

Mathematics Education in the Early Years

Tamsin Meaney • Ola Helenius
Maria L. Johansson • Troels Lange
Anna Wernberg
Editors

Mathematics Education in the Early Years

Results from the POEM2 Conference, 2014

 Springer

Editors

Tamsin Meaney
Bergen University College
Bergen, Norway

Maria L. Johansson
Luleå Technical University
Luleå, Sweden

Anna Wernberg
Malmö University
Malmö, Sweden

Ola Helenius
National Centre for Mathematics
Gothenburg University
Gothenburg, Sweden

Troels Lange
Bergen University College
Bergen, Norway

ISBN 978-3-319-23933-0

ISBN 978-3-319-23935-4 (eBook)

DOI 10.1007/978-3-319-23935-4

Library of Congress Control Number: 2015958765

Springer Cham Heidelberg New York Dordrecht London

© Springer International Publishing Switzerland 2016

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media
(www.springer.com)

Judy Patterson (1948–2015) was an inspiring teacher educator and it is to her and her family that this book is dedicated. One of the last academic tasks that she undertook was to complete a review of a chapter that is included in this book. Her knowledge, skills, and willingness to give to the community of mathematics education researchers will be sorely missed, as will her infectious laughter.

Vale, Judy

Acknowledgement

Funding to bring the keynote speakers, Professor Alan Bishop, Monash University, and Professor Helen May, University of Otago, to Malmö for the conference was obtained from the Swedish Research Council. Without this funding and the keynotes, the conference would not have prompted the in-depth discussions which led to the development of the chapters included in this book.

Contents

Part I Introduction

Introduction	3
Ola Helenius, Maria L. Johansson, Troels Lange, Tamsin Meaney, and Anna Wernberg	
A Historical Overview of Early Education Policy and Pedagogy: Global Perspectives and Particular Examples	19
Helen May	

Part II Family and Transitions

Can Values Awareness Help Teachers and Parents Transition Preschool Learners into Mathematics Learning?	43
Alan J. Bishop	
Negotiating with Family Members in a Block Play	57
Ergi Acar Bayraktar	
Mathematical Understanding in Transition from Kindergarten to Primary School: Play as Bridge Between Two Educational Institutions	81
Dorothea Tubach and Marcus Nührenbörger	
Investigating the Potential of the Home Learning Environment for Early Mathematics Learning: First Results of an Intervention Study with Kindergarten Children	99
Julia Streit-Lehmann and Andrea Peter-Koop	
The Impact on Learning When Families and Educators Act Together to Assist Young Children to Notice, Explore and Discuss Mathematics	115
Ann Gervasoni and Bob Perry	

Part III Mathematical Processes

When Is Young Children’s Play Mathematical?	139
Ola Helenius, Maria L. Johansson, Troels Lange, Tamsin Meaney, Eva Riesbeck, and Anna Wernberg	
Two Frameworks for Mathematical Reasoning at Preschool Level	157
Lovisa Sumpter	
Adaptability as a Developmental Aspect of Mathematical Thinking in the Early Years	171
Götz Krummheuer and Marcus Schütte	
“Similar and Equal...”: Mathematically Creative Reflections About Solids of Children with Different Attachment Patterns	203
Melanie Beck	
Children’s Play as a Starting Point for Teaching Shapes and Patterns in the Preschool	223
Kerstin Bäckman	
Preschool Children Learning Mathematical Thinking on Interactive Tables	235
Dorota Lembrér and Tamsin Meaney	
What Is the Difference? Young Children Learning Mathematics Through Problem Solving	255
Hanna Palmér	

Part IV Mathematical Content

Playing with Patterns: Conclusions from a Learning Study with Toddlers	269
Camilla Björklund	
Development of a Flexible Understanding of Place Value	289
Silke Ladel and Ulrich Kortenkamp	
The Relationship Between Equivalence and Equality in a Nonsymbolic Context with Regard to Algebraic Thinking in Young Children	309
Nathalie Silvia Anwandter Cuellar, Manon Boily, Geneviève Lessard, and Danielle Mailhot	
Developing a Mathematically Rich Environment for 3-Year-Old Children: The Case of Geometry	325
Pessia Tsamir, Dina Tirosh, Esther Levenson, Ruthi Barkai, and Michal Tabach	

MaiKe: A New App for Mathematics in Kindergarten	341
Anna Susanne Steinweg	
“I Spy with My Little Eye”: Children Comparing Lengths Indirectly	359
Johanna Zöllner and Christiane Benz	
The Role of Conceptual Subitising in the Development of Foundational Number Sense	371
Judy Sayers, Paul Andrews, and Lisa Björklund Boistrup	
Part V Professional Development	
Teachers’ Interpretation of Mathematics Goals in Swedish Preschools	397
Laurence Delacour	
Reflection: An Opportunity to Address Different Aspects of Professional Competencies in Mathematics Education	419
Christiane Benz	
Index	437

Contributors

- Paul Andrews** Stockholm University, Stockholm, Sweden
- Kerstin Bäckman** University of Gävle, Gävle, Sweden
- Ruthi Barkai** Tel Aviv University, Tel Aviv, Israel
- Ergi Acar Bayraktar** Goethe-Universität Frankfurt am Main, Frankfurt, Germany
- Melanie Beck** University of Frankfurt/IDEA Center, Frankfurt, Germany
- Christiane Benz** University of Education Karlsruhe, Karlsruhe, Germany
- Alan J. Bishop** Faculty of Education, Monash University, Melbourne, VIC, Australia
- Camilla Björklund** University of Gothenburg, Gothenburg, Sweden
- Manon Boily** Université du Québec à Montréal, Gatineau, QC, Canada
- Lisa Björklund Boistrup** Stockholm University, Stockholm, Sweden
- Nathalie Silvia Anwandter Cuellar** Université du Québec à Outaouais, Gatineau, QC, Canada
- Laurence Delacour** Malmö University, Malmö, Sweden
- Ann Gervasoni** Monash University, Clayton, VIC, Australia
- Ola Helenius** National Centre for Mathematics, Gothenburg University, Gothenburg, Sweden
- Maria L. Johansson** Luleå Technical University, Luleå, Sweden
- Ulrich Kortenkamp** Universität Potsdam, Potsdam, Germany
- Götz Krummheuer** Goethe-Universität Frankfurt am Main, Frankfurt, Germany
- Silke Ladell** Universität des Saarlandes, Saarbrücken, Germany

- Troels Lange** Bergen University College, Bergen, Norway
- Dorota Lembrér** Malmö University, Malmö, Sweden
- Geneviève Lessard** Université du Québec à Outaouais, Gatineau, QC, Canada
- Esther Levenson** Tel Aviv University, Tel Aviv, Israel
- Danielle Mailhot** Université du Québec à Outaouais, Gatineau, QC, Canada
- Helen May** University of Otago, Dunedin, New Zealand
- Tamsin Meaney** Bergen University College, Bergen, Norway
- Marcus Nührenbörger** TU Dortmund University, Dortmund, Germany
- Hanna Palmér** Linnaeus University, Växjö, Sweden
- Bob Perry** Charles Sturt University, Albury, NSW, Australia
- Andrea Peter-Koop** Faculty of Mathematics, University of Bielefeld, Bielefeld, Germany
- Eva Riesbeck** Malmö University, Malmö, Sweden
- Judy Sayers** Stockholm University, Stockholm, Sweden
- Marcus Schütte** Technical University Dresden, Dresden, Germany
- Anna Susanne Steinweg** University of Bamberg, Bamberg, Germany
- Julia Streit-Lehmann** Faculty of Mathematics, University of Bielefeld, Bielefeld, Germany
- Lovisa Sumpter** Dalarna University, Falun, Sweden
- Michal Tabach** Tel Aviv University, Tel Aviv, Israel
- Dina Tirosh** Tel Aviv University, Tel Aviv, Israel
- Pessia Tsamir** Tel Aviv University, Tel Aviv, Israel
- Dorothea Tubach** TU Dortmund University, Dortmund, Germany
- Anna Wernberg** Malmö University, Malmö, Sweden
- Johanna Zöllner** University of Education Karlsruhe, Karlsruhe, Germany

List of Reviewers

Vigdis Flottorp, Oslo and Akershus University College of Applied Sciences, Oslo, Norway
Naomi Ingram, University of Otago, Dunedin, New Zealand
Barbara Clarke, Monash University, Melbourne, Australia
Lisser Rye Ejersbo, Danish School of Education, Aarhus University, Denmark
Sue Dockett, Charles Sturt University, Albury, Australia
Gert Monstad Hana, Bergen University College, Norway
Toril Eskeland Rangnes, Bergen University College, Norway
Ingvald Erfjord, Agder University, Norway
Marit Johnsen Høines, Bergen University College, Norway
Anita Wager, University of Wisconsin-Madison, USA
Ann Anderson, University of British Columbia, Canada
Per Sigurd Hundeland, Agder University, Norway
Martin Carlsen, Agder University, Norway
Rose Vogel, Goethe-University Frankfurt am Main, Germany
Jill Cheeseman, Monash University, Melbourne, Australia
Ewa Swoboda, Rzeszów University, Poland
Patti Barber, University College London
Jody Hunter, Massey University, Palmerston North, New Zealand
Dianne Siemon, RMIT University, Melbourne, Australia
Amy Parkes, Michigan State University, USA
Pirjo Aunio, University of Helsinki, Finland
Judy Paterson, University of Auckland, New Zealand