Supportive Writing Assignments for Less Skilled Writers in the Mathematics Classroom

Markus Linnemann and Sabine Stephany

1 Writing—An Important Competence in the Mathematics Classroom?

Writing competence is, in addition to reading skills, one of the key competencies in a highly literate society, and its teaching is one of the central tasks of any school curriculum. In German schools, in research, and in public discourse, writing is mainly a matter for the German classroom. Writing is not yet a focus in other disciplines.

So why do we promote writing in the disciplines at all and in mathematics in particular? One purpose of writing is to learn subjects in general: Writing can be used to enhance students’ knowledge and understanding of a particular subject (cf., Mason & Boscolo, 2000, 2001). In contrast to spoken language, which is temporal and ephemeral, written language “leaves a permanent record that can be pondered and reflected upon” (Shanahan, 2006, p. 174; see also Pohl & Steinhoff, 2010). As writing gives time, it enables the writer to arrange, to deepen and to link knowledge, as well as to discover misconceptions.

Another purpose of writing in the disciplines is to provide writers with the opportunity to take part in specialist discourse. This includes following school lessons, using specialist knowledge for communicative purposes, recognizing which issues of the respective subject are socially relevant, and which content contributes to social progress. These cannot all be taught in the German classroom but must be a topic of each other subject in the curriculum.

However, learning math through writing is not a “fast sell”; writing assignments must be carefully constructed. Instructional concepts are in the scope of this article, but first we will briefly outline our understanding of writing competence and describe different functions of writing in the mathematics classroom. We will then look at the role of writing and writing assignments in mathemat-i

ics from three perspectives: curriculum requirements, teachers' attitudes, and students' difficulties. These insights reveal a strong need to define demands for writing assignments that support all students, but particularly support less skilled writers. On this basis, we will propose criteria for designing supportive writing assignments (SWA). Eventually we will give examples of SWAs and evaluate their impact on learning math and math related language.

2 Writing and Writing Competence

For the following considerations we will first explain our understanding of writing and writing competence under three headings: Writing is composing; writing is unlike speaking; and writing is an ongoing process.

2.1 Writing is Composing

In this paper the term ‘writing’ means composing. Composing a text is an active, problem-solving, constructive process, because writers have to contribute their social, motivational, cognitive, and linguistic experiences (Becker-Mrotzek & Schindler 2007; McCutchen, Teske, & Bankston, 2008).

For us, writing competence is divided into two aspects. First, writers have to integrate components that are mostly independent of the text type, and they have to integrate constituents that are effective across subjects. These include, for example, cognitive factors at a basic level, perceptual and motor skills, grapheme-phoneme correspondence, orthography, essential grammatical competence, reading competence, cohesion, and coherence. Further text-type independent components students have to integrate are the ability to take someone’s perspective, the ability to reflect, and to produce an unambiguous illocutionary act. Second, we consider writing competence to be an integration of components and knowledge that are subject-specific. These include a highly specialized lexicon, and specialized syntactic and morphosyntactic structures of text types that are typical of a given subject.

Because text composition involves a complex interaction of the above-mentioned components, writing demands considerable cognitive resources (Hayes, 1996; McCutchen, 1996). Mastering lower-level processes (such as spelling) releases cognitive capacity to integrate other skills to achieve a higher order skill (such as idea generating; Fayol, 1999). In addition to these processes, metacognitive control over writing subprocesses plays an essential role in text production (McCutchen, 1988).