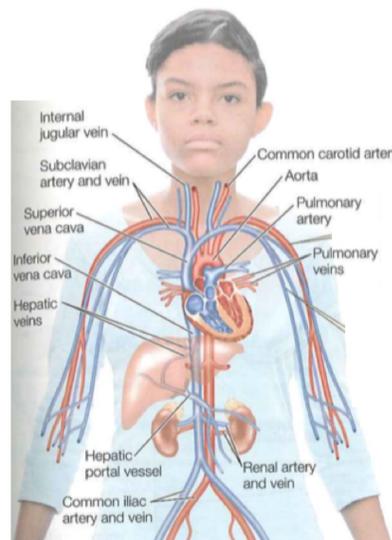


Clarifying Content for Instruction

The crucial competence of science teachers

Context and Relevance of the Study

The challenging task of a teacher is to make complex and often abstract topics intelligible for learners. Yet, scientific literature often contains misleading statements and even scientifically wrong representations (see fig. 1). Thus, it cannot be used directly as subject matter for instruction. Instead, science teachers need the competence to critically examine scientific content from an educational perspective (e.g. Duit et al. 2005). One way of systematically addressing this matter is the Scientific Clarification (see fig. 2). The reconstructed and clarified conceptions should be scientifically accurate and the aims of lesson content planning. However, reconstructing clarified conceptions of a biological topic from an educational perspective is difficult for many preservice science teachers (Kishk, 2015; Fröling, 2015; Vogt, 2016). Therefore, this current research project investigates into this issue.



"The circulatory systems of amphibians, reptiles, and mammals have two circuits, an arrangement called double circulation... The two ventricles pump in unison; while some blood is traveling in the pulmonary circuit, the rest of the blood is flowing in the systemic circuit."

(Reece et al. 2014: 918ff.)

Figure 1: Blood circulation (snipped taken from Sadava et al. 2014: 1031)

Theoretical Frames

The theories of embodied cognition (Gropengießer 2007) and conceptual metaphor (Lakoff & Johnson 1980; Lakoff 2014) offer valuable insights into underlying conceptions.

The Model of Educational Reconstruction (MER) provides the research frame with its three interrelated research tasks (Kattmann et al. 1996; Duit 2007; Duit et al. 2012; Niebert & Gropengießer 2013) (see fig. 2). Scientists' conceptions (in science textbooks) are systematically linked to students' conceptions to reconstruct clarified conceptions which are comprehensible and scientifically accurate. Working out these core conceptions is the aim of the Scientific Clarification.

Research Questions

1. How do preservice science teachers treat content knowledge for instruction?
2. How do experts conceptualize the tasks and aims of the Scientific Clarification?
3. What learning interventions enhance the preservice science teachers' lesson content planning?

Research Design and Methods

The developed tasks of the Scientific Clarification will be critically commented on and evaluated by experts to ensure the quality. This collection of tasks may be extended in the course of the study.

In semi-structured interviews, biology preservice science teachers' ways of clarifying content for instruction will be examined and what interventions might help them with lesson content planning. They should be able to handle critically clarifying tasks to systematically work out clarified conceptions of a biological topic (see fig. 2). The methods of data analysis are the Qualitative Content Analysis (Mayring, 2008) and Systematic Metaphor Analysis (Schmitt, 2005).

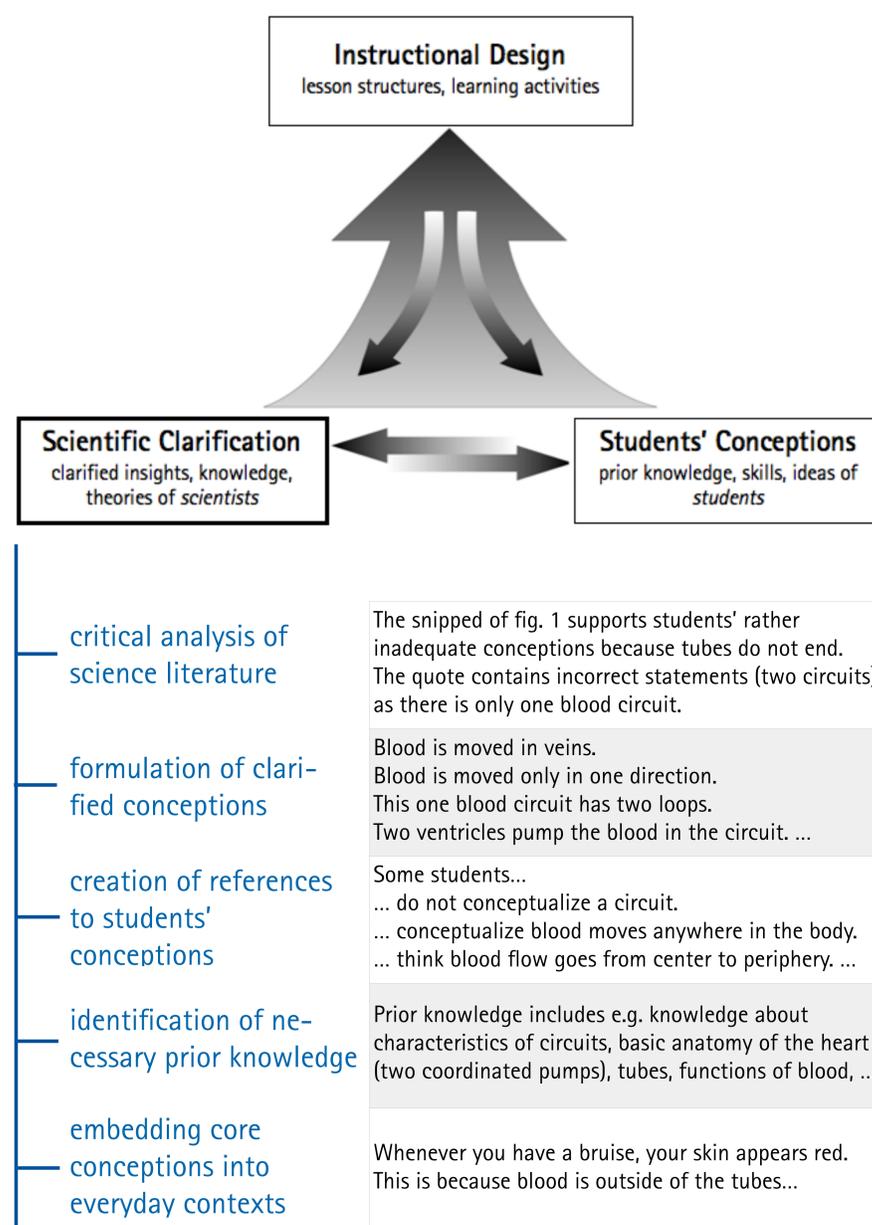


Figure 2: Interrelated research tasks of the Educational Reconstruction (adapted from Kattmann et al. 1996) and some tasks of the Scientific Clarification (based on Gropengießer 2016) with sample solutions

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