

How Does Internationalisation Affect Learning and Teaching of Computer Science: A Study at Tongji University in China

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Abstract

In the era of globalisation, higher education institutions cannot be excluded from internationalization. It has become a main theme of universities all over the world, including China. This discussion paper describes a proposed research project exploring how internationalisation in a Chinese university affects students' learning of computer science and the quality of teaching. It opens for discussion the question of what a Chinese university can learn about computer science education from international collaborations. Three questions are proposed for discussion on the focus of the research project and its methodology.

Keywords: internationalisation, computer science education, computing education, teaching quality, learning environment.

1 Introduction

With the current development of ICT and globalisation, every part of the world is closely linked to every other. No country can remain isolated from the rest of the world. In order to prepare our university graduates to perform and work effectively and efficiently in this globalised arena, it is important to help them to learn to interact and work collaboratively with counterparts who have different cultures and backgrounds. In this way, we hope that their horizons will be broadened and their capabilities for dealing with issues involving inter- or multi-cultural perspectives will be enhanced.

Two questions concerning internationalisation of the Chinese academic environment have recently inspired the first author of this paper, Doris Yang, to submit a research proposal to University of Hong Kong, Hong Kong. The questions are:

- How does internationalisation in a Chinese university affect how the students learn computer science?
- What can a Chinese university learn about computer science education from international collaborations?

In this paper we will elaborate on some aspects of this forthcoming project, with the aim of discussing the values of internationalisation in computer science education, as well as possible ways to gain insights about these values. The paper starts with a discussion of the significance of the upcoming project (section 2), continues with a literature review (section 3), then presents the project with its theoretical underpinning (section 4), and finally proposes questions for discussion (section 5).

2 Significance

No matter what conclusion we might draw from the study, the outcomes from this project will be valuable to other universities in similar situations. We believe that the results will enlighten us about student exchanges in computer science, about Chinese students in computer science (whether they are in China or elsewhere) and about internationalisation of Chinese universities. It will also offer insights about what we can gain, and what problems arise, when we teach computer science in an internationalised environment.

In order to cope with the internationalised curriculum and mixed Chinese/Western classrooms, students have to change their way of learning. They need to learn to work with people with different cultural backgrounds and learn from one another in new ways. Both incoming and outgoing students experience different learning

environments¹ and bring changes to the existing systems at the same time. The teachers might need to refine their teaching strategies, but must still meet the demands of the local students.

Further, we assume that an investigation of the learning and teaching of computer science from the perspective of Chinese students and teachers in an international education context will enhance our understanding of the nature of learning, both of Chinese and non-Chinese students. It will thus provide insights that can be used to improve the development of learning and teaching.

3 Related Research

As this project spans a broad area, we have structured the section concerning related research according to three major themes: internationalisation at an institutional level, Chinese students, Computer Science Education.

3.1 Internationalisation at an institutional level

In general, the education and learning traditions of China are heavily influenced by its Confucian heritage (Bush & Qiang, 2000). Confucius's definition of the purpose of education as changing people for the better remains at the heart. Although modern schooling has been accompanied by attitudinal changes, "the Chinese people have not lightly discarded the patterns of thinking and action from their rich historical past whose values have permeated the new Marxist precepts" (Cleverley, 1991, p.xii).

To some extent, Chinese academics are still relatively isolated from current developments in Western countries. Postiglione and Mingle (1999) report that although 95% of 276 academics from three universities in Shanghai agree that international connections are important, only 11% of them have studied or travelled overseas in the past three years. There is also general concern about the quality of Chinese higher education due to insufficient funding and poor infrastructure (Postiglione & Mingle, 1999).

In the context of internationalisation, institutions of higher education in China are looking to benefit from "new skills and different approaches brought by international scholars, better international research networks, or enhanced communication skills" (Welch, 1997, p.336). One of the means to reach these aims is through joint programs with foreign universities, which have increased rapidly since the 1990s. These programs have played an important role in facilitating human resource development and capacity, making use of foreign educational resources in the globalised world (The National Centre for Educational Development Research, 2002).

In recent years, the number of incoming international students in Chinese higher education institutions has grown dramatically, but compared to many Western universities, the degree of internationalisation is still low.

International students have moved from courses specifically designated for them to places where they can take the same courses as Chinese students. There is also an increase in the number of non-degree programs delivered in English for short-term international students and a growth in the number of degree-conferring programs in English at both undergraduate and postgraduate levels (Huang, 2006). Internationalisation is also taking place in the part of the curriculum that is intended mainly for domestic students. By the end of 2006, more than 100 higher education institutions and about 165 joint programs in China have been approved by the authorities².

This summary shows that much research has been done on internationalisation from an organisational perspective. Still, the teachers' and students' own experiences of internationalisation in their educational context have until now been under-investigated (Wihlborg, 2005).

3.2 Chinese students

Previous research on Chinese learners, published in English, can broadly be characterised into two categories: The first category investigates how Chinese learners living in Asia learn. These studies often reveal and focus on factors such as individual/collective orientations, socialisation, or forms of motivation, with the aim of offering a nuanced picture of the Chinese learner (see for example Watkins & Biggs (1996, 2001) and references in these books). They frequently draw comparisons with the Western situation, rather than studying Chinese learners in their own right. The second category contains projects that explore the situation of Asian learners who live and study in Western countries. These projects generally see these learners as a minority with its own particular problems and strengths (see for example Volet (1999)). Again, the Western values come to serve as a frame of reference.

3.3 Computer Science Education

Much effort has been put into exploring how students learn computer science. Although international aspects have been discussed frequently within the computer science education community, they are only rarely studied in empirically based projects. The Runestone initiative (Last, Almstrum, Daniels, Erickson & Klein, 2000), in which students in two different countries jointly develop an advanced software system, is one of few exceptions. The students' learning of computer science, their collaboration and their experience of the situation have been investigated by Hause & Woodroffe (2001) and by the second author of this paper, Anders Berglund (2005). Of particular interest in the context of the proposed project is that Berglund has used phenomenography (Marton & Booth, 1997) as his principal research framework. This approach has been used fairly frequently in computer science education research; see Berglund (2006) for an overview.

¹ We use the term *learning environment* in a broad sense in this paper. It encompasses many components, such as teaching, literature, atmosphere, and, of course, the physical environment.

² <http://www.jsj.edu.cn/mingdan/002.html>, accessed on August 17, 2007

Our literature overview has not revealed any studies related to student exchanges in computer science that discuss the learning of computer science or the students' experiences of their learning. Further, we have not found any studies exploring the learning of computer science from the point of view of Chinese learners.

4 The Upcoming Project

4.1 The Setting

The School of Software Engineering (SSE) in Tongji University, Shanghai, China, is a newly established school, founded in 2002. Due to its specialty in the IT industry, internationalisation is an important aim for the school. The school has currently several types of international program: student exchange programs, staff exchange programs, international internship programs and joint-degree programs. In order to recruit international students, the school offers many courses in English and uses English textbooks in most courses. This greatly improves students' ability to use English and facilitates communication in the international context.

More and more international students study in the school and join courses that were originally intended only for Chinese students. These international students come from different countries and are in different socio-economic situations. They bring not only different ways of studying and thinking about computer science, but also different cultures and values. Chinese students and staff have to learn how to cope with these students and might need to change their own way of acting. This is the inspiration of the proposed research project, which will explore the ways and the degree to which internationalisation influences the students' learning and the teachers' work in SSE.

4.2 Research Questions

With this as a background, the following research questions have been proposed for the project:

- 1) How does internationalisation affect learning in computer science in SSE?
 - a) How does internationalisation affect the learning environment in SSE?
 - b) How do Chinese students and foreign students affect each other's ways of study?
- 2) How does internationalisation influence teaching in SSE?
 - a) How does internationalisation influence teaching strategies?
 - b) How does the internationalisation of the curriculum affect the quality of teaching?

4.3 Methodology

Based on Crotty's (1998) work, the methodological framework for this study is:

- Epistemology – Constructionism
- Theoretical Perspective – Interpretivism

- Methodology – Phenomenography
- Methods – Interview

The outcome of the project will be descriptive, and will be based mainly in qualitative research approaches, particularly phenomenography (Marton & Booth, 1997).

4.4 Phenomenography

Phenomenographic studies strive to discover and describe the different ways in which people understand or experience certain phenomena (Marton & Booth, 1997). The common method to collect data for phenomenographic studies is through open, deep interviews (Booth, 1997). *Open* indicates that there is no definite structure to the interview, while *deep* indicates that the interview will follow a certain line of questioning until it is exhausted, until the participant has nothing else to say or until the researcher and participant have reached some kind of common understanding about the topics of discussion.

4.5 Data Collection

In a phenomenographic research project, the interviewees are typically asked to respond to open-ended questions about the particular phenomenon being studied. Their responses are analysed into conceptual categories on the basis of qualitative similarities and differences.

The students will be chosen for interviews based on a sampling design, such as incoming exchange students, outgoing exchange students/interns and regular students who do not attend any international program. The questions will be designed so that the interviews can reveal differences in the students' experiences of learning and of the different cultures in their learning environment.

All teachers at SSE will be invited to take part in the study. Therefore the individual interview, aiming to collect teachers' experiences of their teaching, will be complemented with Russell's synergetic focus group discussions (Russell, 1994). Focus groups are distinguished from group interviews because they explicitly include participant interaction and they seek to be more than mere conversations. Therefore, analysts can find more influencing factors (Wilson, 1997).

Students and staff from academic partners, such as the Department of Information Technology, Uppsala University, Sweden, and some personnel from partner companies will be included in the study.

4.6 Analysis

Each interview will be recorded, transcribed verbatim and analyzed following the principles of phenomenographic analysis. The data analysis process will involve reading of transcripts and progressive refining of emerging categories of description. The data will be pooled and an iterative approach will be adopted to ascertain relations, similarities and differences in the responses. The fundamental concern is to understand the meanings of learning and teaching inherent in the responses.

5 Discussion Topics

This paper started by asking two questions. These questions can be slightly reformulated to serve as discussion topics:

- In which ways does internationalisation affect how our students learn computer science? This is, as we have discussed in this paper, one of the main research questions in this project, and the outcome of the project is expected to inform us on this. Still, as the project is to a large degree explorative, in that it aims to address a domain that has previously been little researched, speculations about the expected outcome can support the work, for example through a more focused data collection.
- What can the university learn about teaching of computer science from international collaborations?

We also wish to discuss a third question:

- The project is theoretically rooted in phenomenography. Would this approach be sufficient for tackling these complex research questions, or are complementary perspectives needed?

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