Exploring Mathematics Education in Various Countries

Interview with Jinho Kim, the President of the Korean Society of Mathematical Education (KSME)

Sebastian Schorcht

Photo: Soomin Kim

Jinho Kim

General

Dear Jinho Kim, we are very grateful for your willingness to share insights about KSME with us. Could you describe how the mathematics education research community is organized in your country?

The mathematics education research community in Korea is highly dynamic and well-organized, encompassing several academic societies that address different educational levels and theoretical orientations. Major organizations include the Korean Society of Mathematical Education (KSME), the Korean Society for Educational Studies in Mathematics (KSESM), the Korean Society of Elementary Mathematics Education (KSEME), Society for Research on Philosophy of Mathematics Education (SRPME), and the Korean School Mathematics Society. Among these, KSME serves as the central hub connecting researchers, policymakers, and practitioners nationwide and internationally. It publishes leading journals such as *Mathematics Education Research and Practice* (MERP) and the Journals of the Korean Society of Mathematical Education (*The Mathematical Education*, *Theoretical Mathematics and Pedagogical Mathematics*, *Education of Primary School Mathematics*, and *Communications of Mathematical Education*), and it organizes national and international conferences, research workshops, and international symposia. From this year, KSME provides webinars featuring distinguished researchers as speakers. Through these platforms, KSME fosters scholarly exchange and supports the translation of research into classroom innovation. For your reference, you can find many other activities conducted by KSME on the KSME website www.ksme.org/eng/content/greeting.php.

Research Focus and Methods

Are there specific themes or issues that are particularly in focus in mathematics education research in your country?

Recent years have witnessed several prominent research trends in Korea's mathematics education community. One major focus is curriculum and textbook research, particularly related to the 2022 revised mathematics curriculum and its implications for teaching practice. For example, the 2022 revised mathematics curriculum highlights student agency as one of key instructional approaches. It would therefore be worthwhile to examine whether the achievement standards are aligned with the nature of student agency oriented instruction and implement lessons that strengthen students' agency. A second major theme is the integration of Artificial Intelligence (AI) into mathematics learning and teaching. This includes studies on AI-based digital textbooks, intelligent tutoring systems, and data-driven personalization. Currently, AI-based digital textbooks are widely used by elementary and secondary schools for enhancing equitable access for

all learners with AI-enhanced adaptive supports. As the MERP 2025 editorial (Choi, Lee, Lee, and Hwang, 2025) highlighted the importance of bridging the gap between research and practice in mathematics education, recently many Korean researchers have shown interest in this topic. Actually, the theme of the International Conference on Mathematics Education, held by KSME from November 14 to 16 in 2025, was *Bridging Research and Classroom Practice for the Future of Mathematics Education*. Many researchers, including Deborah Ball, who delivered a keynote lecture on *Dismantling Dichotomies of Mathematics Teaching Practice*, presented on the connections between theory and practice (KSME, 2025). Furthermore, affective domains (e.g., students' motivation, hope, self-efficacy, engagement, and growth mindset) have become significant research areas. According to Kwon and Kim (2024), in Korea, studies on the affective domain have been found to be closely related to cognitive aspects such as achievement, ability, and problem solving. Moreover, the scope of research has been expanding with the emergence of new concepts such as meta-affect (Do and Paik, 2019), and mindset (Pang, Kim, and Kwak, 2024). These directions collectively reflect a movement toward understanding mathematics learning not only as cognitive development but also as socially and technologically situated practice.

What challenges does the mathematics education research community in your country face?

Despite its strong tradition, the Korean mathematics education research community faces several challenges. The first challenge is the frequent revision of the national curriculum. Actually, from 1998 to 2022, there have been five revisions over roughly four years, and teachers who must implement each new curriculum may experience the revision cycle as even shorter (Kim, 2008). Such frequent curriculum reforms create instability, making longitudinal and comparative research difficult. Moreover, because research funding is largely policy-driven (Jang, 2014), topics often follow government priorities rather than organically emerging from scholarly discourse. A representative example is research on AI-empowered digital textbooks. With the change of government and the resulting shift in AI-based education policy, AI-empowered digital textbooks have been reclassified as educational materials (Kim, 2025). leading to a sharp decline in related research funding support. Another challenge lies in the evaluation system for research productivity, which emphasizes individual publication counts, discouraging collaborative and interdisciplinary projects (Kim, et al., 2022). Finally, institutional barriers – such as limited localization support and financial constraints – restrict the country's ability to host large-scale international conferences like EARCOME or ICME, despite the strong intellectual infrastructure present within KSME and related societies. Despite these challenges, the KSME Board has resolved to co-host academic conferences with neighboring countries, such as the Japan Society of Mathematical Education and the Chinese Society of Mathematical Education, in order to further support the active international engagement of Korean mathematics educators, and is currently seeking to initiate contact with these organizations.

How is collaboration between mathematics educators and teachers organized in your country to implement research findings into practice?

Collaboration between researchers and teachers in Korea is both institutionalized and practice-oriented. The Korean Society of Mathematical Education plays a key role in bridging this gap by involving teachers in workshops, conferences, and collaborative projects. Nationwide groups such as the National Elementary Mathematics Research Association and the Mathematics Culture Research Association engage teachers in classroom-based studies, often presented through roundtables and practice-sharing sessions during KSME's annual conferences. Moreover, KSME organizes research exhibitions and R&E (Research and Education) presentations for high school students, encouraging early research engagement. Beyond conferences, the Society's newsletter regularly (6 times per year) features mathematics problems and teaching insights contributed by school teachers. Through additional initiatives such as the Mathematics Essay Contest, Peer Teacher Mentorship Program, and the Woobo Education Award, KSME recognizes and supports exemplary teaching and practitioner-led inquiry.

International Perspectives and Collaborations

To what extent do international research trends and discussions influence mathematics education in your country?

Korean mathematics education is deeply influenced by global research trends and actively contributes to international discourse. For example, the recently revised 2022 Mathematics Curriculum shifted in a direction that emphasizes strengthening student agency in lessons and enhancing mathematical competencies such as problem solving, reasoning, communication, connections, and information processing, which shows that these changes are aligned with global trends.

Beyond the curriculum level, Korean mathematics education has begun to actively shape global discussions on AI-enhanced teaching and learning through empirical classroom research and system-level design. For example, Kwon (2024) developed a customized GPTs-based chatbot for pre-service teacher education and analyzed its educational performance in mathematics, showing how generative AI can be embedded in mathematics teacher education in ways that support individualized guidance, formative feedback, and reflective learning on questioning practices. Building on international debates about the role of AI in schools, Shin (2020) examined prospective mathematics teachers' perceptions of AI in mathematics education and identified a nuanced division of labor between teachers and AI: teachers were seen as responsible for relational, open-ended, and affective aspects of teaching, while AI was positioned as a powerful tool for individualized practice, structured assessment, and administrative support. Furthermore, Korea's development of AI-based instructional systems such as the *TocToc Math* (Yeo et al., 2025) reflects not only the principles of personalized learning but also extends AI-teacher co-agency in classroom settings. Korean empirical studies provide further evidence of this trajectory. Collectively, these studies position Korea as a co-constructor of emerging global standards in AI-empowered mathematics education rather than a mere adopter of external models.

Educational Policy and Practice

What role does mathematics education research play in shaping educational policies and curricula in your country?

Mathematics education research in Korea has a direct and significant influence on national policy and curriculum development. Empirical studies conducted by universities and societies such as KSME and KICE (Korea Institute for Curriculum and Evaluation) provide foundational evidence for curriculum reform. For example, 2022 revision mathematics curriculum introduced conceptual refinements such as the representation of equality and equivalence and the use of dual number lines in textbooks – changes that stemmed from research on students' mathematical reasoning. Moreover, studies on teachers' and students' perceptions inform how achievement standards are framed and operationalized. Many mathematics education researchers also serve as curriculum consultants or policy advisors, ensuring that educational reforms remain theoretically grounded and pedagogically sound.

Are there any special programs or initiatives focused on teacher training or professional development in mathematics?

Korea's teacher training system is both rigorous and structured. Pre-service education is provided through National Universities of Education (for elementary teachers) and Colleges of Education (for secondary teachers), which integrate disciplinary mathematics, pedagogy, and classroom practicum. In-service teacher development is managed by regional Offices of Education through mandatory and elective programs. At the national level, the Fourth Comprehensive Plan for Mathematics Education (2020–2029) emphasizes mathematical literacy, AI-based teaching, and interdisciplinary integration. The Korea Foundation for the Advancement of Science and Creativity also sponsors projects that enhance teachers' capacity to use AI tools, digital platforms, and STEAM-oriented curricula. Through these initiatives, Korea aims to strengthen teacher professionalism and sustain innovation in mathematics classrooms.

What particular challenges will educational policy in your country have to face in the coming years?

Korea's mathematics education policy must navigate several complex challenges in the near future. The first is ensuring mathematics education for all, particularly addressing the needs of students from multicultural or disadvantaged backgrounds. The second challenge arises from demographic decline, which requires rethinking school structures, resource allocation, and long-term curriculum goals. Third, the rapid spread of digital technologies demands ongoing teacher professional development to ensure that technological tools – ranging from calculators to dynamic geometry software – are used effectively rather than superficially. Finally, there remains a persistent gap between curriculum achievement standards and their practical realization in classrooms; future policies must provide more concrete guidance on how to implement and assess these standards in diverse learning environments.

Could you describe how both teacher education and the school system are structured in your country?

Teacher education in Korea operates through two main institutional pathways: National Universities of Education, which prepare elementary teachers, and Colleges of Education, which train secondary school teachers. Both systems emphasize a balance of mathematical content knowledge, pedagogical content knowledge, and teaching practicum. After appointment, teachers

receive continuous professional development organized by the Provincial Offices of Education. Many teachers later pursue graduate studies in mathematics education to deepen their research competence. Korea's school system itself consists of six years of elementary education, three years of middle school, and three years of high school, followed by optional university education. This structure allows for coherent progression but also creates challenges for aligning teacher education with evolving curricular demands.

Future Perspectives

What trends or developments do you see as particularly promising or important for the future of mathematics education in Korea?

One particularly promising direction for the future of mathematics education in Korea is the growing emphasis on internationalization across research, teacher education, and classroom practice. Korean mathematics education has matured to a point where global exchange is no longer supplementary but essential for advancing innovation and maintaining relevance in a rapidly changing educational landscape.

In this regard, the Korean Society of Mathematical Education (KSME) has been actively expanding its role in fostering international joint academic conferences. By co-organizing conferences, special issue forums, and research symposia with partner organizations, we seek to create sustained platforms where scholars, teachers, and policymakers can share insights, compare curricular reforms, and examine emerging pedagogical models. These joint events help build a common research agenda and cultivate a more integrated global mathematics education community.

A third development I view as highly important is the deliberate strengthening of collaborative research partnerships with Asian countries. East and Southeast Asia face many shared educational challenges – such as enhancing students' problem-solving capacities, integrating digital technologies, and supporting teacher professional learning – yet each country brings distinctive cultural and institutional strengths. Collaborative studies, cross-national lesson analyses, and regional research networks offer a powerful pathway for generating contextually sensitive but internationally relevant knowledge.

Together, these efforts – internationalization, global joint conferences, and deeper collaboration across Asia – represent strategic directions that will significantly shape and enrich the future of mathematics education in Korea.

What steps do you believe are necessary to further promote and improve research and practice in mathematics education in Korea?

First, we must expand and redesign teacher professional development so that it becomes more subject-focused, enabling teachers to deepen both their mathematical understanding and their pedagogical content knowledge. Effective mathematics teaching cannot rely solely on general pedagogical training; it requires sustained opportunities to engage with the discipline itself.

Equally important is enhancing the quality of teacher education for preservice teachers, particularly regarding their expertise in interpreting and using the national curriculum guides and teacher manuals. Building a strong foundation at the preservice stage ensures that beginning teachers enter the profession with a coherent understanding of mathematical trajectories, instructional design, and student learning progressions.

In addition, researchers need to engage more directly with authentic classroom practice. By grounding research in real-world instructional cases – documenting lessons, analyzing student thinking, and examining teacher decision-making – we can generate insights that meaningfully inform both theory and practice.

Another promising direction is the development of mathematics coaching systems. Well-prepared mathematics coaches can support teachers through classroom-based mentoring, collaborative planning, and ongoing reflection, helping to bridge the gap between research and daily instructional practice.

Finally, Korea needs long-term, policy-oriented research initiatives that examine the systemic conditions shaping mathematics education. Multi-year projects that explore curriculum reform, technology integration, assessment innovation, and equity issues will provide the kind of evidence base needed for sustainable policy improvement.

Taken together, these steps – subject-specific teacher training, strengthened preservice preparation, research deeply connected to classroom practice, the establishment of mathematics coaching roles, and long-term policy research – will play a critical role in advancing mathematics education in Korea.

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Jinho Kim, President of KSME
jk478kim@dnue.ac.kr