

Interactive comment on “HydroViz: evaluation of a web-based tool for improving hydrology education” by E. Habib et al.

Anonymous Referee #2

We thank the reviewer for the extensive review and the very valuable comments. Our replies to the reviewer’s comments and how we revised our manuscript are included below in a blue font

GENERAL COMMENTS

This paper provides a description of the HydroViz web-based tool for hydrological education and, thus, fits the scope of the special issue.

An interesting case study is reported; but the authors get caught in the details rather than drawing out the transferable knowledge from this study that is of wider relevance to hydrology education. The authors need to identify the novelty and significance of this paper in relation to their previous work and in the context of the pedagogic and hydrological literature.

We thank the reviewer for these comments and the valuable suggestions, with which we fully agree. As such, to address this concern, we revised the paper significantly in the following specific ways: (1) we included the Introduction section discussion on how our work fits into the overall context of hydrological education, (2) we included more linkage to pedagogic and hydrological literature, (3) we discussed how our developments and results can be applicable in a wider sense to the field of hydrology education and other earth science fields.

Moreover, it is very difficult to benchmark whether (or not) HydroViz is an effective hydrology education tool as there is no comparison/ control group (i.e. students that learned the same information in another way). This is a major issue that the authors must address.

HydroViz is a proof of concept project that proposes a learning model for improving hydrology education. As such, the evaluation of the project did not intend to measure the added gain in students’ learning as opposed to other traditional hydrology education approaches. Instead, the focus of the evaluation experiment was on two general aspects of the HydroViz tool: 1) to evaluate how effective the project idea and the tool design is in delivering the intended educational contents so that we can continue to pursue the developments in future, larger-scale developments, and 2) to inform the improvement of this and other similar projects. As such, the authors understand that the evaluation is preliminary and we are not making the argument that this tool is better than other existing curricula that don’t use tools such as HydroViz. Meta-analysis of many educational research shows that there is no significant difference when studies that compare the effectiveness of using new technology vs. old technology are pooled together. New technologies afford new instructional design and instructional strategies. When new technologies are compared with old technologies, it is not clear whether the change in student performance is caused by new instructional strategies, new technologies, or just the increased motivation from the novelty of the tool. (There are many citations on this. Here is a website dedicated to this <http://www.nosignificantdifference.org/>). Instead of asking whether HydroViz is better than the existing curriculum, we need to identify the features and characteristics in HydroViz that make it more effective than the existing approach. It is our future plan to have more rigorous evaluation study after we make improvement of the software based on current evaluation data. In our future studies, we do plan to conduct comparison studies. Instead of comparing HydroViz with the existing curriculum (too many variables are different in this comparison), we need to carefully design the comparison so that we are comparing one variable at a time.

As illustrated by my numbered list in the SPECIFIC COMMENTS, there are several matters that require further explanation/ clarification to improve the readability and rigor of the paper.

## SPECIFIC COMMENTS

### ABSTRACT

1. The abstract should explain the wider implications of this evaluation of HydroViz in terms of hydrology education. [Done](#)

2. p. 2570, Line 6: what do you mean by “buy in” and buy-in by whom?

[We added “by faculty and students”.](#)

3. p. 2570, Line 13: is there a comparator (e.g. traditional class room teaching) for Hydroviz to assess its relative effectiveness as a learning tool?

[We addressed this in a paragraph above.](#)

4. p. 2570, Line 16: what do you mean by “somewhat effective” and why is HydroViz more effective at senior-level?

[We changed it to an exact number.](#)

5. p. 2570, Line 20: these issues need to be expanded and explained.

[These are explained in the paper. It has a lot of details that we cannot put it in abstract.](#)

6. p. 2570, Line 21: future plans require further explanation.

[These are explained in the paper. It has a lot of details that we cannot put it in abstract.](#)

### INTRODUCTION

7. The goal of HydroViz is discussed; but there is a need to explain the aim and objectives of THIS PAPER (i.e. evaluation of the educational system and to what end). The paper must aim to be more than a description of the HydroViz tool and seeks to evaluate utility for hydrology education.

[Good point. We added the purposes of the paper toward the end of the intro section.](#)

8. The authors have published previously on HydroViz

[<http://hydroviz.cilat.org/publications.html>](http://hydroviz.cilat.org/publications.html) so they should situate this paper in relation to previous work in the Introduction. (I note their 2011 ASEE Journal of Advances in Engineering Education is not cited.) What is the novelty of this paper? What does it add beyond previous publications?

[At the time this manuscript was submitted to HESS, the authors’ website contained outdated information about our publication plans; in fact, the manuscripts listed in our website as \(Habib, E., Y. Ma, and D. Williams \(2011\) in AEE journal\) are not actually published, or considered for review by any other journals. As such, the HESS doesn’t contain any overlap with the authors’ own publications. We apologize for any misunderstanding that may have occurred because of the outdated information listed on our own website under the “Publication” tab.](#)

9. p. 2571, Line 27: missing punctuation. [Corrected.](#)

10. Section 3 perhaps should come before Section 2 to explain the educational needs before describing HydroViz. As is, the tool comes before the purpose.

[We revised the paper in such a way that the educational need and rationale for HydroViz is now better explained earlier in the paper \(Introduction section\). However, we prefer to first introduce the HydroViz tool \(data and simulation contents, software aspects\) before we talk about the class learning modules that are embedded into it.](#)

#### HYDRO-DATA...

11. This section is very descriptive with most of the background information available (it seems to me) on the HydroViz website.

We shortened this section significantly and removed any redundant or unnecessary details.

#### HYDROVIZ SOFTWARE

12. This section is (again) very descriptive. The text needs to tease out how and why this approach has potential to enhance student learning.

We deleted some details and added discussions on how the software design enhance learning and dissemination of the software.

#### LEARNING MODULES

13. All the necessary information is in Table 1; consequently, the text can be abridged considerably. We shortened the text but left some details to make the paper self-sufficient.

14. Are there any points of good practice or teaching innovations in terms of module design?

We included a new section called “Design Principles” to highlight the overall lessons drawn from our work and which can guide and contribute to the enhancement and development of other active hydrology educational systems.

#### IMPLEMENTATION AND EVALUATION

15. p. 2575, Line 24: specify which courses and where.

We added a reference to a table in the paper.

16. p. 2576, Line 9: how did “homework assignments” help determine effectiveness?

These are really knowledge application and performance tasks in HydroViz. Since they complete the tasks at home, we call them homework. Based on Wiggins and McTighe (1998), these are important assessment method to evaluate student learning.

17. p. 2576, Line 13: what were the criteria for assessing project effectiveness? These criteria need to be clear. What is the benchmark for assessing improved effectiveness (e.g. traditional class room teaching)?

We did not claim that this software is better than the traditional classroom teaching. We claim that the program is effective based on students’ performance in completing the tasks in HydroViz and students’ perception in the survey and interviews. We also refer the reviewer to our reply to the second item in the general comments above.

18. p. 2576, Line 14: unclear; please be more specific.

We made it more specific.

19. Section 5.3. could be shortened and integrated into Section 5.1.

Participants is typically a separate section in research report, so we left it as a separate section.

20. p. 2576, Line 11: refer to Table 1 and delete text.

We incorporated this change.

21. Section 5.4: I am still very unclear how “homework assignments” help determine effectiveness.

See reply to comment # 16.

22. A link to the “Online Surveys” should be provided and the descriptive text shortened to pull-out key points. [We appreciate the reviewer’s comment, but we believe including such information is necessary for the self-integrity of the paper; especially that the links to the online surveys are not fixed and may change from a semester/university to another.](#)

23. The “Informal Interviews” do not seem to have been conducted in a very systematic manner. How robust is this information? [We added further information about how the Interviews were conducted and how they were used to support and triangulate the survey data.](#)

24. p. 2578, Line 16: the paper contains quite a bit of internal repetition. For example, the information on the student cohorts has been provided three times by this point. Please remove unnecessary repeating.  
[We removed them.](#)

25. Section 5.5 is confusing; and it would appear that HydroViz was used differently between levels and institutions, which has implications for interpretation of data.  
[We actually did take this into consideration when interpreting the data.](#)

26. Section 5.6 (variable) data used for evaluation needs to be much better justified.  
[We added some justification.](#)

## EVALUATION RESULTS

27. I find it very difficult to benchmark whether (or not) HydroViz is an effective hydrology education tool as there is no comparison/ control group (i.e. students that learned the same information in another way). This is a major issue that the authors must address. For example, non-contextualized %s of students agreeing cannot be used to say the HydroViz tool is a better means of education than other pedagogic approaches.

[Please see comments earlier \(second item in General Comments and other items in Specific Comments\). Again, we are not claiming that this tool is better than other approaches.](#)

28. p. 2581, Line 2: what does the preceding paragraph tell us? [We are not sure we follow the reviewer’s comment and which part of the manuscript he/she refers to.](#)

## WHAT CAN BE DONE TO IMPROVE HYDROVIZ?

29. This section is very descriptive.

The authors should focus on issues that are of wider relevance to the use of web-based tools for hydrology education. As is, this section is too specific to HydroViz to be of wider interest to the HESS readership.

[We deleted some details and left the ones that are relevant to the design principles in the next section.](#)

## SUMMARY, DISCUSSION...

30. p. 2581, Line 21: The statements about HydroViz being effective are difficult to evidence based on the results presented for the reasons mentioned earlier in my review (i.e. lack of control group to benchmark against).

[Again, we are not comparing HydroViz with anything else right now. We are just trying to see whether students learn anything from using the tool. See our reply to the second item in General Comments and other items in Specific Comments.](#)

31. Again, this section is repetitive and very descriptive. As stated above, the authors should

focus on issues that are of wider relevance to the use of web-based tools for hydrology education. We deleted descriptive details and revised it to focus on the design principles generated from this project that may inform other similar projects.

32. No references are made to the hydrology or educational literature. It is very important that the authors situate their work in educational theory and within the discipline of hydrology to clearly illustrate the novelty of their work and its wider implications. It is the generalize-able points (not this interesting case study) that the HESS readership will be interested in. The transferrable knowledge seems to be lost in the case study detail.

We added the references and focused on the generalizable ideas rather than the details.

#### TABLES

33. Table 3 needs a caption. Done

34. Tables 3-7 consider plotting selected data as graphs to help visualize results. We definitely see the reviewer's point, but there is so much data and columns in these tables which may result in too many figures (and too busy figures as well).

#### FIGURES

35. Figure 2 could be deleted and a link to the webpage provided instead. This figure helps in explaining what the web interface of HydroViz looks like and we think it is necessary to have it within the paper

#### MINOR POINT

36. Data are plural.