Chapter 13
Values in Mathematics Learning: Perspectives of Chinese Mainland Primary and Secondary Students

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Abstract Using the What I Find Important (in mathematics learning) (WIFI) framework (Seah et al. 2017), this study investigated the aspects of mathematics learning that were ascribed particular value by the Chinese Mainland primary and secondary students. Compared with the secondary students, the primary students tended to attribute greater value to ability, effort, diligence, use of formulas and memory. The secondary students were more likely to value knowledge and thinking as components of mathematics learning. Students in general valued a teacher-led yet student-centered learning approach. In addition, gender differences were observed. Specifically, the boys tended to attribute greater value to ability, rational understanding and creativity than girls, whereas the girls tended to value mathematical exploration more highly.

Keywords Values in mathematics learning · WIFI study · The Chinese Mainland students

13.1 Introduction

Undoubtedly, providing quality education and effective teaching for citizens is important for all countries in the world. Ways of ensuring effective mathematics teaching and learning have received attention from researchers for decades. Whether a teaching method or strategy is effective and successful depends on how the teacher uses it and the teacher's judgment. Such judgments actually reflect the teachers' mathematics education values. In school mathematics, values are reflected through the mathematics curriculum, pedagogical practices and individual views on the relevance and importance of mathematics, mathematical activities, and the study of mathematics. But values are not just matters of individual decisions. Societal influences also play a role and hence differences between countries can also be observed: practicing

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and memorizing are valued in the Eastern education system in general whereas communication and critical thinking are emphasized in the Western system.

Values in mathematics education are the convictions internalized by an individual to be the most important and worthwhile components of the learning and teaching of mathematics (Bishop 1988; Seah and Andersson 2015). Many studies have been influenced by Bishop's (1988) three pairs of complementary values; namely *rationalism* and *objectism*, *control* and *progress*, and *mystery* and *openness*. Later, he argued that the two values in each pair might appear to be opposites of each other, but are actually complementary and that all are fostered through mathematics learning at school (Bishop 1999, p. 2). In fact, the kind of values in mathematics that are recognized by students, is not only influenced by the mathematical knowledge presented in textbooks, but are also influenced by their teachers' characteristics and teaching style (Opdenakker and van Damme 2006, p. 16). These values are related to mathematics educational values which are in turn related to the norms and practice of mathematics pedagogy and show students what is required to learn mathematics well (Atweh and Seah 2008; Seah et al. 2017).

13.2 Previous Research

Research on values in mathematics education is mainly divided into three fields: teachers' values in mathematics teaching (Dede 2015; Bishop et al. 2001), values in mathematics curriculum or textbooks (Dede 2006; Seah et al. 2016) and students' values (Seah and Wong 2012) with the majority of studies dealing with teachers' values. Little knowledge is known about values from the students' perspective. Given the deeply affective qualities of values, much more research in this area is required, particularly empirical studies focussed on what students themselves value in their learning experiences. Rather than thinking of mathematics teaching as just teaching mathematics to students, we should remember that we are also teaching students through mathematics. They are learning values related to the subject through how they are being taught. What students see as valuable in their mathematics learning experience is worthy to know. Thus, the purpose of this current study was to investigate what the Chinese Mainland students value in their mathematics learning.

In the Third Wave Project (Seah and Wong 2012), pairs of key values relating to mathematics education were identified including *ability* and *effort*, *wellbeing* and *hardship*, *process* and *product*, and *application* and *computation*. These pairs of mathematics educational values were often identified in East-Asian mathematics classroom. In Hong Kong, junior students considered enjoyment, order, achievement, student involvement, teacher-led monitoring, and teacher support to be vital to the effective learning of mathematics (Law et al. 2012). Malaysian primary students valued board work, exercise or practice, learning through mistakes, explanation and students' involvement as the five common elements of an effective mathematics lesson (Lim 2015). In Japan, fifth grade students tended to value process, effort, exploration, fact, openness and progress, whereas ninth grade students tended to value product, ability, exposition, idea, mystery, and control (Shinno et al. 2014) suggesting students' values can change over time. Zhang et al. (2016) reported on primary students' values in mathematics learning from the Chinese Mainland, Hong Kong and Taiwan. It was found that six value components formed the value structure. They were achievement, relevance, practice, communication, ICT and feedback. Achievement orientation is identified as the most dominant values in these students' mathematics learning. ICT was valued least (relatively) for all three regions.

It should be noticed that although some of the same values have been reported in different countries, their meanings may differ subtly. For example, even though many students valued a 'fun' environment, in Chin and Lin's (2000) study, the term 'fun' was used to describe interesting mathematical problems that elicited Taiwan students' curiosity. But in Hong Kong students valued games and quizzes as a means of maintaining a lively and enjoyable (fun) classroom environment (Law et al. 2012), which is some what different to the use in Taiwan.

13.3 Values Taught in Chinese Mathematics Classroom

In the Chinese Mainland, after the Communist party took control in 1949, the educational system from then on was very much influenced by the Soviet Union. This meant that the region was untouched by the Modern Mathematics movement, while basic skills, as well as traditional topics like Euclidean geometry, were emphasized. In the early 2000s education became available to the general mass of the population. China's open door economic policy, first implemented in the mid-1980s, saw an increasing flow of educational ideas from elsewhere, including from Western countries.

Reform-oriented teaching practices, common in the West, require constructivist and inquiry-based classrooms (Ministry of Education of the People's Republic of China 2001, 2003). As well a shift from *the product* (content) emphasis in traditional the Chinese Mainland mathematics teaching, to *process* (ability) has been advocated and is gradually occurring (Wong et al. 2004). Consequently, classroom teaching and learning environments have been changing to meet these new ideas and challenges.

With the mathematics curriculum reforms implemented at the turn of the millennium, and the government's recent proposal for a competency-based curriculum (Zhang and Lam 2017), the Chinese Mainland mathematics classrooms are experiencing considerable changes (Lam et al. 2015). For instance, the use of real-life scenarios, mathematical games and activities, and project-based learning have been advocated by many teacher-educators.

As an extension of the original WIFI study, this study aimed at investigating what kinds of mathematics learning values the Chinese Mainland primary and secondary students now hold, following the curriculum reforms. The findings may afford greater insights into the influence of social-cultural factors on classroom teaching and learning.

Table 13.1 Grade and gender of participants

Grades	Gender		N	Percentage (%)
	Girls	Boys		
5–6 (Primary)	320	370	690	28.2
7–8 (Junior secondary)	165	150	315	12.9
10–11 (Senior secondary)	717	726	1,443	58.9
Total	1,202	1,246	2,448*	100.0

*Gender not reported by 70 of the 2,518 students

13.4 Research Design and Methodology

A total of 2,518 students from four big cities in the Chinese Mainland were asked to indicate which aspects of mathematics learning they considered most important. The participants were sampled from the cities of Wuhan, Quanzhou, Hangzhou and Dalian, in central, southern, eastern and northern China respectively. A total of 10 government schools were involved in the study; 4 primary, 3 junior secondary and 3 senior secondary. All the students used the same publisher's textbooks that follow the same mathematical curriculum syllabus (MOE 2012). This chapter does not aim at discussing the differences between regions/schools/classrooms. Thus we grouped them together as a whole sample and categorized them only by grades and gender (see Table 13.1).

Data for the study were collected using the validated WIFI questionnaire (Seah 2013). A translation and back translation method together with factor analysis was used for metric equivalence checks in the Chinese context (Seah et al. 2017; Zhang et al. 2016). The questionnaire consists of four sections: a 5-point Likert scale consisting of 64 items (section A); 10 items with continuous dimensions (section B); an open-ended scenario-stimulated section (section C); and questions eliciting the students' demographic and personal information (section D). In an earlier analysis (Zhang et al. 2016), a principal component analysis was conducted for section A. In this chapter we report findings from the Chinese Mainland students for section B and section C.

In section B, the semantic differential method was used to measure connotative meaning. Scores were given on a horizontal line with five positions (1, 2, 3, 4 and 5) from left to right. An example is: 'Leaving it to ability when doing mathematics' (on the left) versus 'Putting in effort when doing mathematics' (right). Each side (left or right) represented one value dimension (a mathematical value or a mathematics education value). An independent sample t-test and multivariate analysis of variance were used to analyze the statistical differences between the responses given by students of different genders and grades.

Section C was contextualized using specific scenarios (e.g. Imagine that there is a magic pill. Anyone who takes this pill will become very good at mathematics.) Students are required to nominate what to each of them would be the three most important values in such a situation. The rationale behind this is to allow for the open-ended nature of the responses to provide students with more choice to express their thoughts. The students' responses were coded by using the coding guide in the previous WIFI study and analyzed in terms of the frequency. Three experts (one professor in mathematics education, two experienced mathematics teachers) coded the data individually. We obtained high reliability with a Kappa correlation coefficient of 0.90.

13.5 Results

Results in Table 13.2 indicate that the students tended to place greater value on the process of obtaining the answer to a problem, than on finding the answer itself. They emphasized enjoyment and ability over hard work and effort during learning. Using mathematical concepts to solve a problem was believed to be more important than using a formula to find the answer. Mathematical facts and theories were considered more important than the ideas and practices used in everyday life. The students also believed that remembering mathematical concepts, rules or formulas is more important than creating them. Although learning mathematics from others and exploring mathematics by oneself were considered equally important, the students felt that it is more important for someone (such as the teacher) to provide concrete mathematical examples rather than simply stating the answer. In mathematics teaching, keeping mathematics magical or mystical was valued over merely demonstrating and explaining the subject. The students also felt that mathematics should be used for development or progress rather than simply to explain events.

We found statistically significant differences between the grades for most items in section B, especially between primary and secondary. The primary students tended to value effort, progress, and exploration more highly than the secondary students. Statistically significant differences were also found between the juniors and seniors for half of the 10 items.

Across the population, significant gender differences were found in the responses to six items (Table 13.3). The girls valued exploration more than the boys. The boys placed a higher value on fun, ability, rational understanding, and creativity. Further comparison of the three school grades revealed significant gender differences for two items (Q70 and Q71) in the primary group, one item (Q73) in the junior secondary group, and five items (Q68, Q69, Q72 and Q73) in the senior secondary group.

In section C, the students were asked to propose ingredients for a hypothetical magic pill capable of making its taker good at mathematics. Unlike the limited information in section B, section C provided students more choice to express their own thoughts. Of the top five elements cited (see Table 13.4), effort was valued most highly across the three groups, with ability and wisdom valued only by the secondary students. Both the primary and junior secondary students valued the use of formulas, whereas only the senior students valued thinking. Interestingly, the boys and girls in each group reported the same top five key elements, but in a different order (see Table 13.5).

Table 13.2 Differences by grades in students' responses to section B items

Items (score 1–5)	Total		Primary (Grade 5–6)		Junior (Grade 7–8)		Senior (Grade 10–11)		F-test	η^2
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
66. Process versus product	1.79	1.01	1.74	1.01	1.98	1.01	1.78	1.01	7.00***	0.006
67. Fun versus effort	2.50	1.28	2.39	1.25	2.46	1.23	2.56	1.31	4.18*	0.003
68. Ability versus effort	2.95	1.24	3.41	1.26	3.04	1.21	2.72	1.18	79.08***	0.061
69. Objectism versus rationalism	2.81	1.07	2.75	1.10	2.76	1.00	2.85	1.07	2.67	0.002
70. Facts and theories versus ideas and practice	2.47	1.05	2.56	1.08	2.52	1.03	2.41	1.04	5.04**	0.004
71. Exposition versus exploration	3.02	1.21	3.39	1.20	2.99	1.20	2.86	1.18	48.71***	0.038
72. Recalling versus creating	2.47	1.14	2.49	1.14	2.32	1.04	2.50	1.15	3.35*	0.003
73. Exposition versus exploration	3.72	1.19	3.92	1.19	3.65	1.17	3.64	1.19	14.16***	0.011
74. Openness versus mystery	2.40	1.14	2.50	1.20	2.44	1.07	2.35	1.13	4.51*	0.004
75. Control versus progress	3.16	1.11	3.47	1.14	3.22	1.12	3.01	1.07	42.75***	0.034

Note ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$

Table 13.3 Gender differences in students' responses to section B items

Items	Primary					Junior					Senior				
	Girls		Boys		t-test	Girls		Boys		t-test	Girls		Boys		t-test
	Mean	SD	Mean	SD		Mean	SD	Mean	SD		Mean	SD	Mean	SD	
66	1.71	0.99	1.75	1.03	−0.59	1.89	0.92	2.07	1.10	−1.52	1.79	0.97	1.73	1.04	1.20
67	2.38	1.20	2.40	1.28	−0.24	2.54	1.21	2.33	1.25	1.47	2.63	1.31	2.50	1.30	1.89
68	3.46	1.23	3.38	1.26	0.78	3.13	1.15	2.95	1.28	1.31	2.79	1.12	2.65	1.24	**2.35**
69	2.83	1.00	2.68	1.17	1.84	2.80	0.97	2.71	1.06	0.84	3.03	1.02	2.69	1.11	**6.06*****
70	2.67	1.04	2.46	1.12	**2.56***	2.55	0.97	2.50	1.10	0.47	2.43	1.01	2.40	1.07	0.41
71	3.50	1.14	3.29	1.25	**2.32***	3.12	1.17	2.86	1.22	1.93	2.87	1.13	2.85	1.24	0.28
72	2.42	1.12	2.57	1.15	−1.70	2.23	0.96	2.43	1.13	−1.70	2.39	1.07	2.60	1.22	**−3.32*****
73	4.02	1.13	3.85	1.24	1.87	3.79	1.05	3.51	1.28	**2.11***	3.75	1.09	3.56	1.26	**3.20****
74	2.49	1.21	2.50	1.18	−0.11	2.43	1.10	2.45	1.03	−0.14	2.32	1.09	2.37	1.18	−0.77
75	3.49	1.08	3.44	1.19	0.60	3.30	1.00	3.18	1.22	0.95	3.06	0.98	2.97	1.14	1.72

Note $***p < 0.001$, $**p < 0.01$, $*p < 0.05$

Table 13.4 Frequency (%) comparisons between groups on key elements in section C

Overall top 5	Key element	Primary	Key element	Junior secondary	Key element	Senior secondary
1st	Effort	133(30.8%)	Effort	62(17.5%)	Ability	405(29.2%)
2nd	Diligence	75(17.4%)	Ability	44(12.4%)	Thinking	323(23.3%)
3rd	Formula	69(16.0%)	Formula	42(11.8%)	Effort	261(18.8%)
4th	Smartness	68(15.7%)	Wisdom	41(11.5%)	Wisdom	219(15.8%)
5th	Memory	59(13.7%)	Knowledge	41(11.5%)	Memory	199(14.4%)

Table 13.5 Gender difference between groups with respect to the key elements in section C

Overall top 5	Primary		Junior secondary		Senior secondary	
	Girls	Boys	Girls	Boys	Girls	Boys
Ability	5(2.60%)	21(9.01%)	18(13.4%)	24(19.2%)	258(34.9%)	143(22.7%)
Effort	72(37.5%)	24(10.3%)	32(23.9%)	27(21.6%)	149(20.2%)	111(17.6%)
Thinking	12(6.25%)	19(8.15%)	10(7.46%)	6(4.8%)	187(25.3%)	131(20.8%)
Wisdom	32(16.7%)	22(9.44%)	21(15.7%)	17(13.6%)	130(17.6%)	85(13.5%)
Memory	24(12.5%)	35(15.0%)	14(10.4%)	3(2.4%)	117(15.8%)	30(4.77%)

The findings from section C showed many consistencies with the findings for section B. For example, efforts and memory are both valued by most students in sections B and C. An interesting finding is that the value of exposition was given more emphasis in section B, while the element of teacher(s) is seldom mentioned by students in section C. Smartness or wisdom entered one of top five important elements in section C, this natural ability seems more valued by primary students in section B compared to secondary students.

13.6 Discussion and Conclusion

Understanding more about values is key to generating possibilities for mathematics teaching. These findings revealed that both primary and secondary Chinese Mainland students tended to value process, pleasure, ability, facts and theories, recall, and exploration over their respective opposing dimensions, product, effort, ideas, create and exposition respectively. The value dimensions of process, facts and theories, and recall are very similar to the findings in the previous study in section A (Zhang et al. 2016). For example, in section A, students value achievement, which indicated they thought "knowing the steps of a solution", "knowing which formula to use" and "memorizing the facts" are important for their mathematics learning. These can also be reflected in students' choices in Q70 and Q72 of section B where students tended to value truths and facts in mathematics and remembering mathematical ideas, concepts and rules. In section C, we could also see these with formula and memory in the top five choices of students' values. Interestingly Zhang et al.

(2016) reported that both the relevance to mathematics (e.g., stories about mathematics, hands-on activities, and mathematics puzzles) and practice were important for students learning mathematics. But here in Q67 of section B, when they needed to make a choice on fun and effort when doing mathematics, students tended to value feeling relax or having fun more than hard work. The emphasis on pleasure, process, and exploration also echoed the findings reported by Zhang (2014). The students believed that an enjoyable atmosphere is important to mathematics learning and felt that students need to be involved in classroom activities. These priorities were echoed in the Chinese Mainland recent curriculum reforms (MOE 2001, 2003, 2012). Of the mathematical value dimensions tested (e.g., in Q69, Q74, and Q75), objectism (be more pragmatic and concrete), openness (sharing mathematics with others), and progress (using mathematics for development) were highlighted.

This finding, together with the students' emphasis on facts and theories and the process of recall, resembles the results reported in previous studies (Seah and Peng 2012; Zhang 2014). There the students believed that an effective mathematics teacher must present, demonstrate, and explain mathematics-related information clearly. So not only gaining mathematical knowledge, but also learning how to learn was considered important. Although constructivism and student-centered learning are promoted in curriculum reforms in the Chinese Mainland, these results suggest that students still prefer the teacher-led approach. The product–process dichotomy has generally been regarded as the major distinction between Eastern and Western mathematics teaching (Leung 2001), with Chinese mathematics classroom being teacher-oriented/teacher-centered. However, the notion of teacher-led, yet with a student learning focus, may be a more suitable description of the Chinese Mainland lessons script (see Wake and Pampaka 2008; Wong 2009).

In our former study (Zhang et al. 2016), only primary students' views are investigated. However it appears that as they progress through school their value choices do change. In section B, statistically significant differences were found between both the primary and secondary students and the junior secondary and senior secondary students. These differences may be explained by the students' own growth and development as they move on from primary to secondary and experience changes in their learning environment, teaching approaches, and cultural context.

Just how the students' environment changes as they progress might be worth further exploration. In primary classrooms students are told to work harder and be diligent more frequently than secondary classrooms. As well in secondary years ability becomes more important to students. These are hints of the changes that are present but further work is needed.

It seems that what students value in their mathematics learning is probably influenced by how they have been taught in the classroom, as well as their existing conceptions of mathematics (Wong et al. 2002, 2016; Zhang and Wong 2015). If a student sees mathematics as a set of rules, facts, and procedures, his or her learning approach and understanding probably will be more instrumental, and will probably also value this approach to learning mathematics. In contrast, students in a constructivist classroom may hold a broader conception of mathematics and show more profound learning motives and strategies. Some results suggest that such students have more positive learning attitudes, place greater value on mathematics, and are less anxious about mathematics learning (Ding and Wong 2012). Clearly these ideas are laced through with values, and need to be more thoroughly explored in the Chinese Mainland context.

The Chinese society is widely believed to hold education in high regard, to value effort, and to be achievement oriented (Leung 2001). This was supported by the results from section C. Chinese students have an examination-oriented mentality, influenced by Chinese cultural values such as a social achievement orientation and an emphasis on diligence, effort, and collectivism. Interestingly, although teaching practices and parents' expectations have been shown to affect children's learning (Hauser-Cram et al. 2003; Rosenthal and Jacobson 1968; Rubie-Davies et al. 2010), the students in this study did not explicitly indicate the importance of these external factors for their mathematics learning. Specifically, the top five elements listed in response to section C included neither teachers nor parents. Instead, the students tended to focus on themselves: e.g., their own ability, knowledge, memory and wisdom. It may be these students believed that internal factors are more important to learning than external factors, and the help and support from their teachers or parents maybe perceived by them as not being as beneficial as it appears to be elsewhere. Hence this suggests that a further investigation should focus on these external factors.

In this study we focused on the little researched area of student values. However how students learn values has not been addressed and awaits more insightful study. Does value negotiation occur between teachers and students in the teaching and learning of mathematics in the Chinese Mainland? How and in what contexts can teachers foster such negotiation? By exploring what values students do seem to exhibit at various school levels, as was done here, may give a good guide in exploring these further questions. The answers to all these questions will deepen our understanding of students' mathematics learning environments, both in the Chinese Mainland and more widely, and help teachers to design their teaching more effectively.

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References

Atweh, B., & Seah, W. T. (2008). *Theorizing values and their study in mathematics education*. Paper presented at the AARE Conference, Fremantle, Australia.

Bishop, A. J. (1988). *Mathematical enculturation: A cultural perspective on mathematics education*. Dordrecht: Kluwer.

Bishop, A. J. (1999). Mathematics teaching and values education: An intersection in need of research. *ZDM Mathematics Education, 31*(1), 1–4.

Bishop, A. J., Clarkson, P., FitzSimons, G., & Seah, W. T. (2001). Studying values in mathematics education: Aspects of the VAMP project. In J. Novotna (Ed.), *European research in mathematics education* (Vol. 2, pp. 368–376). Prague: Charles University.

Chin, C., & Lin, F. L. (2000). *Values and values statement emerged in students' preferences on test items: A case study from mathematical induction*. Paper presented at the history and pedagogy of mathematics 2000 conference, Taipei, Taiwan.

Dede, Y. (2006). Values in Turkish middle school mathematics textbooks. *Quality & Quantity, 40,* 331–359.

Dede, Y. (2015). Comparing primary and secondary mathematics teachers' preferences regarding values about mathematics teaching in Turkey and Germany. *International Journal of Science and Mathematics Education., 13*(1), 227–255.

Ding, R., & Wong, N. Y. (2012). The learning environment in the Chinese mathematics classroom. In Y. Li & R. Huang (Eds.), *How Chinese teach mathematics and improve teaching* (pp. 150–164). New York: Routledge.

Hauser-Cram, P., Sirin, S. R., & Stipek, D. (2003). When teachers' and parents' values differ: Teachers' ratings of academic competence in children from low-income families. *Journal of Educational Psychology, 95,* 813–820.

Lam, C. C., Wong, N. Y., Ding, R., Li, S. P. T., & Ma, Y. (2015). Basic education mathematics curriculum reform in the greater Chinese region — Trends and lessons learned. In B. Sriraman, J. Cai, K-H. Lee, L. Fan, Y. Shimuzu, C. S. Lim, & K. Subramanium (Eds.), *The first sourcebook on Asian research in mathematics education: China, Korea, Singapore, Japan, Malaysia and India* (pp. 305–335). Charlotte, New Carolina, U.S.A: Information Age Publishing.

Law, H. Y., Wong, N. Y., & Lee, L. N. Y. (2012). A study into espoused values in Hong Kong mathematics classrooms. *ZDM Mathematics Education, 44*(1), 45–57.

Leung, F. K. S. (2001). In search of an East Asian identity in mathematics education. *Educational Studies in Mathematics, 47,* 35–51.

Lim, C. S. (2015). Riding the third wave: Negotiating teacher and students' value preferences relating to effective mathematics lesson. In S. J. Cho (Ed.), *Selected regular lectures: 12th international congress on mathematical education* (pp. 471–485). Cham: Springer.

Ministry of Education of the People's Republic of China. (2001). *Mathematics curriculum standard for compulsory education stage (experimental version)* [in Chinese]. Beijing, People's Republic of China: Beijing Normal University Press.

Ministry of Education of the People's Republic of China. (2003). *Mathematics curriculum standard for normal senior high schools* [in Chinese]. Beijing, People's Republic of China: People's Education Press.

Ministry of Education of the People's Republic of China. (2012). *Mathematics curriculum standard for compulsory education stage* (2011 ed.) [in Chinese]. Beijing, People's Republic of China: Beijing Normal University Press.

Opdenakker, M. C., & van Damme, J. (2006). Teacher characteristics and teaching styles as effectiveness enhancing factors of classroom practice. *Teaching and Teacher Education, 22,* 1–21.

Rosenthal, R. J., & Jacobson, L. (1968). *Pygmalion in the classroom: Teacher expectations and pupils' intellectual development*. New York: Holt, Rinehart & Winston.

Rubie-Davies, C. M., Peterson, E., Irving, E., Widdowson, D., & Dixon, R. (2010). Expectations of achievement: Student, teacher and parent perceptions. *Research in Education, 83*(1), 36–53.

Seah, W. T. (2013). Assessing values in mathematics education. In A. M. Lindmeier & A. Heinze (Eds.), *Proceedings of 37th conference of the international group for the psychology of mathematics education* (Vol. 4, pp. 193–200). Kiel, Germany: PME.

Seah, W. T., & Andersson, A. (2015). Valuing diversity in mathematics pedagogy through the volitional nature and alignment of values. In A. Bishop, T. Barkatsas, & H. Tan (Eds.), *Diversity in mathematics education: Towards inclusive practices* (pp. 167–183). New York, NY: Springer.

Seah, W. T., Andersson, A., Bishop, A., & Clarkson, P. (2016). What would the mathematics curriculum look like if values were the focus? *For the Learning of Mathematics, 36*(1), 14–20.

Seah, W. T., Baba, T., & Zhang, Q. P. (2017). The WIFI study: Students' valuing of mathematics learning in Hong Kong and Japan. In J. W. Son, T. Watanabe, & J. J. Lo (Eds.), *What matters? Research trends in international comparative studies in mathematics education* (pp. 333–354). Cham, Switzerland: Springer.

Seah, W. T., & Peng, A. (2012). What students outside Asia value in effective mathematics lessons: A scoping study. *ZDM, 44*(1), 71–82.
Seah, W. T., & Wong, N. Y. (2012). What students value in effective mathematics learning: A 'Third Wave Project' research study. *ZDM Mathematics Education, 44*(1), 33–43.
Shinno, Y., Kinone, C., & Baba, T. (2014). Exploring 'what Japanese students find important in mathematics learning' based on the Third Wave Project. In C. Nicol, S. Oesterle, P. Liljedahl, & D. Allan (Eds.), *Proceedings of the joint meeting of PME 38 and PME-NA 36* (Vol. 5, pp. 169–176). Vancouver, Canada: PME.
Wake, G., & Pampaka, M. (2008). The central role of the teacher - even in student centered pedagogies. In O. Figueras, J. Cortina, S. Alatorre, T. Rojano, & A. Sepu´lveda (Eds.), *Proceedings of the Joint Meeting of PME 32/PME-NA 30* (pp. 377–384). Mexico: PME.
Wong, N. Y. (2009). Exemplary mathematics lessons: What lessons we can learn from them? *ZDM Mathematics Education, 41,* 379–384.
Wong, N. Y., Ding, R., & Zhang, Q. P. (2016). From Classroom environment to conception of mathematics. In R. B. King & A. B. I. Bernardo (Eds.), *The psychology of Asian learners: A festschrift in honor of David Watkins* (pp. 541–557). Singapore: Springer.
Wong, N. Y., Han, J. W., & Lee, P. Y. (2004). The mathematics curriculum: Towards globalisation or Westernisation? In L. Fan, N. Y. Wong, J. Cai, & S. Li (Eds.), *How Chinese learn mathematics: Perspectives from insiders* (pp. 27–70). Singapore: World Scientific.
Wong, N. Y., Marton, F., Wong, K. M., & Lam, C. C. (2002). The lived space of mathematics learning. *Journal of Mathematical Behavior, 21,* 25–47.
Zhang, Q., Barkatsas, T., Law, H. Y., Leu, Y.-C., Seah, W. T., & Wong, N. Y. (2016). What primary students in the Chinese Mainland, Hong Kong and Taiwan value in mathematics learning: A comparative analysis. *International Journal of Science and Mathematics Education., 14*(5), 907–924.
Zhang, Q. P. (2014). The third wave: Chinese students' values in effective mathematics teaching in two secondary schools. *Journal of the Korea Society of Mathematical Education Series D: Research in Mathematical Education, 18*(3), 209–221.
Zhang, Q. P., & Lam, C. C. (2017). Reflections on competency-based mathematics education (in Chinese). *People's Education, 6,* 43–47.
Zhang, Q. P., & Wong, N. Y. (2015). Beliefs about mathematics, mathematics knowledge and approaches to teaching among Chinese teachers. In L. Fan, N. Y. Wong, J. Cai., & S. Li (Eds.), *How Chinese teach mathematics: Perspectives from insiders* (pp. 457–492). Singapore: World Scientific.