General Comments

The manuscript by *N. J. Kinar* shares the experiences gained from a class activity held in a fourth year Hydrology class offered at the University of Saskatchewan. The activity is aimed at synthesizing hydrological process knowledge from a systems approach perspective. Inputting the collected data by the low-cost instrumentation using electronic circuits design, students were asked to build a hydrological model for gaining insights into mathematical modelling in environmental sciences.

First and foremost, I would like to thank N. J. Kinar for his motivation to invest in designing innovative activities for advancing hydrology teaching in line with growing technology opportunities. I believe that this work sets a good example on how small efforts like designing such class activities during early years of hydrology education (i.e. postgraduate level) can prove valuable in shaping the future minds that are able to connect the dots in trying to solve today's (and future's) increasingly complex and growing environmental problems in the most efficient and plausible manner.

In general, the manuscript conveys a good quality content and is well-written. There are, however, a number of opportunities to make it more successful. Repetition of information is the biggest issue that prevails throughout the manuscript. Paragraphs with only a few sentences are very common (it is not disturbing me as it makes the reading easier), in some parts not really necessary though. Merging (e.g. last two paragraphs in Sec 3.3) or creating a bullet point list (e.g. "the students found that" in P9) can be considered.

Please see below a summary of my observations that I would like draw the attention of the author.

- ♥ The Title reads fine. It is long but comprehensively highlights the paper's scope to the potential targeted audience. Abstract and Short Summary is written in a concise manner and include key information about the paper. Supplementary Material provides the required background knowledge on the electronics and some practical considerations, as well as explains in detail the three circuits (Water Detection Circuit, Relative Humidity (RH)/Air Temperature Circuit, Pyranometer Circuit) whose descriptive schematics are available via figshare for downloading.

- ♥ Introduction: It can definitely benefit from drawing a wider picture for setting the background in relation to fundamental links to practical considerations. For details, please see my comment on P2 L33 under "Specific Comments".

- ♥ Research Question & Objectives: Not mentioned at all. Please add a paragraph stating the objective of this manuscript. Obviously, one objective is to share experiences (i.e. challenges, tips and resources), and another is to highlight the benefits of integrating simple hands-on exercises (using simple technology) into teaching curriculum to enhance active learning in geo- and environmental sciences, particularly in hydrology education.

- ♥ Materials and Methods (Section 2): I don't think that this title is appropriate. This section is overloaded and mixed, needs to be revised. A new outline with properly structured sections (subsections) which enable the reader to follow the manuscript with much less confusion is a must.

- **Methodology:** Open a new section please. A workflow diagram would be really helpful here. It should depict different stages involved in every main phase of this class activity (i.e. pre-, during- and after). A brief summary should be added explaining which methods/tools/etc. are considered/used in each before describing each step in detail in subsections.

- **Results (Section 3):** The subsections "3.1 Manufacturing Defects" and "3.2 Choice of Configuration" don't seem to fit well in here. These shall be moved to a new section titled "Electronic Circuits". "3.3 Open-Ended Feedback" and "SLEQ Feedback" form the core of this part. Instead of "Results", this section can be titled such that it tells the reader now is time to read the feedback by the course participants. Section 4 "Discussion" should be combined in this section too.

- **Outline:** Thus, my new outline suggestion is:

1. *Introduction*
2. *Methodology*
   Be more specific about stages of the class activity (i.e. pre-, during- and after).
   a. *Course (activity) proposal and acceptance*
   b. *Technical setup material purchase*
   c. *Preparation of handouts, guidance material for students*
   d. *Implementation of the activity*
   e. *FAQ*
   f. *…*
   g. *Design, Analysis and Collection of Written Feedback*
3. *Systems Approach and Hydrological Modelling*
   Try to create two or three subsections on the text provided in "2.1 Background". Be careful not to overlap with the Introduction part. In other words, avoid repetition.
4. *Electronic Circuits*
   a. *Theory and Construction*
   b. *Classroom Application*
      It is too long as a whole, but some paragraphs are very short. Try to create sub-subsections to clearly present various aspects presented in Sec 2.3.
      Manufacturing defects and choice of configuration shall be mentioned here.
   c. *Example Applications for Electronic Circuits*
   d. *Modelling with Electronic Circuit Data*
5. *Feedback*
   a. *Open-Ended Feedback*
   b. *SLEQ Feedback*
   c. *Feedback Loops (i.e. Sec 4 Discussion)*
6. *Conclusion*

- ♥ Conclusion: Overall not so good. I especially liked the paragraphs on P19 (L598-620). However, these are essentially the summary of feedback from the students. My suggestion is to relocate this into (new) Section 5 "Feedback". P18 L587-591 should be in the Methodology.
  Conclusion can be concise. It is more important to adopt a more general perspective into the scope and purpose of the study rather than sharing (again) various details of the activity. See also my comment on the Introduction. This (conclusion) is the part where the author can take the floor to convince the reader that hydrology education needs improvements which incorporate innovative class activities into teaching strategies adopted by the lecturers (and invite more lecturers to embrace this strategy). A discussion on the importance of teaching aspect of a "professorship" position can be given too. (e.g. a call for universities to accommodate such needs by distinguishing explicitly between "lecturer" and "researcher" positions. And that courses should be designed by a joint team so that well-defined teaching strategies supported with innovative and fitting class activities can be formulated addressing the needs of students and in line with emerging topics & technologies in hydrology.)

Specific comments

P2 L33. The connection to the previous paragraph can be strengthened in the following manner:

First, set the scene by mentioning that geography and environmental science teaching (recommended to) involve(s) different components, i.e.: introduction of conceptual theory, examples of how theories are implemented in real life applications and relevance to address societal challenges (addressed by the United Nations Sustainable Development Goals, UN SDGs), class activities to consolidate information to knowledge for achieving efficient learning of students. Then it is safe to bring forward the latter (class activities) and explain further. Paragraph 1 (in the current version of the manuscript) fits into here. Also, it will be good to include some comments on how such activities encourage development of a diverse set of skills, as well as if (by training future's professionals) and how such skills contribute to Multi-, Inter-, Trans- disciplinary research and practice.

Secondly, provide a brief overview on the progress and needs of hydrology education (see the list of suggested reading). Give some examples of class activities from the hydrology literature.

Thirdly, highlight the importance of data for science and teaching: The essential ingredient for geography and environmental sciences is data. Data collection is the backbone of advances in geosciences (thus teaching). In hydrological sciences education, water data (discharge and/or water level) collection is traditionally covered in many hydrology courses, however in rather a traditional way (e.g. in terms of measurement techniques) and often with a limited scope within a short duration. Maybe merge Paragraph 3 into this section. I recommend citing Tauro et al. (2017) to give an overview on the efforts to advance hydrological sciences through innovative measurement techniques. Also, the need for such efforts in view of not only providing support to financially disadvantaged countries but also harnessing the power of harmony in unity (e.g. WMO HydroHub).

Lastly, explain how electronic circuits are used for data collection purposes in hydrology and meteorology. Paragraph 2 fits into here, followed by Paragraph 4, 5 and 6.

P2 L59-63. How is the open source electronics movement linked to the Open & FAIR data? Briefly mention.

P3 L70. Before Paragraph 7, please state the research objective (and associated questions). L74-75 are the objectives of the course taught, not the manuscript's.

P3 L76-93. Paragraph 8-9-10 should be moved to Section 2 "Materials and Methods" (Sec 2.3 in particular) as they describe several aspects related to pre-, during- and after the class activity (i.e. electronic circuit construction).

P18 L587-591. Better if moved to Section 2 "Materials and Methods" (before subsections, a general summary can be given supported with a diagram showing all the stages).

P19 (Code and Data Availability). Thanks for your dedication to Open Science and FAIR Data.

P20 (Author contribution). Is there really a need to specify all tasks individually? Maybe one sentence is enough? E.g. All tasks (conceptualization, methodology, software, ….) are contributed by N. K.

P20 (Acknowledgements). Thanks for being so elaborate and honest.

P21 (References). Quite a comprehensive list, impressive. Properly cited, incorporated well into the text.

Minor Edits

P1 L14. "systems science, models in hydrology, and calibration" > "systems science, modelling in hydrology, and model calibration"

P3 L71. Abbreviation (USask) can be used for the "University of Saskatchewan" in the remaining part.

P4 L115&122, P5 L160. Students in the Advanced Hydrology > Just say "students".

P7 L213&L222, P12 L430, P17 L529… The name of the course "Advanced Hydrology class" doesn't need to be indicated every single time.

P13-15 L405-470. The texts quoted should be written in Italic.

P18 L578. Add in parenthesis the English translation of "tawāw".

P18 L581. allowed for > allowed

P18 L584. Instead of "hydrology", use "technology".

P18 L586. Reformulate the sentence, maybe better as follows: "This paper provides explanations on Circuit theory and relevant concepts for classroom implementation and replication."

References (used in this review)

Tauro, F., Selker, J., Van De Giesen, N., Abrate, T., Uijlenhoet, R., Porfiri, M., ... & Ciraolo, G. (2018). Measurements and Observations in the XXI century (MOXXI): innovation and multi-disciplinarity to sense the hydrological cycle. Hydrological Sciences Journal, 63(2), 169-196. https://doi.org/10.1080/02626667.2017.1420191

HydroHub by the World Meteorological Organization https://hydrohub.wmo.int/en/home

Suggested Reading

Kingston, D. G., Eastwood, W. J., Jones, P. I., Johnson, R., Marshall, S., Hannah, D. M., & Seibert, J. (2012). Experiences of using mobile technologies and virtual field tours in Physical Geography: implications for hydrology education. Hydrology & Earth System Sciences, 16(5). https://doi.org/10.5194/hess-16-1281-2012

Ruddell, B. L., & Wagener, T. (2015). Grand challenges for hydrology education in the 21st century. Journal of Hydrologic Engineering, 20(1), A4014001. http://dx.doi.org/10.1061/(ASCE)HE.1943-5584.0000956

Seibert, J., Uhlenbrook, S., & Wagener, T. (2013). Preface" Hydrology education in a changing world". Hydrology and Earth System Sciences, 17(4), 1393-1399. https://doi.org/10.5194/hess-17-1393-2013

Van Loon, A. F. (2019). Learning by doing: enhancing hydrology lectures with individual fieldwork projects. Journal of Geography in Higher Education, 43(2), 155-180. https://doi.org/10.1080/03098265.2019.1599330

Wagener, T., Weiler, M., McGlynn, B., Gooseff, M., Meixner, T., Marshall, L., ... & McHale, M. (2007). Taking the pulse of hydrology education. Hydrological Processes: An International Journal, 21(13), 1789-1792. https://doi.org/10.1002/hyp.6766