Exploring Issues About Values in Mathematics Education

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Highlights

- This commentary article is intended to provide a broad yet brief look at research and issues about values and valuing in mathematics education from a broad view about related issues.
- The articles in the Special Issue provided new findings, insights, and directions in research on values and valuing in mathematics education.
- In the future, more attention should be paid to the issues concerning values as a construct from a social-cultural perspective, and more studies addressing enacted values, using more observational data, and with large scale and long duration are needed.
- There is also a need for more exchanges and interdisciplinary collaborations between mathematics educators, other discipline-based educators, and general educators, especially educational sociologists, for the advancement of research in this area.

Keywords

Educational values, mathematics education research, mathematics teaching and learning, values and valuing in mathematics education

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Introduction: Values of education

In his classic book, *What is learned in school*, Robert Dreeben (1968) argued that restricting the treatment of the contributions of schooling to cognitive outcomes related to instrumental knowledge including skills and knowing specific rules, facts and procedures is too narrow. He contended that “the social experiences available to pupils in schools…provide opportunities for children to learn norms characteristic of several facets of adult public life” (p. 65).

According to Dreeben, different from other agents or mechanisms like family, mass media, and occupational apprenticeship, schools as institutions for social learning can contribute to the acquisition of four social norms, that is, independence, achievement, universality, and specificity (see more details in Dreeben, 1968).

Dreeben’s work focused primarily on students’ social experiences in schools on the one end, which includes their interactions with others (e.g., peers and teachers), the hidden curriculum and the environmental socialization, and the outcome of such experiences on the other, namely, social values (Campbell, 1970; Johnson, 1982), and much less on specific disciplines of students’ learning like mathematics and science. That is quite understandable, since when discipline-based educational researchers talk about students’ experiences and ends of learning of a specific school academic subject such as mathematics, they usually focus more on the cognitive aspects, such as skills and knowledge of mathematics.¹

In fact, issues about values in mathematics education did not receive much attention from researchers and practitioners for a long time, at least, until the early 2000s, although, researchers like Bishop (2001, 2014), who is a, if not the, leading pioneer in this area, have argued that values are a significant feature of education in any field, including mathematics education.

Values and valuing: Focusing on mathematics education

The last two decades or so have witnessed a gradual growth of attention from mathematics education researchers to issues about values in mathematics education. A notable milestone is that in 2012, *ZDM-Mathematics Education*, one of the leading journals in the field, published a Special Issue, the first issue of Volume 44, devoted to the research in this area, with the theme “Values in East Asian Mathematics Education: The Third Wave” (https://link.springer.com/journal/11858/volumes-and-issues/44-1) (Seah & Wong, 2012). That Special Issue provided readers with a collection of 10 articles, excluding a book review article, from 17 researchers with a main focus on issues related to values and valuing in mathematics education in several East Asian countries or regions including Chinese mainland, Japan, Malaysia, and Hong Kong SAR, though mathematics education outside East Asia such as Australia and Sweden also received some attention.

In my view, this current Special Issue of *ECNU Review of Education (ROE)* marks another important milestone in the advancement of research on values and valuing in mathematics education.
It presents readers with a new and concerted collection of articles written by a group of more than a dozen researchers, comprising both veteran and new faces, from different parts of the world.

Among the seven articles in this Special Issue, four address issues concerning students’ values and valuing in their learning of mathematics in China, Korea, New Zealand, and Australia.

In the article by Tang et al. (2021), the researchers examined the values of Chinese school students concerning mathematics learning. Using self-report questionnaire data collected from 1,253 students in six primary, six junior high, and six senior high schools, a stratified and in some stages randomly selected sample comprising 426 students in fourth to sixth grades, 407 in the seventh to ninth grades, and 420 in the tenth to twelfth grades, all in Zhejiang province, the researchers revealed that these Chinese students valued seven elements concerning their learning of mathematics: culture, memorization, technology, practice, objectism, understanding, and control; those students placed different degrees of importance on these seven elements at different learning stages; moreover, it is particularly worth noting that the junior high school years are a critical period of change in students’ values. Nevertheless, it is clear that, given the vast area of China and the large population of Chinese students with different social, economic and ethnic background, further research is needed in order to obtain a more comprehensive picture of the Chinese students’ values in their learning of mathematics.

Pang and Seah’s (2021) study primarily aimed to address issues about Korean students’ values and valuing in their learning of mathematics. Like many other studies reported in this Special Issue, it was also part of the larger “What I Find Important (in my mathematics learning)” (WIFI) study. The data were collected using a questionnaire from 816 sixth and ninth graders, from 19 primary, and 15 secondary schools respectively across the country. The results highlighted that those Korean students valued understanding, connections, fun, accuracy, and efficiency in their mathematics learning; furthermore, there existed significant gender difference in valuing connections, and the students’ valuing of connections, fun, accuracy, and efficiency was mediated by school type, that is, primary and secondary schools. Based on the findings of the study, the researchers argued how Korean students’ values about mathematics and mathematics learning might explain their excellent performance despite a “negative” affective mode, as evidenced in large international comparative studies such as the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA).

Hunter’s (2021) article reports a study that examined 134 Pasifika students’ beliefs of mathematics educational values and their reasons for rating values at different levels of importance. Those students were at Years 7 and 8 from two low-socioeconomic middle schools in New Zealand. In the study, the students were first presented with 15 mathematical learning statements on an online survey, representing mathematics educational values (including “practice, respect, family support, utility, collaboration, clarity, problem-solving, communication, persistence,
belonging, accuracy, teacher explanation, recall, flexibility, and risk taking”), and then asked to choose three most and one least important statements from them. Follow-up semi-structured individual interviews were conducted with each student to examine the reasons for their choices. The responses from the survey showed that the mathematics educational values ranked highly by the greatest percentage of those Pāsifika students were practice, family, respect, and persistence, while the values of accuracy and utility were rated as the least important, and the interviews indicated commonalities in accounting for the importance of different values. The findings of the study revealed that there were many intersections between cultural values of the Pāsifika students and their mathematics educational values, indicating a need for a more culturally inclusive and responsive pedagogy, as argued by some other researchers (e.g., Houghton, 2015).

Hill et al.’s (2021) study explored the intersection between Australian students’ values and well-being in mathematics education. The researchers proposed a seven-dimensional framework of student well-being in mathematics education comprising cognitions, relationships, engagement, accomplishment, positive emotions, perseverance, and meaning. Using an online survey, they collected the responses from 119 eighth-grade students, who were ethnically highly homogenous, in a large Australian independent school to three open-ended questions about their conceptions of mathematical well-being and about what they valued most when learning mathematics. The article argued that the results confirmed the alignment between students’ conceptions of well-being and their values in mathematics education, thus suggesting a crucial role for values at a time when increasingly more education systems are paying attention to fostering well-being of students.

Two of the seven articles examined issues primarily about teachers or educators’ values about mathematics and mathematics teaching. The study presented by Kalogeropoulos et al. (2021) investigated, in an intervention context, whether the four-value alignment strategies, namely, scaffolding, balancing, intervention, and refuge, as identified in an earlier work by Kalogeropoulos and Bishop (2017), can comprehensively account for educators’ value alignment strategies. Using the data collected from semi-structured interviews with two teacher-leaders involved in an intervention program in Australia, which were designed mainly for catering to students who were in the 20th to 40th percentile in terms of their mathematics performance, the paper argued that a fifth strategy, termed the Beacon strategy, is needed to better describe the full range of value alignment strategies employed by educators in the intervention program. According to the authors, teachers could be purposefully pursuing value alignment by digging in and reasserting their expectations until the student behaves in a manner aligned with the teachers’ values. While the study provided new insight that might help improve mathematics teaching and learning, further study, particularly at a large scale, is needed to confirm the observation.

Dede et al. (2021) employed a semantic content analysis approach to examine the mathematical values, mathematics educational values, and educational values reflected in 16 mathematical modeling tasks from Brazil, Germany, U.K., and U.S. Those modeling tasks were selected from published
studies, with four tasks being in each of the four different perspectives: realistic/applied modeling, model eliciting approach, socio-critical modeling, and cognitive modeling. By analyzing each sentence in these tasks, the study found that the mathematical values of “control, mystery and openness” appeared in all the modeling tasks, and the mathematical values of “rationalism and objectism” appeared in the tasks in the realistic/applied and socio-critical modeling perspectives; the mathematics educational values of “product, exploration, creating, relevance, pleasure, and application” also emerged in all the modeling tasks; and the educational values of “social justice, equity, social welfare, humanity, and altruism” were more important in the socio-critical modeling, and the educational value of “individualism” was more emphasized in the model eliciting approach. The paper argued that by determining the mathematical, mathematics educational, and general educational values involved in mathematical modeling tasks based on different modeling perspectives, an effective and more value-balanced mathematical modeling instruction can be provided. I think the study provided a new and meaningful direction of research in this area, but, because there exist a wide range of mathematics topics at different levels of schooling, further study with a more systematic and representative sampling of modeling tasks is needed to obtain more confirmatory conclusions. In addition, mathematical tasks essentially belong to (educators’) intended curriculum, and whether and how they are used in actual teaching and learning of mathematics is another issue remaining to be examined.

In the final article, the construct of values or valuing by the authors, Seah et al. (2021), follows Bishop’s (1988) seminal conceptual framework in mathematics education and, in a large sense, is more aligned with the typical conceptualization of educational sociologists like Dreeben (1968) as mentioned earlier. The article presents an academic product of several conversations that took place among the researchers, as they were concerned with the lack of emphasis in mathematics education on the roles that the “person” plays in the development of mathematics. It explored how the values and valuing might help address the issue. The researchers put forward two approaches to raising learners’ awareness of the humanness of mathematics: The first is to reframe the values that are operationalized when mathematics is taught and learnt as processes of valuing which teachers and students engage in, and the second is to acknowledge that writers of mathematics books are not simply presenting knowledge but are also acting as mentors conveying about the discipline. The researchers argued that the involvement of the “person” in the development of mathematics should be made more visible in mathematics education.

Discussion and concluding remarks: Issues and future directions

In conclusion, the seven articles collected in this Special Issue addressed a variety of issues about values and valuing in mathematics education in different countries. Overall, three observations can be made from reading these articles.
First, most of these articles examined issues about students’ values and valuing in their learning of mathematics, and some examined teachers and educators’ values and valuing concerning teaching of mathematics.

Second, the studies used different research instruments and methods, with most collecting self-report data through questionnaire survey and interview. It should be noted that, although self-report data have unique values in obtaining information about research subjects’ inner world like their beliefs and values, what really revealed in these studies were espoused not enacted values of those concerned, and the difference should not be ignored.

Third, on the one hand, these articles provided new findings, insights, and directions in research on values and valuing in mathematics education. But, on the other hand, in a large sense, most, if not all, of the studies are small scale, non-observational, and exploratory in nature.

As researchers have noticed, the issues about values in mathematics education are rather complex (e.g., Hill et al., 2021), and this complexity is largely caused by the complexity of the concept of values itself. In fact, when people talk about “values” in mathematics education, what are valued can be mathematics, mathematics teaching and learning, and mathematics education as part of general education, and those who value can be students, teachers, curriculum developers, educational policy makers, government leaders, and the general public or the society, and moreover, values can be about the outcomes of teaching and learning or about their process.

Therefore, it is a fundamental importance to establish a more widely shared construct of values and a stronger theoretical basis for further research in this area. In this regard, I think more attention should be paid to the issues concerning values as a construct from a social-cultural perspective, in other words, issues about values of mathematics education to the holistic development of students for their future as adult members of the society.

In terms of research methods, studies addressing enacted values of students, teachers and other educators or stakeholders of mathematics education, using more observational data, and with large scale and long duration are highly needed to advance the research in this area.

Finally, it appears clear that there is a need for more exchanges and interdisciplinary collaborations between mathematics educators, other discipline-based educators, and general educators, especially educational sociologists, for the development of research in this area. I hope and believe that this Special Issue will make a valuable contribution towards stimulating and promoting such exchanges and collaborations.

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Note
1. When I started my doctoral study majoring in mathematics education at Chicago in the early 1990s, I had the privilege to take courses offered or co-offered by Mr. Dreeben, who was a professor and the chair of the education department of the university, and more importantly, to me, he was in my dissertation advisory committee throughout my study. However, because probably my dissertation work was in the field of mathematics education, and more likely issues about values in mathematics education did not receive much attention in that time, he did not mention and I did not ask about his work on the values of education. It was not until many years after my graduation that I started drawing on his work to think about issues related to values in mathematics education, a theme receiving increasing attention from mathematics educators.

References
Bishop, A. J. (1988). *Mathematical enculturation: A cultural perspective on mathematics education*. Kluwer.
Bishop, A. J. (2001). What values do you teach when you teach mathematics? *Teaching Children Mathematics*, 7(6), 346–349. https://www.jstor.org/stable/41199894
Bishop, A. J. (2014). Values in mathematics education. In S. Lerman (Ed.), *Encyclopedia of mathematics education* (pp. 633–636). Springer. https://link.springer.com/content/pdf/10.1007%2F978-94-007-4978-8_160.pdf
Campbell, E. Q. (1970). On what is learned in school by Robert Dreeben. *Sociology of Education*, 43(2), 205–210.
Dede, Y., Akçakin, V., & Kaya, G. (2021). Mathematical, mathematics educational, and educational values in mathematical modeling tasks. *ECNU Review of Education*, 4(2), 241–260.
Dreeben, R. (1968). *On what is learned in school*. Addison-Wesley.
Hill, J. L., Kern, M. L., Seah, W. T., & van Driel, J. (2021). Feeling good and functioning well in mathematics education: Exploring students’ conceptions of mathematical well-being and values. *ECNU Review of Education*, 4(2), 349–375.
Houghton, C. (2015). Underachievement of Māori and Pasifika learners and culturally responsive assessment. *Journal of Initial Teacher Inquiry*, 1, 10–12. http://hdl.handle.net/10092/11437
Hunter, J. (2021). An intersection of mathematics educational values and cultural values: Pāsifika students’ understanding and explanation of their mathematical educational values. *ECNU Review of Education*, 4(2), 307–326.
Johnson, N. B. (1982). Education as environmental socialization: Classroom spatial patterns and the transmission of sociocultural norms. *Anthropological Quarterly*, 55(1), 31–43.
Kalogeropoulos, P., & Bishop, A. J. (2017). What is the role of value alignment in engaging mathematics learners? In A. Chronaki (Ed.), *Mathematics education and life at times of crisis: Proceedings of the 9th International Mathematics Education and Society Conference* (Vol. 2, pp. 603–610). University of Thessaly Press. http://mes9.ece.uth.gr/portal/images/proceedings/MES9_Proceedings_low_Volume1.pdf
Kalogeropoulos, P., Russo, J. A., & Clarkson, P. (2021). Exploring educator values alignment strategies in an intervention context: The emergence of the Beacon strategy. *ECNU Review of Education, 4*(2), 327–348.
Pang, J., & Seah, W. T. (2021). Excellent mathematical performance despite “negative” affect of students in Korea: The values perspective. *ECNU Review of Education, 4*(2), 285–306.
Seah, W. T., & Wong, N. Y. (2012). Thematic issue on ‘Values in East Asian mathematics education—The third wave’. *ZDM-Mathematics Education, 44*(1), 1–2.
Seah, W. T., Zhang, Q., & Bishop, A. J. (2021). Mentors expressing what they value through their writings: Emphasizing the person in mathematics. *ECNU Review of Education, 4*(2), 230–240.
Tang, H., Seah, W. T., Zhang, Q., & Zhang, W. (2021). The mathematics learning attributes valued by students in Eastern China. *ECNU Review of Education, 4*(2), 261–284.