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Greefrath, G.; Oldenburg, R.; Siller, H.-S.; Ulm, V.; Weigand, H.-G.

Aspects and “Grundvorstellungen” of the concepts of derivative and integral. Subject matter-related didactical perspectives of concept formation.

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Summary: This paper discusses Aspects and *Grundvorstellungen* in the development of the concepts of derivative and integral, which are considered central to the teaching of calculus in senior high school. We focus on perspectives that are relevant when these concepts are first introduced. In the context of a subject-matter didactical debate, the ideas are separated into two classes: firstly, mathematically motivated aspects, such as the limit of difference quotients or local linearization within the concept of derivative, as well as the product sum, antiderivative, and measure aspects of integration; secondly, the *Grundvorstellungen* associated with the concepts of derivative and integral. We regard finding a comprehensive description of Aspects and *Grundvorstellungen* an important objective of subject matter didactics. This description should clarify both the differences and the relationships between these perspectives, including mathematically motivated Aspects and *Grundvorstellungen* that are central to the students' perspective. The primary objectives of this paper include a specification of the concepts of Aspects and *Grundvorstellungen* within the context of differentiation and integration, and a discussion of the relationships between the Aspects and *Grundvorstellungen* associated with the concepts of derivative and integral. We first present the characteristic properties of Aspects and *Grundvorstellungen*, including an account of related concepts and the current state of research. Aspects and *Grundvorstellungen* are analyzed, based on a subject-matter didactical analysis of the concepts of derivative and integral. We conclude with an account of how these insights can be beneficially exploited for introducing differentiation and integration in real-life environments, within the framework of a theory of concept understanding and subject matter didactics.

Classification: I40 I50 C30

Keywords: aspects; basic ideas; derivative; integral; concept

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