Hydrol. Earth Syst. Sci. Discuss., 9, C881–C885, 2012
www.hydrol-earth-syst-sci-discuss.net/9/C881/2012/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Training hydrologists to be ecohydrologists and play a leading role in environmental problem solving" *by* M. E. McClain et al.

M. E. McClain et al.

m.mcclain@unesco-ihe.org

Received and published: 16 April 2012

We appreciate the constructive and knowledgeable comments of the Reviewer. Below, we respond to each comment in turn.

[comment] ...the twist in the manuscript is that ecohydrology, by its very nature, provides cross-cutting training. While I agree, I could argue that this cross-cutting training can come from the intersection of many other disciplines and hydrology as well, e.g., water science/engineering and policy, physical hydrology and chemistry, water and land use management (e.g., agricultural or forest management). I am also not convinced that this is not already occurring in the training of undergraduates and especially grad-

uate students (e.g., see National Research Council, 2012).

[response] We do not mean to suggest that the approach we are advocating is unique or unlike any other in higher education. We recognize that there is a broad movement to develop more integrative and multi-disciplinary programs (which we mention in the manuscript) and that some programs have been in place for years now. Our objectives are to advocate for this approach in the training of ecohydrologists, to provide a thematic context for the program content, and to highlight professional and personal competencies that we believe are of greatest importance. We will emphasize this more clearly in the revised manuscript.

[comment] I recognize that the authors are defining ecohydrology quite broadly and I would agree that it is broad. However, I think it is shortsighted to overlook discipline areas that have trained hydrologists in the way the authors advocate – at least to some extent. It would be helpful for the authors to reflect on how the proposed programs differ from existing programs or the authors could draw more direct comparisons to programmatic models that currently exist.

[response] We agree that making some direct comparisons may be informative and will consider options for how to do this in a way that adds value to the manuscript. Also, we appreciate that there are numerous innovative programs in the USA, as the examples of the Reviewer demonstrate, but our vision is global and the target audience includes a growing ecohydrological science community in Latin America, Africa, Asia, and of course Europe. These readers will assess the vision articulated in the manuscript in the context of their own higher education systems. With the UNESCO affiliations of most authors and our common roots in UNESCO-IHP's Ecohydrology Program, we have intrinsically oriented the manuscript to this wider international community. This should perhaps be indicated more explicitly in the manuscript.

[comment] Personal competencies. This section describes what I believe are critical components of any advanced educational program, especially within areas that are in-

terdisciplinary. However, I do not see this section particularly relevant for this article or at least I don't believe it needs to be emphasized as its own section or take such a substantial portion of the manuscript. The competencies discussed are generic and can be applied to just about any program, and thus, I don't believe the emphasis is needed for an article in a hydrologic sciences journal. Rather than including section 3.2, the authors may consider adding some specific examples as case studies of where the type of training they proposal is critical. This would reinforce their point and strengthen the overall manuscript.

[response] This is a fair comment and expresses an opinion discussed by the authors at the time of writing the manuscript. It also relates to our reply above concerning the wider audience of the manuscript. Some attention to these personal competencies is certainly assumed in most educational programs in the USA, but in our experience we have not found this to be case in all parts of the world. We chose to emphasize these personal competencies so prominently in order to send a clear message regarding their importance and the need to explicitly consider them in the formulation and implementation of training programs in ecohydrology. But even in more progressive educational systems, where attention to these competencies may be assumed, we are unsure they are systematically addressed. We again reviewed the online descriptions of a number of multidisciplinary bachelors and masters programs (including those indicated by the Reviewer) and found little or no mention of developing personal competencies of students. As the citations we include in the manuscript illustrate, real consideration of these competencies is confined largely to literature on organizational, social, and behavioral science. We believe an added value of this manuscript is the simultaneous consideration of professional and personal competencies, bringing together two bodies of literature and assigning nearly equal weight to the two. Despite what we expect would be widespread agreement among ecohydrologists that these personal competencies are critical (as the Reviewer also mentions), we are not aware of other papers saying this so clearly. We would not like to diminish the importance of these competencies by removing the section or assigning the topic a lower status in the manuscript.

We do indicate at the end of the first paragraph in the Personal Competencies section that these apply equally to a wide range of disciplines but also provide our rationale and justification for featuring them so prominently in the manuscript.

[comment] In my mind, some of the early foundations of ecohydrology stem from forest hydrological research, e.g., the Hubbard Brook Ecosystem Study (Likens et al., 1977), plant-water relations (e.g., Lange et al., 1976), and vegetation and watershed management (e.g., Colman, 1953; Kittredge, 1948). Stating this will strengthen some of the management and policy connections that are later made by the authors.

[response] Thank you for this suggestion. We will incorporate these points and references into the revised manuscript.

[comment] The discussion of the 3 spheres of ecohydrology requires some additional thought. The authors recognize that their 3rd sphere is connected to the previous two spheres (line 5, 1490). I would argue that all three are inter-connected. This point should be emphasized. Also, the title for the 3rd sphere really should include fluvial systems since upstream rivers influence downstream rivers and floodplains.

[response] We agree that the three spheres are closely interconnected and intended for that perspective to come through clearly in the manuscript. We place the three in a basin and coastal context, where the land sphere flows into the river sphere and the river sphere flows into the lake and coastal sphere. We also tried to illustrate this in Figure 1. We will revise the manuscript to make this more explicit.

[comment] Obviously the proposed curriculum and training program is geared toward hydrologists given that it was submitted to HESS and anecdotally it seems that most ecohydrologists come from the hydrologic community rather than the ecosystem science community. I wonder if part of the message for this training in ecohydrology should call for a more balanced from ecosystem science, e.g., faculty involved in ecohydrology programs that consider themselves ecologists rather than hydrologists.

[response] This also touches on an issue discussed in some detail by the authors. We agree with the reviewer that there is significant representation of ecologists and other ecosystem scientists in ecohydrology training programs. This also applies to authors of this manuscript! Given that this special issue of HESS is devoted to "Hydrology education in a changing world", we felt obliged to present our vision from a hydrological perspective. We are comfortable with this perspective but in response to the reviewer's advice will acknowledge in the revised manuscript that the balance of ecology and hydrology is more equitable.

[comment] Other programs to include in Table 1, which are not given in Rickwood et al.: University of Idaho: Ecohydrology Science and Management, M.S. University of Arizona: Watershed Management and Ecohydrology, M.S.

[response] Thank you for this information. We will add these programs to Table 1 in the revised manuscript.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 1481, 2012.