



Mapping talk about the mathematics register in a secondary mathematics teacher study group



Beth Herbel-Eisenmann^{a,*}, Kate R. Johnson^{b,1}, Samuel Otten^{c,2},
Michelle Cirillo^{d,3}, Michael D. Steele^{e,4}

^a Teacher Education, Michigan State University, 620 Farm Lane, 316 Erickson Hall, East Lansing, MI 48823, United States

^b Department of Mathematics Education, Brigham Young University, 183 TMCB, Provo, UT 84606, United States

^c Department of Learning, Teaching, and Curriculum, University of Missouri, 121B Townsend Hall, Columbia, MO 65211-2400, United States

^d Department of Mathematical Sciences, University of Delaware, 407 Ewing Hall, Newark, DE 19716, United States

^e Department of Curriculum and Instruction, University of Wisconsin-Milwaukee, 395 Enderis Hall, 2400 E. Hartford Ave, Milwaukee, WI 53211, United States

ARTICLE INFO

Article history:

Available online 11 October 2014

Keywords:

Mathematics register
Communication
Secondary education
Discourse
Teacher study group

ABSTRACT

The mathematics register refers to the forms of meaning and styles of communication used by the mathematics disciplinary community. Many mathematics education scholars have attended to this idea, yet it has gotten little attention in secondary mathematics teacher education. Work related to content-based literacy points to potential benefits for an increased focus on the mathematics register because an important role of teachers is to assist students in developing facility with the mathematics register in order to support students' learning. This study examines the ways in which a group of secondary mathematics teachers talked about the mathematics register over the course of a year-long study group focused on mathematics classroom discourse. In particular, we analyze the study-group discourse to identify themes and shifts in the ways the teachers collectively made sense of the mathematics register. We found that they used two particular discourse practices to make sense of the mathematics register and that they came to discuss the mathematics register as more than specialized vocabulary.

Published by Elsevier Inc.

1. Introduction

Over the past three decades, literacy educators, professional organizations and government agencies have advocated for content-based literacy¹ (see, for example, Fisher & Ivey, 2005), in part, because of the perceived “need to develop students’

* Corresponding author. Tel.: +1 517 432 9607.

E-mail addresses: bhe@msu.edu (B. Herbel-Eisenmann), johnson@mathed.byu.edu (K.R. Johnson), ottensa@missouri.edu (S. Otten), mcirillo@udel.edu (M. Cirillo).

¹ Tel.: +1 801 422 7928.

² Tel.: +1 573 882 6231.

³ Tel.: +1 302 831 4455.

⁴ Tel.: +1 414 229 6871.

¹ As Draper (2002) pointed out, the terms *secondary literacy*, *adolescent literacy*, and *content-area literacy* have all been used to designate “the support of literacy development in middle and high schools with adolescent students in content-area classes” (p. 360).

abilities to comprehend and think critically about multiple forms of text related to the school curriculum” (Alvermann, 2002, p. 193). Yet, there has been little traction for these ideas within the content areas (Siebert & Draper, 2008). In this study, rather than summarize the many issues related to this movement in general, we contribute to the small body of literature developing in the content area of mathematics. Specifically, we examine how a group of secondary mathematics teachers talked about and made sense of an idea central to content-based literacy in mathematics education—the mathematics register. Related to the push for content-based literacy, mathematics education researchers for over three decades have increasingly drawn on the idea of the mathematics register in their work. Michael Halliday (1978), a sociolinguist, introduced and defined this idea:

A register is a set of meanings that is appropriate to a particular function of language, together with the words and structures which express these meanings. We can refer to a ‘mathematics register’, in the sense of the meanings that belong to the language of mathematics (the mathematical use of natural language, that is: not mathematics itself), and that a language must express if it is being used for mathematical purposes. (p. 175)

The use of the mathematics register, however, seems to have stayed in the mathematics education *research* community, which raises the question of how it might be taken up by mathematics *teachers* in order to work toward serious contemplation and incorporation of content-based literacy.

In this article, we build upon the existing literature to investigate how teachers, who were involved in a year-long study group focused on secondary mathematics classroom discourse, talked about and made sense of the mathematics register. More specifically, the professional development materials used in the study group were designed to support teachers in becoming purposeful about cultivating *productive* and *powerful* discourse in their classrooms, where productive refers to the ways in which the teacher’s discourse practices can support students’ “access to mathematical content and discourse practices” (Esmonde, 2009, p. 249) and powerful refers the ways in which the teacher’s discourse practices can support students’ “(positional) identities as knowers and doers of mathematics” (Esmonde, 2009, p. 249). (See Section 3 for further information about productive and powerful.) Like Kazemi and Hubbard (2008), we argue that in order to make artifacts and ideas useful to practice, it is imperative to better understand how teachers talk about and make sense of them because it is teachers who might ultimately use the ideas with students in classrooms (see e.g., Herbel-Eisenmann, Drake, & Cirillo, 2009). Furthermore, we contend that examining professional development is important because teachers’ other potential sources of such ideas (e.g., policy or methods textbooks) often neglect or misrepresent mathematics or mathematics education (Siebert & Draper, 2008).

Some research in mathematics education has suggested that teachers’ implicit understandings of the mathematics register and the values that go along with them shape teachers’ assessment practices (Morgan, 1998). Thus, it is important to investigate these implicit understandings in order to capitalize on them when working with teachers, particularly in contexts such as study groups that allow for sustained interactions related to areas of teaching and learning like classroom discourse. Although we restrict our focus to how teachers talked about the mathematics register in the study group and not what they did with it in their classrooms, we argue that this is an important step toward informed work on how the mathematics register might be taken up in classroom practice.

2. Theoretical perspectives

Our overarching framing of this work is sociocultural and sociolinguistic. We see learning as being related to how one participates in discourse practices of a community (e.g., Gee, 1996; Lave, 1996; Lave & Wenger, 1991; Wenger, 1998). As Moschkovich (2002) summarized, sociocultural perspectives assume that:

learning is inherently social and cultural, . . . ; participants bring multiple views to a situation; . . . representations have multiple meanings for participants; and . . . these multiple meanings for representations and inscriptions are negotiated through conversations. (p. 197)

Since participation and context are central to learning, we draw on the tools of systemic functional linguistics (SFL) in our analysis because the analytic methods of SFL help us see how participation changes over time.² SFL assumes that language learning is intimately related to the context in which the learning takes place (Halliday & Matthiessen, 2003). Halliday, who introduced the mathematics register, was a pioneer in the development of SFL.

With respect to the mathematics register, Pimm (1987) elaborated on Halliday, pointing out that Halliday was not only talking about how mathematical terms are used but also was saying that there are characteristic phrases and certain modes that are acceptable for mathematical processes such as argumentation.³ Arguments, for example, should be precise, brief, and mathematically logical (Forman, McCormick, & Donato, 1998). O’Halloran (2005) provided a detailed description of the mathematics register by focusing on processes, representations, symbolism, and so forth. O’Halloran highlighted, in particular, the important role that this range of meaning systems plays in construing mathematical meaning. Researchers

² See Byrnes (2006), who articulated the areas of compatibility between sociocultural and systemic functional linguistic theory.

³ Pimm (1987, 1988) also wrote extensively about extramathematical and structural metaphors, two important aspects of language and meaning. We do not go into depth about these here because the issues raised are complex and, as a result, were not part of the professional development work with teachers we studied.

Download English Version:

<https://daneshyari.com/en/article/360640>

Download Persian Version:

<https://daneshyari.com/article/360640>

[Daneshyari.com](https://daneshyari.com)