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# International Integer Curriculum Comparison

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# WS01: INTERNATIONAL INTEGER CURRICULUM COMPARISON

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A discussion group met and discussed the current state of research in the domain of integers at the joint PME 38 and PME-NA 36 meetings (Bofferding, Wessman-Enzinger, Gallardo, Salinas, & Peled, 2014). During these meetings productive discussion revolved around what it meant to understand integers. Additionally, the organisers presented a literature review of the research on integers from all of the PME and PME-NA proceedings, which the group discussed. At the conclusion of this meeting, the group expressed interest in investigating integers further together by pursuing an international curriculum comparison study. This working group aims to begin this curriculum comparison study of integers.

## WORKING SESSION GOALS

In one article from the literature review of the PME and PME-NA proceedings, Lindbland and Marton (2004) report on the utility of comparison studies and suggest that we need to better determine and compare what opportunities students have to learn the concepts presented in various international tests used for comparisons (e.g., OECD-PISA, IEA-TIMSS, LPS). A table they reproduce from a TIMSS-1999 report suggests that students have little opportunity to work with integers. This working session is intended to provide participants a space to share and begin a study that investigates differences in integer curricula across countries. With participants sharing expertise on integers from their home country, the study will provide insight into the ways that integers are introduced and learned internationally. At the conclusion of the study we intend to submit a manuscript to *Educational Studies in Mathematics*.

## THEORETICAL BACKGROUND

Within the previously mentioned literature review, it was noted that there were differences in age groups targeted, contexts highlighted, and didactical models used. Further, studies focused on either integer concepts (e.g., order, value), operations (e.g., addition, subtraction, multiplication), or algebraic uses (e.g., simplifying expressions with negatives). When students first learn about negative integers, they must make sense of the multiple meaning of the negative signs and distinguish between magnitude and directed magnitude, a difficult process that can result in several synthetic (or transition) conceptions (Bofferding, 2014). Students also use a variety of conceptual models to reason about integer addition and subtraction situations. Each model involves interpreting the quantities and zero in a different way (e.g., in the bookkeeping model, zero represents not having a gain or loss)

(Wessman-Enzinger & Mooney, 2014). We will begin the curricular analysis by looking for how the curricula address these integer concepts and models.

### **SESSSION 1**

After the coordinators provide some background to this study and share goals, participants will discuss their country's standards or well-utilized curriculum. It will be expected that participants bring their country's standards with integers and integers operations. Similarly, participants should bring copies (e.g., digital or otherwise) of current curricula that introduce integers and integer operations to students. Participants will work in small groups discussing their country's standards or curricula with others. The coordinators will share a Google spreadsheet of a template with initial categorizations for the curriculum study. The initial categorization was developed from the aforementioned literature review and integer concepts. Participants will suggest modifications to the spreadsheet during this session. The first session will conclude with participants working on recording at what age negative integers are introduced, contexts used, typical didactical models employed, information about standards, and descriptions of typical curricula used to support integer learning (e.g., philosophy of the curricula, length of units, use of visuals, etc.).

### **SESSSION 2**

Coordinators will provide a de-briefing of the previous day. After de-briefing, participants will resume work with the shared Google spreadsheet. Half-way through the session, we will discuss themes present within spreadsheet. Discussion will transition to the next moves that should be taken on the integer comparison study. The session will conclude with establishing next directions for the group, ways to continue communication internationally, and possibly generating an outline of the manuscript.

### **References**

- Bofferding, L. (2014). Negative integer understanding: Characterizing first graders' mental models. *Journal for Research in Mathematics Education*, *45*(2), 194-245.
- Bofferding, L., Wessman-Enzinger, N. M., Gallardo, A., Salinas, G., & Peled, I. (2014). Negative numbers: Bridging contexts and symbols. In S. Oesterle, C. Nichol, P. Liljedahl, & D. Allan, *Proceedings of the joint meeting of PME 38 and PME-NA 36* (Vol. 1, p. 204). Vancouver, Canada: PME.
- Lindblad, S., & Marton, F. (2004). What is compared in comparative studies of mathematics education? In M. J. Hoines & A. B. Fuglestad, *Proceedings of the 28th Conference of the International Group for the Psychology of Mathematics Education* (Vol. 1, pp. 201–205). Bergen, Norway: Bergen University College.
- Wessman-Enzinger, N. & Mooney, E. S. (2014). Making sense of integers through storytelling. *Mathematics Teaching in the Middle School*, *20*(4), 202-205.