THE CHINESE LEARNER, THE JAPANESE LEARNER, THE ASIAN LEARNER - INSPIRATION FOR THE (MATHEMATICS) LEARNER

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Prologue: My acquaintance with Professor Iséki

Prof. Iséki signifies the change of my professional path from mathematics to mathematics education. I knew him just when I have finished my M. Phil. in mathematics and I sent him a manuscript which contained an extension of my thesis on topology. Prof. Iséki helped me to have it published in *Mathematicae Japonicae* [64]. In fact I have already begun to teach mathematics in a secondary school and my attention has shifted to mathematics education. At that time, I had special interest in mathematics education in Japan, in particular the *Water Supply* Method put forth by Professors Hiraku Toyama 遠山啓[1] and Kou Ginbayasi 銀林浩. I was very happy to see their book in a book shop during my visit to Japan [54]. I bought it. Afterwards, it was Prof. Iséki again who helped me to know mathematics educators in Japan,in particular, Prof. S. Tanaka. Prof. Tanaka and I published an article on the Primary Japanese Mathematics in the First Decade of the 21st Century in *EduMath* [53]. The passing away of Prof. Iséki is indeed a sad news for the mathematics community and for myself. Here I would like to pay him tribute with this article, which reports not only some shared topics between Hong Kong (and China in general) and Japan, but one of my focus of research interests in all these years.

The Asian learner — how it started

The academic success of the Asians, those studying aboard in particular, has bought to the attention of sociologists and educationalists worldwide. The cover story, "The New Whiz Kids"[11] which appeared in *Time Magazine* is the first piece that came to my awareness. In the article, it was stated that a considerable percentage of students in U.S. best universities were of Asian descent. This may disturb those who believed that the Western educational system was superior to the Oriental system with its reliance on drilling and rote-learning [42]. At that time, the Japanese learner was not particularly mentioned and those from the Chinese mainland were tangentially touched upon. In fact there were not too many students from the Chinese mainland who got a chance to study elsewhere.

A bit earlier, results from the 2nd IEA Mathematics Study (SIMS) conducted in the 1980s [12, 43] also caught a lot of attention. In the study, Hong Kong achieved the highest and Japan was second. At that time, China, such a big country, did not take part since it only implemented its open door policy in the late 1970s. It did not participate in too many international affairs. Before the recent Programme for International Student Assessment (PISA), the 1992 International Assessment of Education Progress (IAEP) mathematics study could be the first similar international studies that China took part, in which it came first and Taiwan and Korea were drew second [30]. These results were further reinforced by China's brilliant records in the International Mathematical Olympiads. The fact that the

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[1]We follow the Western convention of putting the family names at the back though it is customary for both Chinese and Japanese to put them in front.

four little dragons [2] occupied the top four positions in the Third International Mathematics and Science Study (TIMSS) [3] (together with the results in subsequent two rounds of PISA) attracted an abundance of discussions, research, speculations and academic discourse.

At the start, both the Chinese and Japanese were foci of attention. For instance, the above studies initiated the series of investigations by the Stevenson, Hiebert and Stigler's group, in particular the American, Chinese and Japanese study [49], which involving the elementary and high school studies where located in Americans (European, African, Hispanic and Asian), Chinese (Beijing and Taipei) and Japanese (Sendai) [17]. In these studies, Confucianism was also mentioned in which the East-West cultural distinction was attributed to effort vs ability. Their seminal books *The Learning Gap* [51] (which focused basically on IAEP and SIMS) and *The Teaching Gap* [52] (which basically focus on the 1995 TIMSS-video study) were two of the most frequently cited publications in the area. In relation to this, Germany, Japan and the United States were chosen in both the 1995 TIMSS-video study [28] and the TIMSS case study [48, 50].

In another vein, a group of expatriates (many of them came from Australia) began to join the teacher education profession in Hong Kong. First, we have John Biggs who took up chair professorship at the Faculty of Education in the University of Hong Kong in 1987, others include David Watkins, David Kember and Lyn Gow. With the encounter with Chinese students in Hong Kong, together with previous experience with other Asians (Filipinos and Asian immigrants in Australia for instance) for some of them, they feel the same 'myth'[63] or 'paradox'[39]. At the beginning they used the term 'Asian learner'[29], and later on the term 'Confucian heritage culture'(CHC) was coined [5]. In fact, in the aforementioned *Time* cover story, it deliberately drew a distinction between the Confucian and the Buddhist traditions among various Asian cultures, and argued that "immigrants from Asian countries with the strongest Confucian influence- Japan, Korea, China and Vietnam- perform best. By comparison,... Laotians and Cambodians, who do somewhat less well, have a gentler, Buddhist approach to life" ([11], p. 45).

This group of scholars was not mathematics educationalists, though mathematics is always one of the major foci of educational studies. Their work was echoed by other psychologists like Michael Bond who joined the Chinese University of Hong Kong earlier in the mid-1970s. His investigation on Chinese value made substantial contributions to the field and he came up with a series of books like *Beyond the Chinese face* [7], *Psychology of the Chinese people* [8] and *The handbook of Chinese psychology* [9]. Another influential book on the Chinese students was *Growing up the Chinese way* [31], though teaching and learning was not the focus of these several books, they provide psychological and sociological backgrounds to the discussions on the Chinese learners.

Later came Ference Marton who tried to 'solve' the paradox with his theory of variations [10, 37, 39]. He made frequent visits to Hong Kong and established the learner study project (see below). Others who tried to crack the paradox include Morrison [41] and Huang and Leung [27]. We will come back to the opinion of Huang and Leung in the next section.

The Chinese mathematics learner

The above group of Australian scholars, Biggs and Watkins in particular, together with the colleagues and graduate students published their most frequently cited books *The Chinese learner* [59] and *Teaching the Chinese learner* [60]. Some of the more recent related publications are *Revisiting the Chinese learner* [16], *International education and the Chinese*

[2] Japan, South Korea, Singapore and Hong Kong.

[3] Later renamed 'Trends in International Mathematics and Science Study'

learner [44] and *Learning and development of Asian students* [79].

This aroused the attention of mathematics educationalists (Prof. D. Zhang in particular), who saw the need of publishing a book which focused particularly on mathematics. Under the inspiration of Zhang, *How Chinese learn mathematics* was published in 2004 [20]. The subtitle 'perspective from insiders' reflects the feature that it is a book in which we have the Chinese discussing on Chinese (mathematics) education. The same group of editors is now preparing the second book on how Chinese teach mathematics.

In between, there were also influential books published on the Chinese mathematics learner/ teacher. Some of them are *A cognitive analysis of U.S. and Chinese students' mathematical performance on tasks involving computation, simple problem solving, and complex problem solving* [13], *Empirical investigations about Chinese and U.S. students' learning of mathematics* [14], Knowing and teaching elementary mathematics [36], *The middle path in math instruction*[1], *Trends and challenges in mathematics education* [57] and *Mathematics education in China*: *Tradition and reality* [56].

With all these, it seems that we came up with an overall picture of how Chinese learn and teach mathematics, on top of discussions on how Chinese value influence mathematics education [74]. First, Biggs distinguished between repetitive learning and learning by rote [4]. Marton, with the lens of phenomenography, argues that repetition is indispensable as we need variation in order to have discernment, which is a prerequisite for concept formation. So repetition with variation systematically introduced would broaden students'*lived space* which will result in a richer *outcome space* [73]. This is quite in line with the notion of *bianshi* teaching which is widely practiced in the Chinese mainland [22] as well as experimented in Hong Kong [71]. This is precisely the theme of the above mentioned article by Huang and Leung on cracking the paradox of the Chinese learner [27]. The author of this paper further linked up with the notion of going from 'entering the *way*' to 'transcending the way 'in traditional Chinese way of instruction [67, 68]. This would offer a clue on how and why repetitive learning can lead to higher order thinking and acquisition of deep procedures [15].

The Japanese mathematics learner

Such developments may give an impression that the Asian learner can be equated with the Chinese learner. Apparently it is not true, even if one confines 'Asia' to 'Far East Asia' or even to the so-called Confucian Heritage Cultural regions. Hatano and Inagaki showed skepticism on whether we can group the Chinese and Japanese mathematics classrooms as 'Asian'([23], p. 94). Hirabayashi also commented that "It was historical necessity that many domains of Japanese culture have been influenced by the 'CHC (Confucian Heritage Culture)' which was described in Professor Wong's [4] thesis in the Proceedings of ICMI EARCOME 1 [The first East Asian ICMI- East Asia Regional Conference on Mathematical Education] in Korea in 1998. However, this is not to say that there are not many other unique traditional features which are proper to our cultural field, even in today's mathematics education "([26], p. 55). In the paper, Hirabayashi elaborated the notion of *Gei* (art) in Japanese education, which comprises both *Jutsu* (technique) and *Do* (way). Interestingly, though Hirabayashi emphasised the distinctiveness of Japanese education, these terminologies of *Gei*, *Jutsu* and *Do* are common languages shared by the Chinese [66]!

Nevertheless, we don't only have papers delineating the Chinese mathematics classroom, features of the Japanese mathematics classroom were portrayed in various papers. Some of them are [46], [55] and [47].

[4]the author of this paper

In fact the Japanese mathematics learner has attracted much attention and is still a focus of investigation. As mentioned above, Japan was a centre of discussion starting from SIMS and IAEP. The U.S. government particularly chose Japan (together with Germany) in the TIMSS 1995 video study (in which the *Teaching Gap* [52] was based). These two countries were chosen because both are viewed as important competitors of the U.S.; Japan is of special interest because it has repeatedly scored near the top in international comparisons of mathematics achievement ([28], p.89).

The mathematics education community always shows interest on the Japanese way of teaching mathematics. The open ended approach is one. After the publication of the book by Becker and Shimada [3], which was published by the U.S. National Council of Teachers of Mathematics (NCTM), mathematics educators tried to learn from the Japanese on the topic [2]. In the Chinese mainland, a project was led by Z. Dai and a series of books on open problems[5] were published [19]. Some of them were reprinted in Hong Kong. On top of other publications (see, e.g. [77, 78]), Zhang and Dai delivered a regular lecture in 10th International Congress of Mathematics Education, reporting the progress of open mathematics problem solving in China and suggested that it can serve as a bridge between the *basics* and higher order thinking [77]. An international conference was held in 2003 in Shanghai on the topic in which Yoshihiko Hashimoto was invited to report on the latest development of mathematics open approach in Japan, whereas Prof. I. Mok reported the teaching using open problems in Hong Kong. This is one incident of how Japanese mathematics teaching influences both the Chinese mainland and Hong Kong.

Another Japanese practice that imposed great influence was the Lesson Study [21, 75], for which the book *The Learning Gap* already showed high regards [51]. Again, the NCTM published a book on this, with a video attached [18]. In Hong Kong, as mentioned earlier, Ference Marton, M. L. Lo and their colleagues incorporated the notion of *Lesson Study* with the theory of variations [37], together with experiences from the *Teaching Study* in the Chinese mainland and came up with the new notion of *Learning Study* [34, 35, 38]. The Centre for the Development of School Partnership and Field Experience was established in the Hong Kong Institute of Education since 2001 (renamed Centre for Learning Study in 2010) which arrived at fruitful results. The *Lesson Study* once again became a focus of attention and a session was deliberately devoted to this in the last (the 5th) EARCOME.

In fact we have always been learning from one another in history, even in the early years (1960s) when we had the Modern Mathematics movement. Besides learning from the U.K. and the U.S., Hong Kong at that time learned quite a bit from Japan. In particular, Prof. Y.C. Wong, the Head of the Department of Mathematics at the University of Hong Kong, visited Japan to meet Prof. Kentaro Yano 矢野健太郎, hearing his experience on how *Modern Mathematics* was initiated in Japan (Prof. Y.C. Wong also invited Prof. Yano to visit Hong Kong later).

So, like the Chinese region (the same for other countries as well), Japanese mathematics education had a lot of impacts on the world.

The Asian mathematics learner and the mathematics learner: looking for (good) practices

All these led to the discussion that whether there exists an 'East Asian school of mathematics education' ([76], pp. 241-245; see also [33]).

In the above, we have painted, in broad strokes, the 'Chinese' way of mathematics teaching.

[5]According to Becker, an open problem is one which is open either at the given, solution or the process. So 'open problem 'is a more appropriate term than 'open ended problems '.

Some could also depict the Japanese way of mathematics teaching. One may begin to explore the Singaporean learner, or even notions like the Korean learner, the Indian learner$\cdots$. Inevitably there **are** differences in mathematic learning both in cultural background and in actual educational practices. Indeed, mathematics lessons in each region [6] have its 'signature' [25]. However, there are commonalities too.

In fact when Biggs and his colleagues began their endeavors, they did not focus on a particular nation at the start but the Asian learner in general. In particular, Watkins, as a cross-cultural psychologist, conducted his Ph.D. study in the Philippines [24, 62] and then proceeded to Asian regions like Malaysia [61], Nepal [63], and even to other parts of the world [72, 58]. As an academic pursuit, we can make fine distinctions in learning and teaching (mathematics) among different regions, focus of attentions have shifted to learn a lesson from other cultures (for one' own use), or in search of 'good' practices. As said above, that was the reason why the U.S. government choice Germany and Japan in the 1995 TIMSS - video study for comparison.

However, it is common knowledge that 'good' (educational) practices that are effective in one place may not be found effective in another (see Hatano's commentary in [23] and also [6]), we turn to look for practices without pre-determining whether it is good or not good [66]. In fact, no educational practices are value/culture free [45]. Here we would like to quote a paragraph in [69] to elaborate my point (p. 380):

Besides keeping in mind that there could be diversities within regions, what is the purpose of making comparisons? What benefits can be obtained? Biggs and Watkins (2001)[7] alerted us that teaching and learning traditions that may work well in a certain culture may not necessarily work in another. "Adopting Chinese teaching tactics will not solve this one [problems in the West]. Rather, Western educators need to develop their own script, using things that work in Western culture and that will engage students socialized the Western way in productive learning" (Biggs and Watkins, 2001, p. 291). The author of this paper with his colleagues moved on to remark that each educational region, East or West, should ride on its own strength and search for its own path of learning and teaching. As the Chinese maxim "Those stones from other hills can be used to polish the jade "[8] suggests that practices in other countries can serve as a food for the improvement of one's own practice, there is no need to label such practices as 'good' ones (since whether it is good or not depends on how one uses it, and also on cultural backgrounds). Instead of searching for 'good practices', educators may turn to just searching for 'practices' in difference educational regions. By reflecting on the practices of these regions, one reflects on one's own culture, understands oneself more, and forms a basis of moving forward in one's own way. By doing so, it is possible not just getting the stone from the other hill, but use these stones to polish our own jade. This could be the most realistic way to get the bests from these articles.

In fact the inauguration of EARCOME provides a platform for such exchanges. In its first conference, I was fortunate to be invited to deliver a keynote lecture, together with Prof. D. Zhang and F.K.S. Leung on the characteristics of mathematics education in East Asia [32, 65, 78], thereafter, Chinese and Japanese scholars, together with scholars in East Asia and around the world, discussed among themselves on mathematics education in all these EARCOME conferences. And in the last EARCOME (the 5th, which was held in Tokyo, Japan), a panel discussion titled "Excellence in mathematics classroom practice: Toward an East Asian perspective" was held. There are bound to be similarities and differences

[6] Some places like Hong Kong is not a country, so we use 'region 'all through.

[7] [60]

[8] Taken from "Call of the Cranes, Minor Odes of Kingdom "in the Book of Ancient Poetry.

between Japan and the Chinese regions, but there are a lot for us to share. I don't have the slightest doubt that with the concerted efforts among us, we can come up with more useful and well-grounded ideas so that students are able to learn mathematics better.

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