widely claimed mathematical myths in the literature are:

1. Mathematics is a difficult subject
   It is claimed that to many people, mathematics is perceived as a difficult subject to learn and to teach. When Cockcroft (1994) expressing his personal views about the report, Mathematics Counts (Department of Education and Science, 1982), he stated that, "I believe we would be mistaken if we failed to recognize that however we design our programs, mathematics is unlikely ever to be an easy subject to teach and to learn (italic added)…"(p.37). However, it is also this notion of difficulty in mathematics that attracts some people to mathematics. Serge Lang (1984) in his famous public lecture on mathematics to a group of non-mathematicians expressed this in his personal view:
   I must also add that I do mathematics also because it is difficult, and it is a very beautiful challenge for the mind. I do mathematics to prove to myself that I am capable of meeting this challenge, and win it (p.5).
   Therefore, the notion of mathematics as a difficult subject is taken by some persons as a challenge, whereby if they succeed in solving the mathematical problems, then there is a strong sense of satisfaction. It is also this sense of satisfaction and challenge that can motivate them to go into higher level mathematics. Conversely, if they failed in advanced study, then this sense of failure might result in low self-esteem.
2. Mathematics is only for the clever ones
   Closely related to the preconception that mathematics is difficult, is the claim that mathematics is only for the clever ones, or only for those who have 'inherited mathematical ability'. Consequently, people who excel in school mathematics are highly respected and considered to be the intelligent few. This is a common perception in Eastern countries such as China (as reported by Zhang, Liu and Yu, 1990). They are also perceived to be an odd species in some western countries. For those who fail or perform poorly in school mathematics, it is often assumed that they did not have the so-called 'mathematical ability'.
3. Mathematics as a male domain
   Linking the above two myths together, Issacson (1989) proposes that mathematics has been seen to be a 'hard' subject, not necessarily in the sense of intellectually difficult, but hard as opposed to soft or feminine. This leads us to another widespread mathematics myth that 'mathematics is a male dominant subject'. Mathematics and science have always been stereotyped as strongly 'male' or 'masculine'. Perhaps traditionally, most mathematics teachers in secondary school and a large majority of mathematicians were found to be men. Moreover, mathematics as a field of study is often linked to masculine jobs such as military and engineering. Thus many people including primary and secondary students, adults, parents and even teachers regard mathematics as a male domain (Shuard, 1982).
   There is also widespread belief that boys are better in mathematics than girls (Burton, 1989). Various factors have been proposed to contribute to this stereotyped image. Jacobsen (as cited in Burton, 1989) refers this image to the differences in childbearing practices, peer group expectations and social attitudes as the contributing factors. Burton (1989) relates the gender difference in mathematics performance or preference to "bias experienced through patterns of socialization over the period from birth to the end of formal education" (p.182). Further review by Gutbezahl (1995) also suggests that some females' underachievement in mathematics might have related to the negative expectancies and attitudes of their parents, teachers and peers. As a result, these negative expectancies may lower their self-confidence in some people's mathematics and consequently their lower performances in mathematics. Their lower performances reinforce the parents' and teachers' negative expectancies and the vicious cycle perpetuates.
   From these proposed contributing factors, it appears that students' images of mathematics may have been greatly influenced by the social and cultural views. In other words, I argue that public view of mathematics could possibly play an important role in shaping the image of mathematics of our future generation.

Public images of mathematicians

If the public image of mathematics is negative, then according to Howson and Kahane (1990), the image of mathematicians is even worse. They are regarded as "arrogant, elitist, middle class, eccentric, male social misfits. They lack social antennae, common sense, and a sense of humour" (p. 3). In addition, the director of the Public Understanding of Mathematics Forum, Gene Kloz (1996) claims that mathematics profession is the most misunderstood in all of academia. According to him, the public thinks that mathematicians contemplate ancient proofs and work as lonely recluses. Moreover, the most common public image of a mathematician has been furnished by a physicist (example, Einstein) rather than a mathematician.

Why is there such a lack of appreciation of mathematicians' work by the public? Brown and Porter (1997) propose that the mathematicians themselves be blamed. This is because "mathematician themselves failing to define and explain their subject in a global sense to their students, to the public and to the government and industry" (p.11).

In spite of these indicators of claimed poor public images of mathematics (and mathematicians), negative attitudes to mathematics and widespread mathematical myths, relatively few systematic studies have been undertaken on the general public's images of mathematics. Thus the widespread conception that public images of mathematics are largely negative needs to be investigated and tested empirically.

In addition, there are other important reasons for investigating image of mathematics. Most notably, there is the recent decline in recruitment into higher education courses in mathematics, science, technology and engineering noted in the UK and a number of other anglophone countries, where negative views of mathematics (and science) are often cited as contributory factors. In relation to this, I will discuss three problems and issues on mathematics education that negative public images of mathematics are claimed to be among the possible contributing factors.

Related issues and problems

Negative views about mathematics (and science) and mathematical myths have been claimed to be one of the contributing factors to some teething problems in mathematics education. These problems include:

A low performance in mathematics and adult numeracy

Since 1980's, a number of national surveys on adult numeracy (see example Sewell, 1981; ACACE, 1982; Adult Literacy and Basic Skills Unit, 1987; Basic Skill Agency, 1997) have reported a low performance of a significant sample of the UK adults. In the latest international survey report (Basic Skill Agency, 1997), the UK respondents were found to perform relatively low, with only 20% of them completing all tasks correctly and almost half of them (47%) answered 10-12 questions correctly. This is comparatively lower than its European counterparts (such as 76% of the Netherlands, 68% of Denmark and 65% of France and Sweden).

Similarly, in the Third International Study of Science and Mathematics (TIMSS), pupils in England were reported to have achieved lower mean scores in mathematics than half of the other 46 countries. This pattern of achievement was found in both the 9-year-olds (reported in Harris, et al., 1997) and 13-year-olds (reported in Keys, et al., 1996a) in England.

These reports raise concerns for both the government and the mathematics education community. Was the increased problem of low performance in mathematics the result of the proclaimed poor public image and attitudes to mathematics? Conversely, have poor performances in mathematics in international comparison studies damaged the public image of mathematics?

A low enrolment of mathematics and science students in Higher Education

Unlike the other subject areas, there is a steady decline in the number of students taking up Advanced-level (A-level) and higher level mathematics in universities. Porkess (1995) points out that the number of students who took up A-level mathematics in 1995 was similar to what it was 30 years ago. However, since 1965, there has been a substantial increase in number of students participating in post-16 and higher education. The number of students taking A-level mathematics has been rising since then and reaches its peak in early 1980s. However, since 1984, the rate of student taking A-level mathematics has been falling steadily by almost 41%.

On the other hand, there is little hard evidence to support the claim that poor public image of mathematics is possibly one of the many factors that leads to the problem of low take-up in mathematics and science in higher education institutions. Past literatures (Dick & Rallis, 1991; Lee, et al., 1996) have shown that when students choose a subject to specialise in at A-level or university, they are very much influenced by the perceived relevance and usefulness of the subject areas in their future careers and their self confidence in that subject. If students perceived mathematics as a difficult subject and they lack self-confidence in the subject, then they will avoid taking up this subject at higher level. Furthermore, Dick and Rallis (1991) found that the effect of socializers, including parents, teachers and peers in influencing both subject choice and career choices could be subtle but powerful. Thus, I wish to argue that if the public image of mathematics is bad, then we can expect that these socializers or significant others in the lives of students are likely to discourage the students from taking up mathematics, and possibly science, at higher level. Consequently this problem of low enrolment of mathematics students at higher level may be perpetuated.

Shortage of mathematics and science teachers in school

Closely linked to the problem of low take-up are the decreasing rate of recruitment and their increasing rate of withdrawal from courses of student teachers specialising in science and mathematics. It was reported in the Times Educational Supplement (September 12, 1997) that the figures for recruitment into initial teacher training in mathematics and science were 21% and 18% below target in 1995 and 1996 respectively. In addition, for those who accepted the offer for secondary mathematics and science courses, the withdrawal rates were 17 per cent and 19 per cent respectively in those two years as recorded by the

Graduate Teacher Training Registry.

Taverner and Baumfield (Times Educational Supplement, September 12, 1997) studied the reasons underpinning the high rate of withdrawal. They found that the main reasons are financial and social factors such as low pay, lack of respect for teachers and poor discipline in school. However, there are also other factors such as perceived lack of support from the higher education institute, and lack of partnership between school and higher education institution. The image of mathematics as a male domain also seems to affect some of the participants. One female maths graduate comments that, "The school department was predominantly male and seemed to hold the opinion that female teachers shouldn't be teaching maths É [sic] these teachers were making my life unbearable" (p.3).

Besides the above factors, perhaps the availability of alternate careers for mathematics and science graduates, such as in computing, banking and financial services which is growing with great rewards, might be another contributing factor that deterred some people from taking up mathematics teaching as a profession.

The shortage problem of mathematics and science teachers was also reported in many countries such as the United States (Beal et al, 1985), Nigeria (Bajah, 1993), and the United Kingdoms. Various incentives and measures have been taken to attract more young people to mathematics and science teaching but in vain. Worse still, the shortage problem has been claimed to link to decline in passing rate of A-level mathematics. As claimed by the chairman of the Numeracy Task Force, Professor David Reynolds that, "many schools would support the view that the recruitment crisis in maths teaching has finally hit the exam results" (Times Educational Supplement, September 4, 1998).

I will argue that the shortage problem of mathematics and science teachers might also be linked to the unpopularity of mathematics in society. Why is there no such an acute problem of shortage in other subject areas? Why do teachers prefer to teach English or humanity subject but not science and mathematics? The negative images of mathematics as difficult and boring while the image of mathematicians as odd and anti-social may very well discourage people from mathematics and science related careers.

Possible indications of causes to poor public images of mathematics

Having discussed the related problems and issues, there are propositions and speculations about the causes leading to the claimed negative and unpopular images of mathematics. Sewell (1981) proposes that "teachers' attitudes, the formality of much mathematics teaching, the seeming lack of relevance of mathematics to everyday contexts, fear of the subject, literacy problems, gaps in schooling, and parental expectations" (p.72) are the few possible causes. Bell (1989) speculates that most people initially have the capacity to appreciate the beauty of mathematics as an art, but sadly this appreciation "often get suppressed by distasteful school experience" (p.70). Likewise, Ernest (1996) claims that experience of learning mathematics in school, especially the negative ones, are possibly the dominant sources leading to the public image of mathematics. In sum, these propositions seem to suggest that three of the possible factors that influence negative public image of mathematics are (i) parents, (ii) teachers and (iii) school experiences.

However, there are yet to have sufficient empirical data to support these propositions. Past literature indicate that parents have significant influence on their children's attitudes to mathematics (Cain-Caston, 1986), on their mathematics self-concepts (Parsons, Alder, and Kaczala, 1982; Dickens & Cornell, 1990), and consequently on their mathematics achievements. Yet rarely does study explore parents' image of mathematics and how they could possibly influence their children's image of mathematics.

Similarly, the important role of teachers in learning is unquestionable. There are increasing numbers of studies that suggest that teachers' image of mathematics could have influence on their teaching instructions (see Raymond, 1993 and review of Pajeres, 1992, Lerman, 1993), yet only limited study explore the possible influence of teachers' image of mathematics on students' image of mathematics (see example, Brown, 1992).

Indeed, information gathered with regard to these possible factors will definitely enhance a better understanding of the roles of parents and teachers in mathematics education. Subsequently, this information can be used to propose or design for potential involvement of these people in bettering the mathematics learning and teaching.

In addition to the three factors discussed above, I propose there is another possible factor, that is 'social and cultural factor'. Henderson (1981) argued that many people viewed and learned mathematics in a rigid and rote way that has hindered their creativity. This condition is further "systematically reinforced by our culture, which views mathematics as only accessible to a talented few. These views and attitudes, besides affecting individuals, have become part of what separates and holds down many oppressed groups, including women, working class and racial minorities" (p.12).

Many cross-cultural studies (Ryckman & Mizokawa, 1988; Huang & Waxman, 1997) have shown that cultural beliefs and values might have significant influence on students' image of mathematics. The most notable was the debate between beliefs about mathematical ability and effort-related attribution to one's mathematical achievement. It is conjectured that Eastern countries tended to value one's effort more than one's mathematical ability whereas Western countries attributed ability more than effort to a person's success in mathematics.

However, to my knowledge, there is virtually no empirical study, which has explored and compared the images of mathematics between countries, such as Malaysia and the UK. Thus, taking the advantage of my background, I propose to carry out a substudy on cross-cultural comparison on image of mathematics between Malaysians and British public adults. As the public level of literacy and numeracy of both countries are not comparable, a comparison will only be made between a sample of teachers and students from both countries.

1.3 Possible Impacts of public images of mathematics

Despite the above issues and problems that claimed to be negatively influenced by a poor public image of mathematics, mathematics is albeit, important in the modern world in a number of aspects. The following are some possible impacts that may occur due to the negative public images of mathematics.

(i) Utilitarian aspect/personal importance

Everyone needs mathematics as part of his or her basic tools and skills for effective functioning in everyday life. For example, simple arithmetic skills are needed for use at home, in the office or in the workshop. Negative attitudes to mathematics mean a disliking of mathematics and this in turn could lead to avoidance of using mathematics in daily life. Subsequently, this creates low self-esteem or less confidence in using mathematics in daily life. The less a person uses mathematics, the less confident and the more anxious he or she feels about using it. Thus a vicious circle where a negative image of mathematics leads to low self-confidence in mathematics and in turn avoidance of mathematics might perpetuate.

(ii) Economic aspect/ national importance

An adequate supply of mathematics graduates may be an important factor in the workforce and is needed for the scientific and economic development of the nation. A poor image of mathematics can lead to a low take-up and consequently a shortage in the supply of qualified mathematicians, mathematics teachers and mathematics graduates.

Another impact of the public image of mathematics is its crucial role in teenagers' future career decision, especially at the age 16-18. A negative image of mathematics among the teenagers or their parents may discourage them from choosing careers related to or requiring science or mathematics studies. In this technological era, all nations need to have more science and mathematics students. As advocated by Howson and Kahane (1990) "… a bad image of mathematics may result in an enormous national loss in the near future. Conversely a good or improved image may prove immensely beneficial to any nation in the world" (p.4)

(iii) Democratic aspect/ societal importance

In a democratic society, it is desirable that as many citizens as possible can participate in decision making. Mathematical reasoning is needed for critical citizenship, for understanding and for the making of sensible and informed decisions such as in voting and on environmental issues. Poor public image of mathematics could help contribute to keeping the majority of the society mathematically illiterate. This results in a society with some oppressed groups such as women, ethnic minorities and the working class, lacking the conceptual tools and skills to participate fully in our increasingly mathematised culture.

(iv) Cultural aspect/cultural importance

Mathematics forms a major part of our cultural achievement and cultural heritage. Everyone should be allowed and enabled to appreciate the beauty of mathematics and its applications. This should lead to greater involvement in mathematics (and possibly increased) public support of mathematical activity and mathematics education. Conversely, a negative public image of mathematics might deter the public's interest in mathematics and deficit their chances of appreciating the beauty and power of mathematics. As a result, it might also deter public support in mathematics education and research.

(v) Moral aspect/importance of values

The power of mathematics can be misused to give biased interpretations of data and representations of knowledge. For examples, information quoted in advertisements and in political campaigns can be misrepresented to the public for the benefit of the parties concerned. Thus, certain values such as rationality, accuracy and honesty should be inculcated via mathematics teaching so that the public is mathematically literate and is aware of the importance of mathematics in these areas of values.

In view of this significance, it is no surprise that these five aspects constitute the aims and goals of the mathematics curriculum in many of the countries in the world. I will argue that this is also one of the important reason to promote a positive image of mathematics among the public.

1.4. Public Images of mathematics and public understanding of mathematics
Unfortunately, our societies are still divided into 'two cultures'. The low take up of mathematical or science studies means majority of the society is still mathematically or scientifically illiterate and under-informed. In relation to this, increasing effort has been put into promoting a positive public image of science and the public understanding of science recently through various authorities (for example, Royal Society, 1985a, 1985b; The American Association for the Advancement of Science (AAAS), 1989). However, there is relatively lack of parallel effort given to promote a better public understanding of mathematics.

However, there are concerns shown by some parties about the need to change the public's attitudes to, images and beliefs of mathematics. One example is the National Research Council of United States of America's (1989) report on the future of mathematics education (Everybody Counts), which puts considerable emphasis on the need to change the public's beliefs and attitudes about mathematics. Most efforts (such as Advisory Council for Adult and Continuing Education (ACACE), 1982; Gal & Schuh, 1994; Grier, 1994) have focused on the development and promotion of adult numeracy only.

One encouraging sign was a valuable study and report published by the International Commission on Mathematics Instruction (ICMI), titled 'The popularization of mathematics' (Howson & Kahane, 1990). The four key features of the popularization of mathematics suggested are: sharing mathematics with a wider public; encouraging people to be more active mathematically, and bring mathematics into human culture and providing mathematics for all. In reviewing this report, Ernest (1996) suggested that there is another implicit feature, which need to be made explicit with the popularization of mathematics. This implicit message is 'to improve the popular image of mathematics and popular attitudes to it' (p. 786). This emphasises the importance of promoting a positive public attitude to mathematics and a popular public image of mathematics in our societies.

Another more recent effort was taken by a group of mathematicians from Swarthmore who started the Mathematics Forum on the Internet, entitled 'public understanding of mathematics' (Klotz, 1996). Their aims are to communicate with the public [especially young people] both the pleasure and stresses of being a mathematician as well as to improve the public understanding of mathematics.
Issues to be addressed

Yet, there are still a number of issues that need to be addressed here. Firstly, before further effort is given to promote the public understanding of mathematics, and to change the widespread mathematical myths and negative image of mathematics, we need to have a better understanding of the public image of mathematics. Unfortunately, reviews of related literature indicate that so far relatively little systematic research studies have been done on myths and image of mathematics. Most discussions of the topic are theoretically based studies rather than empirical studies. There is some limited research studies on the views of pupils (see example, Hoyles, 1982), student teachers (see example, Civil, 1990) and women (see example, Buerk, 1982). Although there is an increasing number of investigation into adult's beliefs and attitudes towards mathematics (for example, Burton, 1987; Crawford, Gordon, Nicholas & Prosser, 1993; FitzSimons, 1993;1994a; Galbraith & Chant, 1993; Wood & Smith, 1993; Benn,1994), these studies often take the form of case studies. Moreover, the subjects of the studies were generally consisted of participants of courses in further education in mathematics. They were mostly not people on the street, selected at random (except Sewell's study, 1981) Thus, this study seeks to find the range of images that are held by public adult members, both in and out of education sectors. It also aims to uncover some possible reasons underlying the myths and perceived image of mathematics.

Secondly, a great deal of energy and resources goes into the mandatory schooling of all in mathematics from the age of 5 to 16. Currently there is a national concern with numeracy levels attained in international comparisons. This study is concerned with what is probably one of the two main outcomes of this investment (the other being the adult numeracy) among the post school population: namely the images, perceptions, beliefs, attitudes and appreciation of the public.
Lastly, past studies on cross-culture have focused on the debate between ability and effort leading to success in mathematics. However, the question of image as a whole has not been explored and compared. Therefore there is a need to investigate and compare between countries on their images of mathematics.

1.5. Aims of the study
In considering the issues and problems discussed above, as well as the needs to promote a better understanding of the public image of mathematics, the objectives of this study are:

1. To explore and identify the range of images, beliefs and attitudes towards mathematics of a selected sample of public adults.
2. To explore adults' views about the possible causes and sources of their images of mathematics and their attitudes towards mathematics.

3. To investigate any correlation between the range of images of mathematics and social divisions in terms of gender, age and occupational groupings.
4. To investigate whether there are any cultural differences in the range of images of mathematics among the students and teachers of the UK and Malaysian sample.

1.6 Research questions for the study

More specifically, the five main research questions for this study are:

1. What is the range of images, attitudes towards and beliefs about mathematics held by a sample of public adults?
2. What are the possible reasons of liking and disliking mathematics of these adults?
3. What are the possible factors of influence that resulted in their existing images of, attitudes to and beliefs about mathematics?
4. Are there any differences between the range of images, attitudes and beliefs concerning mathematics among the different gender, age and occupational groupings?
5. Are there any cultural differences in the range of images of mathematics among the students and teachers of the UK and Malaysian sample?

1.7. Significance of the study

There are widespread claims about the negative public image of mathematics, but very little systematic enquiry into it. Therefore the result of this study will provide systematic and empirical data on public images and myths of mathematics.

Secondly, by examining the different images, attitudes, belief and myths of mathematics that public adults hold, there is a potential for such images, attitudes, beliefs to be challenged, promoted or discouraged. The information obtained will enhance better strategies and measures for promoting Public Understanding of Mathematics.
Thirdly, the result of this study might inform us what is the extent of the influences of parents and teachers in shaping students' images of mathematics. This information can be used to promote positive influence while attempting to avoid the negative influences of these sources. It will help to understand better the roles of parents and teachers in the shaping of children's images of mathematics.

Fourthly, the findings will reflect possible implication for mathematics education and mathematics teacher education. Knowing how ex-students perceive mathematics learning experiences in school and how this could have influenced their images of mathematics will help us to understand better how mathematics should be presented in the classroom. This knowledge may help to enhance better curriculum planning and teacher development programmes.

Lastly, the impact of cultural difference on image of mathematics revealed in the comparison might serve to support or challenge the notion that mathematics is universal, value-free or culture-free. The findings might help to illuminate our understanding on whether the difference in culture and value system could have led to the difference in images of mathematics, and consequently the difference in mathematics achievement.

Having described the current scenario of the public understanding of mathematics and the importance and significance of the public images of mathematics, I argued that there is an urgent need to carry out this study. Before I conceptualise the theoretical framework of the study (in Chapter 3), I shall first review critically some related studies in literature. This is where I shall turn to now.

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