II. THE RATIONALE FOR THIS STUDY

and the Greek/Latin/Christian tradition on the other. We acknowledge that neither of these 'poles' is well defined, as with any label given to any culture. But we use the two terms to point to the scope that we want to confine ourselves to in this study.

In identifying these two 'poles', we are not claiming that the two cover all major cultural traditions in the world. Nor are we implying that these two are the most important human traditions. For example, it has been pointed out that there is a distinctive East European tradition in mathematics education which is definitely worth studying. Equally worth studying are traditions in South Asia (in particular that of India) and Africa. However, it would not be possible for a single ICMI study to cover all important traditions worldwide. What we hope to achieve, by choosing these two poles for study, is a balance between using pertinent examples to study the relationship between cultural traditions and mathematics education on the one hand, and choosing two major traditions that have attracted attention in the field of mathematics education on the other. More justifications on the choice of the two traditions will be discussed in section II.

I.4 What do we mean by a comparative study?

To compare means to identify similarities and differences, and to interpret and explain the similarities and differences identified. It may not be as easy as it is conceived. Given two things or concepts, there may exist infinitely many aspects of similarities and differences, and hence in a comparative study, we are always confining the comparison to a particular theme or some particular themes. For our study therefore, we are comparing practices in mathematics education (as defined in I.1 above) along the theme of *cultural traditions* (as described in I.2 above). Reminding ourselves of this obvious point is important. In studying mathematics education in different countries, we will definitely come across important aspects of mathematics education that are of interest to us. But in deciding which of those aspects should be included in our study, we have to ask ourselves whether or not those aspects are related to this theme of cultural traditions. Some aspects of mathematics education which we deem to be related to different cultural traditions will be discussed in Section IV.

After we have identified similarities and differences within a certain theme, the next question is what to do with them. A simple juxtaposition of similarities and differences does not in itself explain. There is a need for analysis based on certain theoretical frameworks, or in the absence of a suitable theoretical framework, a need for the establishment of one, based on the differences and similarities observed. More about how this comparative study is operationalised will be discussed in Section III.

II. THE RATIONALE FOR THIS STUDY

II.1 Why is this comparative study important?

Pressures and needs from outside mathematics education. Rapidly developing information and communication technologies have an enormous influence on mathematics, science, production, society, politics, education and even lifestyle. Increasing globalisation is encouraging the assumption of universalism in mathematics education. The increase in journals and books about mathematics teaching, the multitude of conferences in every part of the world, the availability of materials via the World Wide

Web, and the activities of multinational computer companies all increase the pressure for adopting similar practices in mathematics teaching around the world.

At the same time, however, the globalisation processes are producing reactions from mathematics educators in many countries who are concerned that regional and local differences in educational approach are being eradicated. This is not just a mathematical ecology argument, about being concerned that the rich global environment of mathematical practices is becoming quickly impoverished. It is also an argument about education, which recognises the crucial significance of any society's cultural and religious values, socio-historical background and goals for the future, in determining the character of that society's mathematics education.

Policy makers also recognise the importance of adjusting to the changing world and mathematics education reform movements can be found in many countries at this moment. A number of international studies have also taken place in the last decade to provide policy makers with information on the relative standing and effectiveness of their education systems.

Pressures and needs from within mathematics education. Mathematics educators from all around the world are continuing to make efforts to improve the quality of mathematics education. One way to achieve this is through learning from different countries. For instance, many schools in the US are importing the mathematics textbooks of Singapore, while Asian countries are mimicking the approach taken by US textbooks that have been developed as a result of many specific educational projects. While these exchanges do not yet show clear evidence about which approach is the most appropriate for each country, they stress the need for more awareness of the cultural traditions in which the respective mathematics teaching is embedded. More in-depth studies on the relative merits of the different approaches within different education systems are needed.

II.2 Why is this study focused on a comparison between East Asia and the West?

A complete comparison of the background, perspectives and practice of mathematics education around the world is far beyond the scope of an ICMI study. Realistically we need to limit the range of a comparative study while still ensuring that clearly different traditions are being examined. Recently, comparative studies such as SIMS and TIMSS have produced data indicating that there may be some systematic reasons for differences in achievement and practice between some regions. East Asian countries such as Japan, Korea, Taiwan, China, Singapore and Hong Kong consistently outperform western countries in North America, Europe and Australia in these international tests. These results have brought about a growing interest for policy makers and educators to find out the factors behind Asian students' high performance in mathematics.

Surprisingly, a superficial look at mathematics teaching in Asian countries indicated that teaching methods in these countries are not perceived as advanced as in Western countries. For instance, mathematics education in the East Asian countries mentioned above is typically characterised by the following: they are very often content oriented and examination driven. Large class sizes are the norm and classroom teaching is usually conducted in a whole class setting. Memorization of mathematical facts is stressed and students feel that their mathematics learning is mainly learning by rote. Teachers feel guilty for not teaching enough problem-solving during their classes.

Students and teachers are subjected to excessive pressure from highly competitive examinations, and the students do not seem to enjoy their mathematics learning.

This parity between the high mathematics performance in Asian countries and a lack of modern teaching methods is puzzling. It prompts for a call for in-depth studies about mathematics learning that goes beyond classroom teaching. Cultural traditions, for example, could be highly pertinent to students' learning. In particular, there are marked differences in cultural traditions between the East and the West. These cultural differences provide us a unique opportunity to gain a deeper understanding about students' learning and achievement.

This study presupposes that the impact of cultural tradition is highly relevant to mathematics learning. Cultural traditions encompass a broad range of topics. It includes the perceived values of the individual and the society, as well as social structures such as the relationship between parents and children, or the relationship between teachers and students. There are clear differences in all these areas between Asian and Western traditions. For instance, some scholars have identified features of East Asian mathematics education, together with their underlying values, by contrasting them to the West.

Apart from scientific interests in comparing mathematics achievements in the East and the West, there is also a strong political impetus behind such studies. After World War II, Western countries have dominated world economic development for a long time, but in the last ten years, we saw the emergence of East Asia as strong competing economic powers. The United States government, for example, has given very strong support in international comparative studies of mathematics and science, with particular emphasis in the comparison between the U.S. and Japan. The Australian government, on the other hand, recognising the importance of its geography proximity to Asian countries, has funded special studies aiming to get a better understanding of mathematics learning in Asian countries.

The culmination of all of the above issues has made a study between Asian and Western traditions in mathematics education not only interesting but also important. There is also some urgency for such a study to take place now, because with the current advances of technology and communication, the differences between cultural traditions are diminishing. Before long, we will not have such contrasting traditions to provide us with rich information to carry out such as a study.

II.3 What can be achieved from this study ?

The focus of this study is on differences in educational traditions which have cultural and social implications for the environment and practice of mathematics education. This focus does not mean a narrow interest on how to improve scores in international tests. The study is about gaining a deeper understanding of all aspects of mathematics learning and teaching, and about what each tradition can learn from the other.

To develop this point further, the study should not be a 'horse-race-type' of study resulting in a linear ranking list. Instead, in this study we want to start with a mutual understanding of the mathematics education systems and processes in different traditions that lead to more or less satisfactory success in the learning and application of mathematics. Given this degree of 'success', according to some agreed criteria, then we need to identify the conditions that contribute to this success (e.g. learning techniques, external influences, natural abilities of the children, language etc.). Only then can any kind of transfer of methods take place, if desired, from one tradition into

another. It is not a simple import-export business. As an old Japanese proverb puts it: *We cannot easily plant a good seed of another field into our own field.*

In summary, we are hopeful that this study can achieve the following:

1) By contrasting the different traditions, we gain a deeper understanding of various aspects of mathematics learning and teaching. For example, we may gain an insight into the cognitive processes of 'doing mathematics', such as learning about place values, or grasping the concepts of abstract representations in algebra.
2) By contrasting different traditions, we develop a process of self-reflection on our traditional ways that we often take for granted. There is the opportunity to take a fresh look at our usual practices and beliefs, and, in the process, we gain a better understanding about our own traditions.
3) By contrasting the different traditions, we share between us the latest educational development and research. We learn from each other's successes and failures, and develop a common goal for improvement for the coming years.

III. HOW WILL THE STUDY BE OPERATIONALISED?

This study is rather different from the earlier ICMI studies in that it is specifically concerned with comparing practices in different settings and with trying to interpret these different practices in terms of cultural traditions. It is also the intention of the IPC to ensure that the study will result in various products and outcomes including, of course, a book for the ICMI series, but equally important is the process by which the study will proceed. This means that there is a need to create certain kinds of activities for engaging the participants in operationalising the study, and through these activities to develop specific kinds of contributions to the study. The IPC has identified the following as being some of the most important activities and contributions for this study.

III.1 IDENTIFICATION AND ANALYSIS OF PREVIOUS STUDIES

As has been pointed out in the previous section, there is clearly a need to build on the several previous studies which have been carried out on East/West differences, and we wish to encourage contributors to the conference to be aware of the available background literature. In particular we note that there have been various achievement-based studies such as SIMS and TIMSS, and other studies such as PISA etc.

Contributions and proposals will therefore be useful which give some synopses and critical analyses of these studies. In particular, as well as focusing on the various ideas and results that have come from these studies, we will have an interest in the methodologies used in them. Most of the analyses performed on the data of these international comparison projects have been quantitative in nature, and we are more interested in a qualitative aspect which seems to have been ignored so far. The development of productive cooperative researching is one of the outcomes we seek and awareness of previous cooperations will be very helpful in this development.