Reviewer #2 (S. Shaw)

The manuscript is well written and reads easily.

We thank Dr. Shaw for this review and his general support of the study. We feel that, by addressing the concerns in this review, the manuscript has improved. This is true in particular with regards to a more critical assessment of active learning.

Given the very small sample size and lack of direct testing of learning outcomes relative to a control group, most of the conclusions are simply anecdotal. It isn't realistic for the authors to more rigorously test the learning outcomes, but it might be useful to consider with some additional criticality whether more "active" learning (TLA 3) is always the best teaching approach.

For instance:

i. How does "active" learning influence long term retention and application of knowledge? Do students build a sufficient mental framework that allows them to connect an experiment they did over a day or two to other concepts in the same or different discipline?

ii. Are there certain topics that are less suitable to "active" learning? Certainly, learning about experimental design, learning how to make measurements, and learning how to interpret experimental data is probably best taught by trying to carry out an experiment. But, are more theoretical aspects of the science suitable for active learning?

It is correctly identified that it is not (in the context of this current study) necessarily realistic to provide a rigorous test of the learning outcomes or the student abilities to achieve them over the length of the course. This is often an issue when comparing different teaching and assessment strategies within cross-disciplinary courses (see Lyon and Teutschbein, 2011). That being said, we agree that a more critical view of situations or environments where active learning may not be the best alternative could be provided in this study to help round out the presentation.

With that, we have added more text highlighting potential limitations of this study and of active learning environments in the discussion section (specifically in the section 4.2 How active is active enough?) as follows:

"It is often problematic to measure what 'works' in the classroom (Prince, 2004) and it should be noted that active learning environments and/or techniques may not always be optimal. For example, it is rather straightforward to see the benefits of a hands-on environment with regards to learning how to design and conduct experiments (e.g., Spronken-Smith, 2005; Levia and Quiring, 2008) and research has shown how active environments can increase course effectiveness (e.g., Hake, 1998) with some evidence suggesting that even the simplest active techniques can improve student retention (e.g., student-student collaboration during lecture pauses as in Berry, 1991). Still, Mayer (2004) suggests that the 'activity' in and of itself does not necessarily support learning indicating that active learning must involve well designed activities that promote thoughtful engagement around learning outcomes in order to be effective. For example, some purely active techniques like discovery learning (where students engage with

materials without any instructor support) have been shown to be inferior to guided learning with regards to gaining knowledge (Kirschner et al., 2006; Mayer, 2004). Also, as highlighted by Drake (2012), in many cases where active learning shows improved student retention of class materials, instructors still provided a lecture and guided (to some extent) the activities. The take-home message here is that an active learning environment needs to be thought out and planned for to be valuable. This is echoed in the following sections where student and teacher reflections on the course are presented."

Additionally, I have a few minor suggestions:

1. Page 9339, Line 7: Could an additional line or two further summarizing McClain be added? While McClain is cited, most readers don't really want to immediately go read the McClain paper. What do McClain et al. see as the "pitfalls and complex challenges" of teaching ecohydrology?

The following has been added:

"McClain et al. (2012) propose an "educational vision focused on the development of professional and personal competencies to impart a depth of scientific knowledge in the theory and practice of ecohydrology and a breadth of cross-cutting knowledge and skills to enable ecohydrologists to effectively collaborate with associated scientists and communicate results to resource managers, policy-makers, and other stakeholders" necessitated by the trans-disciplinary nature of ecohydrology."

2. p 9342: Could TLA be written out in full on the subheading on this page and on subheadings on subsequent pages? I realize the convention is to establish an abbreviation once and then only continue to use the abbreviation. However, since most readers are unfamiliar with the TLA abbreviation, it would help clarify the organization of the paper to write it in full for the headings.

This has been done.

3. p 9346, 1st paragraph: I didn't quite understand how "active" is being used in this sense. If the student is directing their own learning, aren't they always actively involved (relative to a lecture)? It seems like the distinction is more along the lines of "goal-oriented" (TLA 3) versus "exploratory" (TLA 1) activities. I would consider both to require near equal amounts of student action.

We have clarified this in our revision by restating the general definition of active (with regards to active learning) adopted in this study and removing the confusing terminology. As such, active learning is defined in a general sense as any instructional method that engages students in the learning process (Prince 2004). This clarifies the confusion with regards to the level of activity required in the various activities.