BOOK OF ABSTRACTS

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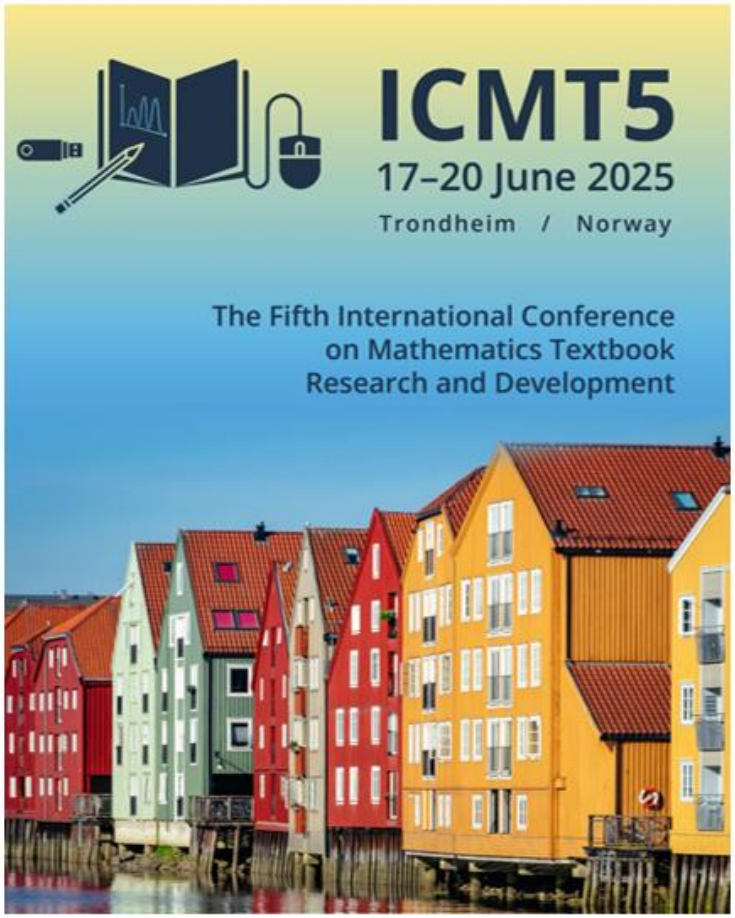

Content

17.6.2025

Plenary session

Speaker	**Alden Jack Edson** Michigan State University, East Lansing, Michigan, USA
Title	**The Evolution in Curriculum Design of a Problem-Based Mathematics Curriculum: New Directions for the AI World**
Abstract	This session explores the evolution of curriculum design within the Connected Mathematics Project (CMP), highlighting its efforts to provide a problem-based mathematics curriculum, Connected Mathematics. For over 40 years, CMP has developed student and teacher materials through iterative design, extensive field-testing, evaluation, and dissemination, adapting to emerging educational - 6 - needs and technological advancements. Over four iterations, the curriculum evolved to meet diverse needs, contexts, and populations. Each iteration reflects a commitment to helping students and teachers develop mathematical knowledge, understanding, and skill along with an awareness of and appreciation for the rich connections among mathematical strands and between mathematics and other disciplines. As educational needs and technological advancements have evolved, CMP has embraced these changes to further enhance its curriculum. The design of a mathematics curriculum involves setting clear learning objectives, engaging students with meaningful problems, employing sound pedagogical strategies, providing robust assessment and feedback mechanisms, and supporting teacher planning and reflection. Recent advances in digital technologies have prompted CMP to develop a digital collaborative platform that integrates artificial intelligence for teaching and learning. Artificial intelligence in education often focuses on personalized learning, support for students with special needs and multi-language learners, online and blended learning, and teacher feedback on classroom dynamics and student engagement. This session will discuss how CMP's platform integrates artificial intelligence to assess, support, and track students' proportional reasoning, potentially transforming the teaching and learning of mathematics. Understanding these developments is crucial for advancing student engagement, improving teaching practices, supporting teacher growth, and informing future educational policies.

Oral communications 1

Parallel session 1A (room U201)

Authors:	**Karin Alush**[1,2], Shai Olsher[1], Yaniv Biton[2] 1: The University of Haifa, Haifa, Israel; 2: Center for Educational Technology, Tel Aviv, Israel
Title (ID):	*Exploring elementary school students' involvement in modifying learning resources* (1132)
Abstract:	This research contributes to the development of student-centered digital learning resources, fostering 21st-century skills by prompting students to engage critically and actively in their learning processes. It focuses on involving students in the design and improvement of digital learning resources, aiming to shift their role from users to active participants in the development process. The research draws on suggestions from 4th and 6th-grade students, examining their experiences with three types of digital resources - assessment, practice, and game-based questionnaires. This qualitative study identifies key themes in the student's suggestions focusing on clarity, task difficulty, and real-world relevance. The findings reveal differences in how students in different age groups engage with digital tasks, offering insights into how student input can inform curricular design.
Author:	**Marcus Gustafsson** Karlstad University, Sweden
Title (ID):	*Designing a topic-centred teacher guide: A case study of quadratic equations* (1122)
Abstract:	In this paper, the process of designing a teacher guide for quadratic equations is described. In specific, how educative features together with contextual factors influence the design process of the teacher guide. The results indicate that this is an iterative two-way process between designing educative and contextual features, and that using features to guide the design is a productive way forward. Further, taking the research findings on quadratic equations as a starting point in the design had implications on the process of designing different features. Implications for designs of topic-centred teacher guides are suggested in the paper.
Authors:	**Fei Zhang**[1], Jiling Gu[2], Xiaoyan Zhao[2], Fu Ma[2], Chunxia Qi[3] 1: Jiangsu Second Normal University, China; 2: Nanjing Normal University, China; 3: Beijing Normal University, China
Title (ID):	*How to design textbooks for promoting students' structural learning: Exploration of designing bnup junior high school textbooks* (1121)
Abstract:	One of the ultimate goals of designing structured textbooks is to promote students' capacity to learning and thinking structurally. In this paper, it is reported when designing the junior high school mathematics textbook published by Beijing Normal University Press (BNUP Textbooks) in mainland China, how to enhance students' to

	build up their structure of learning mathematics. Students are expected gain insights into four types of structures, that is, the logical structure between mathematics content, the growing structure of specific mathematics objects, the research structure of similar knowledge, and the learning structure within each unit. Several suggestions together with examples in the textbook series are illustrated.
Authors:	**Solomon Tesfamicael**, Per Gunnar Østerlie Department of Teacher Education, Norwegian University of Science and Technology, Norway
Title (ID):	*Analysis of the automated feedback types embedded in virtual mathematics teaching resource for T-matte in Norway* (1138)
Abstract:	This paper examines the automated feedback mechanisms integrated into the mathematics course "forsering matematikk 1T," which is part of the national educational platform Digilær.no, aimed at lower secondary school students across Norway. The research utilized feedback classification frameworks established by Hattie and Timperley (2007) and Shute (2008) to analyze the types of feedback provided. Out of the 1,056 tasks and activities reviewed, the findings revealed that the predominant form of feedback was Knowledge of Results (KCR), which accounted for 68.2% of the feedback at the task level and was characterized by delayed timing. In contrast, Elaborated Feedback (EF), which is typically more detailed and informative, constituted only about 17.0% of the feedback provided, also with delayed timing. While existing literature suggests that automated feedback can enhance learning outcomes, the predominance of KCR over EF indicates a significant area for improvement.
Author:	**Xu Hua Sun** University of Macau, Macau S.A.R. (China)
Title (ID):	*Making mathematics connections: A framework of "variation problems" in Chinese textbook* (1117)
Abstract:	A central issue is developing a coherent mathematics curriculum and avoiding treating mathematics as a body of isolated concepts and procedures—an important goal of mathematics textbooks. This issue has been analyzed in a series of curricula and task design and analysis studies. Moving towards mathematics connections practice in curriculums remains largely unseen. One possible reason is that we fail to possess the necessary "framework" in the comparing example to identify useful information about variation practice. This study aims to develop this framework, identifying this practice and its functions in general. This paper reports on the development of an analytical instrument from variation problems ["one problem multiple solution methods" "one problem multiple changes" and "multiple problems one solution method"] as used in Chinese textbooks which identifies concept /solution/ context connections in mathematics textbook examples in developing coherent curriculum. Some educational implications are suggested.

Parallel session 1B (room U301)

Authors:	**Birgit Pepin**[1,2], Iveta Kohanová[1] 1: Norwegian University of Science and Technology, Trondheim, Norway; 2: Eindhoven University of Technology, Netherlands
Title (ID):	*Meta-resources as perceived by pre-service mathematics teachers in an intervention study on designing lessons on reasoning and proof* (1143)
Abstract:	In this paper we report on an intervention study (which was part of an EU-funded study including five international country teams), where pre-service mathematics teachers (PMTs) used and experienced particular resources to design lesson plans for 8th grade students in Norway. Recognising that material resources were needed for PMTs to design lessons, we identified particular material resources as important, but also social/human resources. Leaning on the conceptualisation of 'resources' (material, social/human, cognitive) in the literature, we categorise the four most important resources reported upon and explain and broaden the understanding of 'metaresources' to include social/human resources. Moreover, we link the notion of metaresources to the notion of "curricular noticing" (Dietiker et al., 2018).
Authors:	**Maxim Brnic**, Gilbert Greefrath University of Münster, Germany
Title (ID):	*Interactive and accessible? A first insight into the analysis of digital textbooks with regard to their current development status* (1125)
Abstract:	This study examines the state of the art of digital mathematics textbooks, focusing on the implementation of interactivity and customisation options as key features of modern digital textbooks. This is done in the context of accessibility, which is regulated in the European Union for digital textbooks and can be beneficial for all students in the context of Universal Design for Learning. In a first step, the most up-to-date digital textbooks used in Germany in the 7th grade are examined. The study shows a discrepancy between potential digital improvements and their actual implementation. There are only a few interactive visualisations and task formats in the digital textbooks and hardly any individual customisation options, which are particularly relevant for accessibility.
Author:	**Su Liang** University of Texas, San Anotonio, United States of America
Title (ID):	*Impact of Integrated STEM on Pre-Service Teachers' Math Learning* (1140)
Abstract:	This preliminary study explores the design, implementation, and impact of an innovative curriculum featuring three integrated STEM modules in a mathematics content course for pre-service elementary teachers (PSETs) at a Hispanic-serving institution in the southern United States. The analysis highlights the modules' impact on

	students' learning experiences and outcomes, offering insights into how an integrated STEM curriculum enhances conceptual understanding and engagement in mathematics for future elementary educators. The research also emphasizes the alignment of these modules with textbook development principles, such as scaffolding, contextualization, and interdisciplinary approaches, making it a valuable contribution to the discourse on reimagining mathematics textbooks to better prepare future educators for 21st-century classrooms.
Authors:	Gintautas Jakštas, **Rimas Norvaiša** Vilnius University, Vilnius, Lithuania
Title (ID):	*Fractions and functions in Lithuanian mathematics textbooks* (1151)
Abstract:	After revising the General Mathematics Curriculum in 2022, the preparation of new math textbooks began in Lithuania. We present the results of the analysis of the topics of fractions and functions in new books. Some problems are related to the lack of conceptualization of numbers and ambiguity in the function concept. Among the causes of the issues is the textbook development system. We have discussed the possible cultural causes of problems with school mathematics content.
Author:	**Allan Tarp** MATHeCADEMY.net, Denmark
Title (ID):	*Textbooks in a decolonized future where two 1s and one 2s total one 4s, and not three 3s* (1111)
Abstract:	Meeting existence before essence, counting makes children use bundle-numbers with units, which reverses the operations' order: power bundles bundles, division pushes away bundles, multiplication pushes back to a stack that subtraction pulls away to find the unbundled to place on-top of the stacks. Recounting now roots core math. Between units on a BundleBundleBoard used as division-table, it roots proportionality. Between icons and tens, it roots multiplication-tables and early algebra as well as solving equations. Between physical units, it roots per-numbers and fractions. Between the lines in a stack, it roots trigonometry. And from stacks to squares, it roots square roots and quadratic equations. Once counted and recounted, stacks may finally add, on-top after recounting has made the units like, or next-to as areas rooting integral calculus.

Parallel session 1C (room L402)

Authors:	**Robert von Hering**, Anna Grube, Henning Sievert University of Flensburg, Germany
Title (ID):	*Vocational Orientation in Primary School Mathematics Textbooks* (1153)
Abstract:	Vocational orientation is a topic that can be addressed in the context of general education, including in primary school mathematics education. There is potential for vocational contexts to be combined with mathematical competences as well as for vocational orientation. However, this requires sufficient learning opportunities within vocational contexts. This raises the question of the extent to and quality of which learning opportunities in a vocational context can be identified in mathematics textbooks as representatives of the potentially implemented curriculum. We analysed 13,515 learning opportunities of 20 German mathematics textbooks (five different series, Grades 1 to 4) and identified 46 within a vocational context. Of these, only 14 had a high level of potential for vocational orientation.
Authors:	**Jietong Luo**[1], Shuhui Li[2] , Jiali Tang[3] , Lianghuo Fan[4] 1: The Chinese University of Hong Kong, Hong Kong SAR, People's Republic of China; 2: East China Normal University, People's Republic of China; 3: Chongqing Normal University, People's Republic of China; 4: University of Macau, Macau SAR, People's Republic of China
Title (ID):	*Investigating Exemplary Interdisciplinary Contents in Mathematics Textbooks: Cases from China and The United States* (1119)
Abstract:	This study aims to examine the features of exemplary interdisciplinary contents in mathematics textbooks from China (the PEP series) and the United States (the BIM series), with a focus on their interdisciplinarity, cognitive demand, and some additional aspects such as context, task design, disciplinary balance, and pedagogical function. Four exemplary interdisciplinary contents, two from each textbook series, are selected as representative cases for an in-depth analysis and comparison. The findings reveal some common features of exemplary contents, including that they both use real-world scientific or economic contexts, with high cognitive loads which require various content knowledge from mathematics and other disciplines. There also exist some notable differences between the two series: the cases from the PEP series adopt more specialized scientific research scenarios which require higher-level abstract mathematics (e.g., functions, probability), while those from the BIM series emphasize more real-life social contexts which require relatively easy arithmetic knowledge and more complex calculations. Implications for textbook design and future research are discussed at the end of the article.

Authors:	**Riku Sayuj**, Janine Remillard, Amanda Barany University of Pennsylvania, United States of America
Title (ID):	*A comparative study of teacher positioning through curriculum materials in two educational systems* (1136)
Abstract:	This study examines how mathematics curriculum materials position teachers in relation to professional autonomy and expertise in the USA and Finland. Employing Epistemic Network Analysis (ENA), we analyzed instructional guidance of teacher's guides in each context. Positioning theory guided our analysis, highlighting cultural narratives embedded in curriculum materials. Findings indicate significant differences in teacher positioning: Finnish materials consistently emphasized instructional autonomy, positioning teachers as professionals with expertise. In contrast, U.S. materials frequently employ directive guidance, suggesting a more constrained professional role. This study contributes to understanding how curriculum materials reinforce cultural norms related to teaching and the teacher's role.
Authors:	**Danni Lin**[1], Mucheng Zhang[1], Xiya Liu[2], Yanyan Tian[3], Jian Liu[1] 1: Beijing Normal University, People's Republic of China; 2: Chaoyang School, High School affiliated to Renmin University of China; 3: Beijing Fangshan District education quality monitoring center, China
Title (ID):	*Opportunity to develop critical thinking skills in Chinese and Singaporean 1st grade mathematics textbooks* (1158)
Abstract:	This paper examines opportunities for developing critical thinking (CT) skills in first-grade mathematics textbooks from Singapore and China. Using the Delphi Report framework, we conducted a quantitative content analysis of Targeting Mathematics 1A and New Century Mathematics Grade 1, Part 1. The findings indicate that both textbooks emphasize interpretation but give limited attention to higher-order skills like evaluation and self-regulation. New Century Mathematics incorporates more CT elements in "Statistics and Probability," while "Graphic and Geometry" is the most CT-rich domain in Targeting Mathematics. Additionally, Targeting Mathematics offers a broader range of CT skills and more frequent analysis opportunities across content areas compared to New Century Mathematics.
Author:	**Andualem Tamiru Gebremichael** Norway
Title (ID):	*Learning geometry in two cultural contexts: What does examining textbooks tell us* (1180)
Abstract:	This paper reports on a study that examines the presentation of second-grade geometry in two textbooks used in the respective countries - Ethiopia and Norway. It draws on didactical phenomenology, the van Hiele model of geometrical thinking, and adopts suggestions of three geometry strands for second-grade geometry education. The study employs a document analysis method. The results show that the Ethiopian textbook focuses mainly on the analysis level, while the Norwegian focuses on the visualization level. Though little is available, real-life phenomena are used as starting points in the Ethiopian textbook. While the Norwegian textbook presents real-life

	phenomena well, there is little use of these phenomena as starting points. Both textbooks focus on the two strands - constructing and operating with shapes and figures - and ignore the orienting strand. The study's implications are set out.

Symposium

Organizers	**Sebastian Rezat[1], Dubravka Glasnović Gracin[2], Hendrik Van Steenbrugge[3], Henning Sievert[4]** 1: Paderborn University, Germany; 2: University of Zagreb, Croatia; 3: Stockholm University, Sweden; 4: University of Hildesheim, Germany
Title	**The Quality of Print and Digital Mathematics Curriculum**
Abstract	Due to the special role of curriculum resources (CR) in the educational system, their content, structure, use, effects, and nature—particularly the transition from print to digital—have long been the subject of research (Fan et al., 2013; Rezat, 2024). This research has resulted in a highly differentiated view of CR and the factors influencing their use. However, there appears to be no clear, shared vision regarding the quality of print and digital CR. In the case of textbooks, this is reflected in the multitude of catalogs with varying textbook evaluation criteria. This symposium aims to establish a clearer vision of the quality of print and digital CR, the factors that influence and contribute to it, and how the quality of CR can be examined by addressing the following questions: 1. How can the quality of print and digital CR be conceptualized, operationalized, and measured? This also includes the relationship between quality features and the use of these resources. 2. What factors and features relate to the quality of print and digital CR? 3. What does "the quality of digital CR" mean, and how does it differ from the notion of "quality of printed CR"? 4. What quality features are more generic, and which seem to be more context-specific? Contributions: 1) *S. Rezat, D. Glasnović Gracin, & H. Van Steenbrugge:* The quality of digital curriculum resources surfaced in mathematics education research 2) *S. Olsher, M. Yerushalmy, & A. Weizman:* Curriculum resources' descriptive structure: Difference as a measure of quality 3) *A. Wunsch, R. von Hering, & H. Sievert:* Determining textbook quality in primary school's topic data and chance 4) *J. Remillard, T. Koljonen, H. Krzywacki, L. Condon, & R. Sayuj:* Curriculum material quality from the perspective of teacher enactment


ICMT5

Poster session

(ID) Title	Author(s) Affiliation(s)
(1128) Learning opportunities for length measurement in Taiwanese and German elementary textbooks	**Silke Ruwisch**[1], Hsin-Mei E. Huang[2] 1: Leuphana University Lüneburg, Germany; 2: University of Taipei, Taiwan R.O.C.
(1149) Enhancing Geometric Understanding in STEM Education through Integrated 3D Modules for Pre-Service Mathematics Teachers	**Liang Su** University of Texas, San Anotonio, United States of America
(1173) Development of fractions in three countries' curriculum: Türkiye, Japan and Norway	**Zelha Tunc Pekkan**[1], Keiko Hino[2], Kristina Markussen Raen[1] 1: University of Agder, Kristiansand, Norway; 2: Utsunomiya University, Japan
(1184) Using tools from time series analysis for analysing exercises in textbooks	**Jöran Petersson**[1], Paul Andrews[3,4], Judy Sayers[2] 1: Malmö University, Sweden; 2: School of Education, University of Leeds, Leeds, UK; 3: Centre for Educational Research, VIA University College, Aarhus, Denmark; 4: Department of Teaching and Learning, Stockholm University, Stockholm, Sweden
(1185) The interplay of educative features in printed and digital curriculum resources	JeongSuk Pang[1], **MinYoung Oh**[2] 1: Korea National University of Education, Republic of South Korea; 2: Graduate School of KNUE, Republic of South Korea
(1186) A three-dimensional framework for textbook analysis	Ida Bergvall[2], Anneli Dyrvold[1], **Kristina Palm Kaplan**[3] 1: Umeå University, Sweden; 2: Uppsala University, Sweden; 3: University of Gävle, Sweden
(1189) A bilingual teachers' interaction with curriculum resources to support multilingual students learning in mathematics	**Camilla Normann Justnes** Norwegian University of Science and Technology, Norway

(1190) Using reconstructed textbook activities to teach the properties of even and odd numbers	**HaeSong Oh**[1], JeongSuk Pang[2] 1: Graduate School of Korea National University of Education, Republic of South Korea; 2: Korea National University of Education, Republic of South Korea
(1191) Discernments needed when interpreting representations in print	**Anneli Dyrvold**[1], Judy Ribeck Nyström[2] 1: Department of Science and Mathematics Education, Umeå University, Sweden; 2: Department of Language, Literature and Intercultural Studies, Karlstad University, Sweden
(1192) Conditions and constraints of using a Japanese textbook in Danish schools	**Pia Beck Tonnesen** University of Copenhagen, Denmark
(1194) A comparative analysis of the introduction and expansion of multidigit numbers in Korean and Japanese elementary textbooks	**MinKyung Kim**[1], JeongSuk Pang[2] 1: Graduate school of KNUE, Republic of South Korea; 2: Korea National University of Education, Republic of South Korea
(1197) AI competencies for pre-service mathematics teachers: beliefs, self-efficacy, and usage	**Nils Buchholtz**[1], Sebastian Schorcht[2] 1: University of Hamburg, Germany; 2: Technical University of Dresden, Germany

18.6.2025

Plenary session

Speaker	**Jana Trgalová** Haute Ecole Pédagogique du Canton de Vaud, Lausanne, Switzerland
Title	**Evaluation of digital curricular resources: An issue for research and teacher education**
Abstract	Recent research on the use of digital tools and resources in mathematics education acknowledges the fact that being aware of a tool / resource affordances and limitations is necessary to make relevant choices when planning and enacting digitally enhanced mathematics teaching. Hence, being able to evaluate digital tools and resources appears as a key component of mathematics teachers' digital competency. In this talk, we will compare and contrast diverse approaches to the evaluation of digital resources, highlighting the complexity when it comes to define evaluation criteria. We will conclude by drawing implications for mathematics teacher education and by outlining avenues for further research on this issue.

Oral communications 2

Parallel session 2A (room U201)

Authors:	**Johannah Crandall**, Vilma Mesa University of Michigan, United States of America
Title (ID):	*Navigating stakeholder differences in a design-based research approach to collaborative development of interactive textbook questions* (1168)
Abstract:	In the context of open textbooks that can be authored by multiple people, the question of who can author textbook content becomes paramount. In this project we explore the involvement of multiple stakeholders, Students, Teachers, Authors, and Researchers, as they collaborate to design interactive, short-answer questions for open-source textbooks in calculus and linear algebra, textbooks that also differ in the style of presentation (either definition-theorem-example meant to be presented by the teacher or short texts followed by individual and group explorations and in-class discussion). We present the design-based research methodology we are using and initial differences we perceive as diverse stakeholders negotiate motivations and expectations in the question development process.
Author:	**JeongSuk Pang** Korea National University of Education, Republic of South Korea
Title (ID):	*From curriculum to textbooks: Alignment and enrichment* (1162)
Abstract:	Given the limited research on the textbook development process, this study analyzes how the newly added performance standard on the equal sign and equivalence relationship in the Korean mathematics curriculum has been incorporated into new textbooks. Specifically, we analyze the changes in equation structure in the new textbooks for grades 1-2 compared to previous editions, and how the nine textbooks for grade 4 have organized activities related to the definition of the equal sign, equation structure, and equation solving. Based on these findings, this paper emphasizes the importance of curriculum alignment and enrichment in the textbook development process.
Authors:	Yingchao Liu, **Xiaomei Liu** Capital Normal University, China
Title (ID):	*Structural-oriented design of mathematics textbook* (1165)
Abstract:	Textbooks serve as a bridge connecting the ideal curriculum with the implemented curriculum, acting as a crucial vehicle for transforming curricular ideas into practice. Many countries emphasize big ideas in mathematics curriculum standards. China has proposed a curriculum philosophy that focuses on the structuring of curriculum

	content. Guided by this philosophy, the mathematics textbook of Beijing Normal University Press for Junior High School (2024 edition) using big ideas as the logical thread, organizing the content based on students' cognitive structure. The textbooks innovatively achieve a structured design of textbook objectives, subject content, learning activities, and assessment activities. This provides valuable experience for the structured design of other curricular resources and the implementation of big ideas.
Author:	**Oleksiy Yevdokimov** University of Southern Queensland, Australia
Title (ID):	*New directions in the design of curriculum resources for teaching geometry: The use of visual and analytic generalisations as didactical tools in teacher training* (1150)
Abstract:	The paper discusses how visual and analytic generalisations of theorems in geometry textbooks can serve as didactical tools to enhance mathematics content knowledge in teacher training and can contribute to the development of teachers' skills to promote learning with understanding. The novelty of this method is in combining the elements of content knowledge with specially designed geometry tasks where generalisation plays the leading role towards establishing different properties and their proofs.
Author:	**Deepak Basyal** Coastal Carolina University, United States of America
Title (ID):	*Translating words into symbols: Exploring opportunities in textbooks and student performance* (1154)
Abstract:	Translating real-world problem contexts into mathematical symbols is a crucial skill emphasized in curricula worldwide. This study investigates students' word-to-symbol translation skills and explores how prior-grade textbooks support learning these skills. A sequential explanatory study was conducted to understand this phenomenon. A test was administered to 10th graders, and prior-grade textbooks (Grades 6-9) were analyzed. Results show that students struggle to convert real-world contexts into mathematical symbols, and textbooks offer limited practice opportunities. In particular, students struggle to translate symbols into real-world contexts, suggesting a link between textbook opportunities and student achievement. These skills should be emphasized more in the curriculum and teaching.

Parallel session 2B (room U301)

Authors:	Siri-Malén Høynes, **Iveta Kohanová** Norwegian University of Science and Technology, Trondheim, Norway
Title (ID):	*Norwegian mathematics teachers' use of resources in reasoning and proving* (1101)
Abstract:	Learning reasoning and proving (R&P) is an important part of learning mathematics. In this paper, we present which resources 161 Norwegian teachers reported using when preparing and teaching lessons on R&P. Follow-up interviews with ten of these teachers provided additional insights into how these resources are used. We applied the curricular noticing framework (Dietiker et al., 2018) to identify how teachers attend to, interpret, and respond to different curricular materials. Findings reveal varied approaches to engaging with resources based on teachers' instructional goals, as well as challenges in interpreting the new curriculum and navigating available resources. These findings underscore the need for clearer curricular guidance and more accessible resources to support the curriculum's focus on R&P.
Authors:	Siyu Zuo[1], Lizhe Liu[2], **Chunxia Qi**[1] 1: Beijing Normal University, China; 2: Capital Normal University, China
Title (ID):	*Investigating Chinese teachers' curricular noticing through a project-based learning lesson study* (1137)
Abstract:	This study uses a new type of noticing, termed curricular noticing, to address the question: How teachers attend to, interpret, and respond to textbooks through the project-based learning (PjBL) lesson study? This study included analyses of Chinese junior secondary mathematics textbooks, as well as multiple case studies of several teachers and their classes. Data consist of lesson plans, videotaped lessons, interview, discussions, students' pre and post-lesson quizzes, and reflection reports. Findings present the characteristics of this interactions when design a PjBL, including creating additional curricular material related to its content
Authors:	**Ayla Carvalho**, Rúbia Amaral São Paulo State University, Brazil
Title (ID):	*Teacher-textbook relationship: Interpreting and using mathematics textbooks by teachers* (1113)
Abstract:	This article presents the conceptions of doctoral research aimed at comprehending the relationship between teachers and textbooks, focusing on how teachers interpret and use these materials in their practice. The Design Capacity for Enactment framework guides the study, integrating the concepts of agency and affordances to analyze this relationship. This qualitative research, conducted through the theorEM System and a case study, follows three Mathematics teachers as they plan and teach classes while participating in interviews and writing reflective narratives about their practice. The research aims to significantly contribute to understanding the teacher-textbook relationship, which still needs to be explored, particularly in the Brazilian context.

Author:	**Rafalska Maryna** University Côte d'Azur, France
Title (ID):	*Bridging borders: Understanding Ukrainian teachers' interactions with foreign curriculum resources* (1120)
Abstract:	This study aims to enhance our understanding of how teachers interact with foreign mathematics curriculum resources and the factors influencing these interactions. It analyzes two cases of foreign resource adaptation by Ukrainian teachers. This includes examining the original intentions behind resources designed in different cultural contexts, as well as how these resources are viewed and used from the perspective of Ukrainian teachers. The findings emphasize that teachers' interactions with foreign curriculum resources are shaped by multiple factors, particularly the existence of national evaluation and state-certified textbooks provided free of charge to all students in Ukraine, as well as the pedagogical approaches and mathematical praxeologies embedded in these resources.
Author:	**Marie Therese Farrugia** University of Malta, Malta
Title (ID):	*Bilingual materials for mathematics in Malta* (1106)
Abstract:	In Malta, mathematics is frequently accessed through translanguaging with English and Maltese. This is certainly the case when the teacher's and students' home language is Maltese, because textbooks and other written materials – including examinations – are in English, a legacy of British colonisation that ended in 1964. However, although much translanguaging occurs in verbal interaction, Maltese is not used for written mathematics. In this paper I describe classroom materials that I designed, and that included Maltese text, as part of a design-based research project carried out in an elementary school. The inclusion of Maltese text was viewed positively by both teacher and students and I suggest that this approach might be taken on board as an integral part of a translanguaging pedagogy.

Parallel session 2C (room L402)

Authors:	**Bjørn Smestad**[1,2], Hilde Opsal[1] 1: Volda University College, Norway; 2: OsloMet - Oslo Metropolitan University, Norway
Title (ID):	*Definitions of quadrilaterals in Norwegian mathematics textbooks from 1930 to 1986* (1146)
Abstract:	Definitions are important in mathematics. In this paper, we discuss definitions of quadrilaterals in mathematics textbooks in Norway. Hovtun and Dreyer (2024) studied 24 new textbooks from 2006 to 2020. We have, based on their criteria, analysed definitions of quadrilaterals from 380 textbooks in the period from 1930 to 1986. We find a similar lack of consensus on the definitions of quadrilaterals as Hovtun and Dreyer, but a higher proportion of definitions including both necessary and sufficient conditions in the 1960s and 1970s than the newer textbooks. We also found more minimum definitions. We argue that our method, based on searches of full-text databases, is a valuable supplement to manual reading of textbooks.
Author:	**Kristín Bjarnadóttir** University of Iceland, Iceland
Title (ID):	*Tölvísi – Number wisdom – A 19th century textbook* (1148)
Abstract:	In 1865, the Icelandic Literary Society published the first Icelandic textbook on advanced arithmetic and algebra, Tölvísi – Number Wisdom. The author, Björn Gunnlaugsson, had recently retired after forty years of teaching at Iceland's sole secondary school. His goal was to create a comprehensive textbook, covering not only the curriculum taught at schools, preparing for universities, but more. A comparison shows that its content resembles a textbook by Christian Ramus (1855), although Tölvísi is three times as long. The author's main focus seems to be on divisibility and precisions in approximations, which ties to his major work: a geodetic survey that produced the first reliable map of Iceland. Only half of the manuscript was printed400 pages, in 700 copies–and it did not include practical topics such as ratios, proportions, and interest calculations. The book was largely unintelligible to most of the Society's readers and was never adopted at the school. The aim of this paper is to investigate the book's content to consider whom it could serve.
Authors:	**Mucheng Zhang**[1], Danni Lin[1], Yanyan Tian[2], Xiya Liu[3], Jian Liu[1] 1: Beijing Normal University, People's Republic of China; 3: Beijing Fangshan District education quality monitoring center, China; 2: Chaoyang School, High School affiliated to Renmin University of China
Title (ID):	*Changes in problem contexts in middle school mathematics textbooks: A longitudinal comparative study of equation topics in China* (1159)
Abstract:	Mathematics curriculum guidelines emphasize the critical role of problem contexts in developing students' mathematical literacy. Over the past two decades, Chinese middle school textbooks have increasingly integrated

	diverse problem contexts, especially in the "equations" unit. This study analyzes two popular textbooks from the People's Education Press (2003–2024), utilizing a framework that examines both internal and external characteristics. The results reveal enhanced mathematical complexity, task difficulty, and authenticity, with higher cognitive demands. Additionally, there is a notable increase in real-life, occupational, and mathematical contexts, improving relevance. These shifts highlight the educational value of problem contexts and suggest ways for teachers to more effectively utilize textbook materials.
Authors:	**Marc van Zanten** Netherlands Institute for Curriculum Development SLO & Utrecht University, the Netherlands
Title (ID):	*Actualizing the Dutch legal curriculum for mathematics – Impressions of proces and results* (1164)
Abstract:	In the Netherlands, the legal intended curriculum is of great influence on the work of publishers and authors of textbooks and other curriculum resources. Recently, the government has commissioned the actualization of the Dutch legal core objectives for primary and lower secondary education. For the development of the renewed core objectives for mathematics, an analysis was carried out regarding societal developments and educational trends. This paper reports upon the development process of the actualization of the core objectives and the results thereof, with a focus on new and more emphasized learning content in the drafts.
Authors:	**Maryann Elizabeth Huey**[1], Christa Jackson[2], Lorraine Males[3], Sarah Kasten[4], Sasha Wang[5], Nate Nammany[6] 1: Drake University, United States; 2: St Louis University, United States; 3: University of Nebraska Lincoln, United States; 4: Northern Kentucky University, United States; 5: Boise State University, United States; 6: Mount Vernon High School, United States
Title (ID):	*Fidelity of Informal Inferential Reasoning Tasks in Middle Grade Textbooks* (1172)
Abstract:	With the recent emphasis of statistics as a core component of the secondary mathematics curriculum, the role of inference is gaining in prominence. Current recommendations for statistics education advocate for the introduction of informal inferential reasoning at the middle school level with formalization occurring in later years (Franklin et al., 2007). In this study, we selected five grade 7 mathematics textbooks from the three major textbook publishers: Pearson, McGraw-Hill, and Houghton Mifflin Harcourt. The associated informal inferential reasoning tasks were analysed using a framework developed for characterizing informal inferential reasoning tasks (Huey & Jackson, 2015). We share results and discuss implications for students' opportunity to engage in meaningful learning.

Plenary session

Speaker	**Annalisa Cusi** Sapienza University of Roma, Italy
Title	**The use of digital resources for learning and metacognition: exploring students' perspective**
Abstract	This talk focuses on students' use of digital resources and their reflections on the role of these resources as tools to support mathematics learning and metacognition. Through the lens provided by the instrumental genesis framework (Rabardel, 2002) and interpreting the students' interaction with digital resources and environments in terms of co-action (Hegedus & Moreno-Armella, 2009), I will discuss the main findings of some studies conducted at upper secondary and university levels, which aimed at investigating both the utilisation schemes that students develop when interacting with digital resources, including digital resources using generative artificial intelligence, and their perspectives on this interaction. Based on these results, I will propose some reflections on how the instrumental genesis framework could be extended to take into account the interactions between human users and digital environments in the new context that the advent of generative artificial intelligence has brought to the research scene.

Panel discussion

Panel chair	**Carl Winslow** University of Copenhagen, Denmark
Title	**Panel on recent research about digital curriculum resources**
Abstract	Panelists: • professor **Gilbert Greefrath** (University of Münster, Germany) • associate professor **Shuhui Li** (East China Normal University, China) • professor **Farzad Radmehr** (Norwegian University of Science and Technology, Norway) • associate professor **Osama Swidan** (Ben-Gurion University of the Negev, Israel) The use of digital tools has been common in schools for around 50 years, and it has affected many aspects of mathematics teaching and learning. The development and use of digital textbooks and similar forms of digital material is more recent. As the tools, digital curriculum resources (cf. Pepin & Gueudet, 2018) come in many forms, for instance, text and tool may be integrated. Theorizing is needed for research to capture, with precision, the essential features of digital text for mathematics education, as well as their impact on teaching and learning. The present panel sets out to address the following question: *According to current research, what are the new potentials of digital curriculum resources for mathematics teaching and learning? How can such potentials be theorized?* First, panelists will provide their initial answers, based on personal perspectives and research. Then we invite reactions, questions and further answers from the audience, interspersed with comments from the panel where called for. A round of brief, final remarks by panelists will conclude the session. *Reference* Pepin, B., & Gueudet, G. (2018). Curriculum resources and textbooks in mathematics education. In S. Lerman (Ed.), *Encyclopedia of mathematics education* (pp. 172–176). Springer.

19.6.2025

Plenary session

Speaker	**Lianghuo Fan** University of Macau, Macao SAR, China
Title	**Digitalizing mathematics textbooks in the age of AI: What have we learned from a large research project (EZSMP) in Chinese education settings?**
Abstract	The fast development of information and communication technology, particularly in the area of Artificial Intelligence (AI), has transformed in a sense every aspect of education, including the development and designing of modern mathematics textbooks. Nevertheless, research in this area, particularly about what and how AI can be integrated into the development of mathematics textbooks, is still relatively at an early stage (Fan et al., 2013). This presentation is based on a large research project entitled "A study of developing digital mathematics textbooks and its effect on mathematics teaching and learning", or called EZSMP for short, of which I served as the PI. Starting from 2019, the project team has developed a comprehensive digital mathematics curricular resource platform for mathematics teaching and learning, with a core part being the digitalization of a complete series of mathematics textbooks at the junior secondary level. The digital resources developed have been used in more than 10 schools in the East China region including Shanghai, Zhejiang, and Jiangsu. In the presentation, I will introduce the rationale and research focus, illustrate the conceptual framework, and report the relevant findings of the project. I will also discuss the problems and challenges encountered in the designing, developing and use of the digital mathematics textbooks, and share my views on issues in relation to the development, use and research concerning digital mathematics textbooks.

Oral communications 3

Parallel session 3A (room U201)

Author:	**Jeffrey Choppin** University of Rochester, United States of America
Title (ID):	*Reconceptualizing Analysis of Tasks in Curriculum Materials* (1124)
Abstract:	This paper expands perspectives related to the characterization of tasks in curriculum materials by applying the lens of dialogic potential and by specifying the nature of mathematical activity. To specify the dialogic potential of tasks, the paper draws connections between the non-routine nature of tasks and the potential heterogeneity in how students respond to the tasks. The methodological contribution of the paper is that it provides analytic criteria for characterizing tasks in relation to forms of mathematical activity and mathematical tools, allowing for greater specificity when analysing tasks. Theoretically, the paper connects the dialogic potential of tasks to their non-routine nature and provides specifics of what non-routine tasks look like across mathematical domains.
Authors:	**Elsa Puchaczewski**[1], Marianna Bosch[2], Heidi Strømskag[1] 1: Norwegian University of Science and Technology, Norway; 2: University of Barcelona, Spain
Title (ID):	*Textbooks and didactic transposition analyses: Mathematical modelling in Norway and France* (1166)
Abstract:	Textbooks have always been critical empirical material for analysing didactic transposition processes as partial indicators of the knowledge to be taught. At the same time, considering textbooks from a didactic transposition perspective helps locate their proposals within a set of institutional conditions and constraints that can explain the choices made, as well as their strengths and limitations. This contribution illustrates textbook analysis within didactic transposition processes by examining mathematical modelling as a case study. The specific characteristics of this newly introduced teaching content in European countries are addressed through cases from Norwegian and French first-year upper secondary courses. Compared to other mathematical content, an intriguing difference in treatment emerges, likely linked to the lack of a common, structured body of knowledge about modelling in the scholarly institution.
Authors:	**Fabio Luiz Borges Simas**[1], Rúbia Barcelos Amaral[2], Cecy Leite Alves Carreta[3], Danyal Farsani[4] 1: Universidade Federal do Estado do Rio de Janeiro, Brazil; 2: Universidade Estadual Paulista, Brazil; 3: Escola Municipal de Ensino Fundamental Prof. Joaninha Grassi Fagundes, Brazil; 4: Norwegian University of Science and Technology, Norway
Title (ID):	*Democratic competence in the context of high school: Reflections from integrative projects* (1142)

Abstract:	The National Book and Didactic Material Program (PNLD) distributes textbooks of Integrative Projects (IP) to offer situations that promote Curriculum Integration, provided for in the New Brazilian High School. This study discusses the contributions of IP to the critical education of students, in the light of Critical Mathematics Education and confronts the notions of Curriculum Integration with this governmental initiative. We examined the textbook with the highest circulation in the PNLD 2021. Among the results, it was observed that mathematics is rarely employed to interpret the context presented, that several relevant discussions and critical reflections are left to the teacher's discretion, and that there is an adaptation of the notion of Curricular Integration, which, when compared to theoretical references, weakens its transformative potential.
Authors:	**Melih Turgut**, Farzad Radmehr Norwegian University of Science and Technology, Norway
Title (ID):	*Learning opportunities in YouTube resources: An intrinsic case study on linear transformations* (1145)
Abstract:	YouTube videos are one of the learning resources many undergraduate students use to reinforce their mathematical learning. However, only a few studies have investigated the learning opportunities provided by such online resources. In this study, through an intrinsic case study, we investigate the learning opportunities offered by these resources for studying linear transformations, a key topic in linear algebra. To achieve this, we draw on commognition theory, focusing particularly on how different realization of this mathematical object are discussed in a YouTube video from a highly viewed channel, 3Blue1Brown. The findings indicate that four out of five main realizations of linear transformation are well discussed and connected in this video, making it a valuable supplementary resource for learning linear transformation.
Authors:	**Qianhui Zhao**, Shuhui Li East China Normal University, China
Title (ID):	*Generative ai-driven design and implementation of interdisciplinary curriculum resources: An exploratory case study on the "golden ratio"* (1139)
Abstract:	Designing and implementing interdisciplinary curriculum resources remains a challenge for mathematics teachers. This study explores the potential of Generative AI (Gen-AI) to address these challenges, focusing on the design and implementation of an interdisciplinary module using Gen-AI. Data were collected from one instructor and two seventh-grade students in Shanghai, through interviews and human-Gen-AI interaction data. The results reveal that Gen-AI plays a "supporting" rather than a "replacing" role and can perform seven functions at different stages. Participants gave generally positive evaluations on Gen-AI's roles: positive (3), neutral (3), and negative (1), though greater attention must be given to the potential educational risks that accompany Gen-AI use. Limitations and future directions are discussed in the end.

Parallel session 3B (room U301)

Author:	**Hendrik Van Steenbrugge** Stockholm University, Sweden
Title (ID):	*Developing student teachers' documentation expertise for teaching mathematics in a Swedish context* (1155)
Abstract:	Documentation expertise, or a coherent use of resources is an essential part of a teacher's professionality. Hence, it deserves a specific focus in mathematics teacher education. Yet, preservice teachers seldom learn to interact efficiently with instruction resources. In Sweden, it was not until 2024, that a related examination goal for teacher education came into force. Drawing on the documentational approach to didactics, research on teachers' use of digital resources, comparative textbook study, and the cultural specifics of using instruction resources in Sweden, I will propose a framework for developing preservice teachers' documentation expertise in teacher education in Sweden.
Authors:	**Bethany Rose Woollacott**[1], Anselm R. Strohmaier[2] 1: Loughborough University, United Kingdom; 2: Freiberg University of Education, Germany
Title (ID):	*Analysing the impact of linguistic modifications on how students read and learn from mathematics textbooks* (1161)
Abstract:	Research investigating how students read their mathematics textbooks is limited and unpromising. The existing literature finds that mathematical text is the least-used feature of undergraduate mathematics textbooks, and that undergraduates struggle to read this text – even if they are proficient general readers. In this study, we aimed to gain insights into which aspects of mathematical texts support students' mathematical reading ability. We used eye-tracking technology to investigate the impact of various linguistic modifications on how students read mathematical texts in the style of textbook expositions. Our findings suggest that problematic linguistic features did not impact reading as expected, and we propose necessary areas of research to explore these findings further. We also conclude by suggesting implications for future mathematics textbook exposition design.
Author:	**Anna Dailey**[1], Leslie Dietiker[1], Pelin Jackson[1], Madeline Keyes[2] 1: Boston University, United States of America; 2: Boston College, United States of America
Title (ID):	*Influences on Teachers' Attending to Mathematics Textbooks: Patterns in Lesson Planning* (1167)
Abstract:	This study explores how six high school mathematics teachers attend to curriculum materials during lesson planning and identifies influences on that attention. Staged lesson planning interviews as teachers planned with a diverse set of curriculum materials revealed their attending patterns to certain textbook portions were influenced by a variety of factors, including the teacher's instructional orientation.

Author:	**Zainab Abdallah Saqer** The Ben-Gurion University of the Negev, Beer-Sheva, Israel
Title (ID):	*Student-teacher interactions during geometry learning with e-textbooks* (1177)
Abstract:	This paper presents a study on interactions when students engage with geometrical topics using an e-textbook. Guided by the Interactionism Approach, the study employed qualitative research methods to analyse data collected through observations. The findings indicate that e-textbooks significantly transform classroom interaction dynamics. Specifically, they shift the teacher's role from being the primary source of knowledge to a strategic facilitator, guiding students through their digital exploration. Furthermore, both teachers and students increasingly ask procedural questions, moving beyond basic recall to achieve a deeper conceptual understanding.
Author:	**Ljerka Jukić Matić** University of Osijek, Croatia
Title (ID):	*The role of textbooks in primary mathematics education in Croatia: selection and use* (1109)
Abstract:	This study explores how primary school teachers in Croatia choose and utilize mathematics textbooks, both print and digital formats. Data were collected through a questionnaire that examined textbook utilization in lesson planning and implementation, exercise selection, and the integration of digital textbooks. The results show that teachers predominantly rely on printed textbooks to structure lessons and select exercises, whereas the adoption of digital textbooks remains limited. The findings highlight a tension between the structured use of textbooks and the potential for promoting student autonomy.

Parallel session 3C (room L402)

Authors:	Kinga Szűcs[1], **Mária Slavíčková**[2] 1: University of Erfurt, Germany; 2: Comenius University in Bratislava, Slovakia
Title (ID):	*Gaps in reasoning and proving opportunities between expositions and exercises in lower secondary textbooks related to Thales'theorem* (1118)
Abstract:	The study presented in this paper examines reasoning and proving opportunities in textbooks from the Czech Republic, Hungary, Slovakia and Thuringia. Our findings suggest not only a gap between expositions and exercises in terms of general and particular statements, but they also show that Hungarian textbooks favor deductive reasoning more than textbooks from the three other regions under investigation.
Authors:	**Ole Nikolai Jåtun**, David A Reid University of Agder, Norway
Title (ID):	*Mathematical proofs in Japanese and Norwegian grade 5–9 textbooks* (1131)
Abstract:	This study compares the presentation of proofs in Norwegian and Japanese Grade 59 mathematics textbooks, focusing on logical, mathematical, and didactical structures. Proof and proving have distinct roles in the curricula of these two countries, with Norway recently emphasizing reasoning and argumentation, while Japan has long incorporated proof into mathematics education. The research analyses textbooks from both contexts, focusing on specific theorems such as the sum of interior angles in a triangle, and the Pythagorean theorem. The results reveal differences in how proofs are introduced, structured, and integrated into the learning process across these educational systems.
Authors:	Ryoto Hakamata[1], Fiene Bredow[2], Christine Knipping[2], **Takeshi Miyakawa**[3], Yusuke Shinno[4] 1: Kochi University, Japan; 2: University of Bremen, Bremen; 3: Waseda University, Japan; 4: Hiroshima University, Japan
Title (ID):	*How proof-related words are used in German and Japanese mathematics textbooks (1147)*
Abstract:	In this paper, we analyse and compare the usage of proof-related words in German and Japanese mathematics textbooks. To achieve this, we first explored the words used in proof-related activities. We then identified specific and common attributes of these words and examined functions attributed to these words in proving contexts. The results show that German textbooks use a wider variety of words than Japanese textbooks; however, in both countries' textbooks, the transition from informal to formal usage of proof-related words, from ordinary to mathematical usage, and the formulation of reasoning structures are linguistically marked.
Author:	**Ieva Kilienė** Vilnius university, Lithuania

Title (ID):	*Analyzing arithmetic word problems in Lithuanian textbooks* (1105)
Abstract:	There is presented the study results of the frequency of different types of arithmetic word problems (AWP) in Lithuanian textbooks. The results show the lack of variety among types of AWP. We propose the framework for analysis of the frequency of types of AWP in a textbook and apply it to a particular set of primary school textbooks. We use a statistical method to compare the sample from the textbook rather than the entire textbook. The approach adopted in the paper could be used to analyse other textbooks from different countries.
Author:	**Xinrong Yang** University of Macau, Macau S.A.R., China
Title (ID):	*A longitudinal analysis and comparison of the characteristics of open-ended tasks in Chinese middle school textbooks* (1156)
Abstract:	This study conducts a longitudinal analysis of the characteristics of open-ended tasks in Chinese middle school mathematics textbooks across five editions (1982, 1992, 2003, 2012, and 2022). By integrating multiple frameworks for analyzing open-ended tasks, the study examines the evolution of task conditions, methods, answers, complexity, and extensions, as well as the distribution of task types. The findings reveal that while the proportion and degree of openness of open-ended tasks remains relatively low, significant changes emerged after the 2001 curriculum reform: the diversity of open-ended tasks increased, tasks with multiple possible answers became more prevalent, and the complexity and extensibility of tasks improved. Notably, the proportion of investigation and real-life application tasks increased significantly, while procedural tasks decreased. These changes reflect the influence of China's curriculum reform, which emphasizes higher-order thinking and creativity. However, the dominance of closed conditions and methods suggests that examination culture continues to shape task design.

20.6.2025

Plenary session

Speaker	**Jana Višňovská** University of Queensland, Brisbane, Australia
Title	**Mathematics as (an invisible) theory in the world of curriculum resources**
Abstract	In this presentation I draw on the history of mathematics and mathematics education to show that at the time when mathematics as an academic discipline was reconceptualised, the proposals for propagating the changes to school mathematics were highly contested, and accepted only tentatively, as conjectures to be revisited. Using analyses of current national curriculum documents from Australia and Mexico, I demonstrate that these once tentative changes act as the unquestionable truths about mathematics in schools today. They affect what mathematics can and cannot be—and thus how it can and cannot be encountered by students. In addition, they render certain phenomena invisible (and thus not attended to and unachievable) in both mathematics teaching and mathematics education research. As conceptualised in the primary curricula of these two countries, mathematics is not a practice developed in response to the human need for understanding of quantitative phenomena, and quantitative phenomena are currently not part of the mathematics-to-be-taught. These omissions have severe consequences in that they introduce mathematical incoherencies into classrooms. While it is possible to envision textbooks that correct the omissions introduced by curricular frames to some extent, the cause I raise is that of adopting mathematically coherent conceptualisations to underpin mathematics in curricular frameworks, so that these frameworks could provide sound guidance to textbook designers and teachers. I give two historical examples, from France and China, in which such conceptualisations—theories of school mathematics—underpinned mathematics curricula. I propose some directions for what a construction of a mathematically coherent theory of school mathematics might involve today.

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Parallel session 4A (room U201)

Authors:	**Beatriz Fernanda Litoldo**[1], Douglas Ribeiro Guimarães[2], Danyal Farsani[3] 1: Universidade Federal do Triângulo Mineiro, Brazil; 2: Universidade Estadual Paulista 'Júlio de Mesquisa Filho', Brazil; 3: Norwegian University of Science and Technology, Norway
Title (ID):	*Cryptography, tasks, and cognitive demands* (1116)
Abstract:	Cryptography has been developing as an interdisciplinary context in mathematics education, combining application possibilities with mathematical concepts. The purpose of this study is to analyze tasks from two Brazilian textbooks, conducting the analysis based on the characteristics of the tasks related to Low and High levels of cognitive demand. The analysis of the 24 tasks showed that only two were High level, and the rest were Low level. We conclude that, with these results, the opportunities for developing mathematical skills such as critical thinking and problem solving involving mathematical concepts in the context of cryptography are limited. These findings highlight the need to reevaluate the formulation of tasks in textbooks, especially with regard to cryptography, which can offers a fertile field for High level tasks.
Authors:	**Rúbia Barcelos Amaral**[1], João Vitor Munhoz Duarte[1], Manuela Vieira Matheus[1], Fabio Luiz Borges Simas[2] 1: Universidade Estadual Paulista, Brazil; 2: Universidade Federal do Estado do Rio de Janeiro, Brazil
Title (ID):	*Geometric Constructions in Textbooks Before and After Brazil's High School Reform* (1163)
Abstract:	Brazilian high school has recently undergone a curricular reform, impacting textbooks that are purchased by the government and distributed free of charge to public schools. The research we present compares the 2018 and 2021 editions of two collections of Mathematics textbooks, focusing on geometric constructions content. The 2018 call for proposals was the last before the reform, and the 2021 one, the first after the new guidelines. It was observed that, although the essence of the content remained the same, there were changes in layout and updates to university entrance exam questions. The inclusion of tasks involving computational thinking and dynamic geometry software was the most significant change. However, most tasks still require students to follow instructions, with little room for creative exploration.
Authors:	**Gabriel Alves**[1], Beatriz Litoldo[2], Rúbia Barcelos Amaral[1] 1: Universidade Estadual Paulista, Brazil; 2: Universidade Federal do Triângulo Mineiro, Brazil
Title (ID):	*From wonderland to the enchanted kingdom: The pedagogical potential of tasks in artificial contexts* (1171)
Abstract:	This study investigates the pedagogical potential of mathematical tasks in artificial contexts, absent in textbooks in Brazil. It was observed that textbooks focus on semireal, real and purely mathematical contexts, with little

	exploration of imaginative or fanciful scenarios. As part of the investigation, two examples of tasks in an artificial context are presented, in the teaching of geometry. These activities aim to stimulate students' abstract reasoning and creativity by situating mathematical concepts in playful and fictitious scenarios. The analysis suggests that the diversity of contexts, can enrich teaching by developing cognitive skills, such as critical thinking and flexibility in problem solving, and point out that the inclusion of artificial contexts can complement the other contexts, promoting interdisciplinary and engaging learning.
Authors:	**Margaret Borden**[1], **Michelle Pace**[1], Erin Krupa[1], Dustin L. Jones[2] 1: North Carolina State University, United States of America; 2: Sam Houston State University, United States of America
Title (ID):	*Analysing the authenticity of a U.S. statistics textbook* (1114)
Abstract:	We conducted an analysis of over 1200 problems from a textbook for Advanced Placement Statistics using a modified authenticity framework from Paredes et al. (2020). Each task was evaluated based on five components: event, question, data, purpose, and specificity of information. While the textbook problems showed high authenticity in events, data, and specificity of information, they often lacked a clear purpose and rarely involved the student's role. These findings suggest that curriculum designers can enhance authenticity by focusing on purpose and student involvement, thereby improving real-world application and engagement in statistical learning.
Authors:	Tammy Irene Booysen[1], **Lise Westaway**[2] 1: Rhodes University, South Africa; 2: United Arab Emirates University, United Arab Emirates
Title (ID):	*Is less more: A workbook analysis?* (1127)
Abstract:	Textbooks are central in most countries to the development of mathematical understanding. Visual representations play a significant role in supporting learners' understanding of the various mathematics concepts. In this paper, we report on place value visual representations in Grade 3 workbooks from South Africa and Singapore. We draw on an adapted version of the Visual Representation Framework by Fotakoupoulou and Spiliotopoulou (2008) to analyse the place value concept, the type of visual representation, its relation to the content, and the visual representation's function. The findings indicate that there are many more VRs in the South African workbook than in the Singapore workbooks. The VRs in the South African workbooks have a similar amount of VR in the following categories: type of visual representation, its relation to content and function.

Parallel session 4B (room U301)

Authors:	**Lea Stallmeister**, Sebastian Rezat Paderborn University, Germany
Title (ID):	*Students' use of different material resources for specific purposes in the process of learning mathematics* (1110)
Abstract:	The importance of digital resources alongside traditional ones for learning mathematics has steadily increased in recent years. However, what resources students use and for which purposes the resources are used to learn mathematics outside class cannot be inferred from previous studies. Insights into students' purposes of resource use can contribute to a deeper understanding of students' self-directed learning of mathematics. 1101 secondary school students were surveyed about their resource use in a self-developed questionnaire. The results indicate that the selection of resources varies with the specific purpose of the activity. Despite the wide range of digital resources, the textbook is still the most widely used resource. However, for "better understanding", educational videos are used more frequently than textbooks.
Authors:	**Jennifer Lewis**[1], Saliha Asli Ozgun-Koca[1], Chris Nazelli[1], Charlene Jones[2] 1: Wayne State University, United States of America; 2: Detroit Public Schools Community District, United States of America
Title (ID):	*Students voting with their feet? The effects of curriculum pacing guides* (1182)
Abstract:	This paper reports on the effects of a curriculum pacing regime on teachers' instructional decisions in elementary mathematics classrooms. Twenty elementary teachers in a large urban school district in the US were interviewed to understand their choices about what they taught each day, what students needed and were learning, as well as teachers' perceptions of pacing guides and other directives related to curriculum use. Implementation of a new mathematics curriculum came along with strict pacing directives enforced at the school and district level; professional development in mathematics is provided by a commercial organization linked to the textbook publisher. Our analyses indicate that years of experience, teaching assignment, and building leadership influence teachers' decisions about what to teach when, even when school district policy directs teachers to base such decisions on the pacing guide alone. The paper concludes with questions about the effects of curriculum choices on chronic absenteeism and standardized test scores in one large urban school district.
Authors:	**Ismael Almahdi**, Osama Swidan Ben-Gurion University of the Negev, Beer-Sheva, Israel
Title (ID):	*Use of resources and mathematics teachers' scheme in the case of an e-textbook design* (1160)
Abstract:	This paper reports on a study that identifies the types of resources teachers choose and how they use these resources when designing a chapter in an e-textbook for learning geometry. The study was guided by the

	Documentational Approach to Didactics. A qualitative research method was used to analyze the data, which were collected through observation and semi-structured interviews. The findings indicate that teachers utilize a range of resources, including mathematics textbooks, websites, and GeoGebra, during their design process. They develop various utilization schemes for using these resources, which include teachers' rules of action related to incorporating GeoGebra and websites in their e-textbook design.
Authors:	Lynsey Gibbons, **Kelly McKie**, James Hiebert University of Delaware, United States of America
Title (ID):	*Using educative curriculum materials to support analysing mathematics teaching in deep and specific ways* (1123)
Abstract:	In this paper, we examined how educative curriculum materials can support mathematics teacher educators (MTEs) and teachers to engage in fine-grained analyses of teaching. Our thesis is that conversations focused on educative materials can provide especially rich collaborative learning opportunities for teachers. Through analysing planning conversations within teacher collaborative groups, we found that the teachers and an MTE used curricular materials to examine and prepare rich learning opportunities for students. This analysis provides an additional perspective of what an educative curriculum means in terms of supporting teachers to develop ambitious teaching practices.
Author:	**Gresa Pozhegu-Ermeni** Norwegian University of Science and Technology, Norway
Title (ID):	*Exploring effective problem-posing tools for teaching inquiry-based learning: Analyzing preservice teachers' practice reports within an activity theory perspective* (1126)
Abstract:	The purpose of this study is to determine which problem-posing tools support the learning objectives in an inquiry-based learning approach. Our theoretical framework is based on Activity Theory. A total of seventeen mathematics pre-service teachers' practice reports were collected and analyzed using content analysis. Practice reports provided feedback on practical teaching of inquiry-based learning with problem-posing activities and that can be incorporated into the curriculum in future iterations. We found that understanding the effectiveness of problem-posing tools, facilitate the problem-posing process in the inquiry-based environment and researchers should focus on consolidating this in practice in future research.