

## ***Interactive comment on “Addressing secondary students’ naïve ideas about freshwater springs in order to develop an instructional tool to promote conceptual reconstruction” by S. Reinfried et al.***

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We thank the anonymous reviewer for his/her kind comments. Our paper includes some misunderstandings that concern the way we refer to former studies (e.g. p. 1594, line 1-5 or p.1590, line 8). The reviewer also made a number of valuable suggestions that we will consider in the final version of our paper.

Response to the general comments: Our paper concerns a study in educational research that addresses hydrology education at the undergraduate level. Nevertheless, the results of our study are of interest to all instructors in hydrology education because they address problems that concern the learning of complex science concepts in gen-

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eral. Learning always occurs on the basis of the learners' pre-instructional ideas, which has an influence on the way the knowledge to be learned is perceived and processed. In our paper we used the term "naïve" ideas to describe the students' pre-instructional knowledge. The term "naïve" idea is a standard term in conceptual-change-research and is not meant judgemental. Quality instruction has to take the learners' "naïve" ideas into account. Instructors that consider their learners' "naïve" ideas in their teaching reflect their appreciation for their learners. They are aware of the fact that each individual constructs his/her view of the world on the basis of their individual experiences and knowledge and brings it to the lecture hall or classroom. On p. 1593 line 19-25 we refer to the term "naïve" and give examples of other expressions that are of common use in conceptual-change-research. In our paper we refer to Aebli's theory of reasoning and understanding. We used Aebli's approach to construct a worksheet aimed at promoting active cognitive learning in order to achieve deep understanding. Aebli's approach is not a general approach to learning but, on the contrary, an approach that specifically seeks to bring the psychology of learning and the learning of complex scientific knowledge together. In contrast to other approaches to learning, Aebli's approach specially focuses on the learning of science concepts. For the construction of the worksheet we used only the most important, most common and most generalizable pre-conceptions expressed by the participants in our study. The worksheet therefore only relates to the most common and important pre-conceptions that need to be addressed to achieve a basic understanding of the key elements of hillslope springs by 13 year old learners.

Response to the specific comments: The reviewer asked why it is important for teenagers and the general public to understand springs. In order to achieve scientific literacy, which is a contemporary demand of compulsory schooling, learners' have to study scientific concepts on an appropriate level and in an appropriate way to understand them. It does not suffice just to learn factual knowledge by heart or to remain on a descriptive level by just telling people that a site where groundwater emerges at the surface is called a spring. People who are trained to understand scientific concepts

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during their compulsory education will be able to participate in discussions concerning environmental problems and take responsible action. In Sct. 1 / 2 we explain why a better knowledge about springs is desirable. In Sct. 6 we drew attention to the fact that already philosophers in Ancient Greece used similar ideas to those of our students to explain the origin of springs. We referred to the “naïve” ideas of the Ancient Greeks to show that these ideas are explanatory models that come natural to mind to people who have little or no scientific background knowledge. The fact that lay people, whether they lived in the past or life today, call upon the same “naïve” ideas to explain natural phenomena accounts for the validity of our research.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 1589, 2012.

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