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Comment on hess-2021-30

Anonymous Referee #1

Referee comment on "Teaching hydrological modelling: Illustrating model structure uncertainty with a ready-to-use computational exercise" by Wouter J. M. Knoben and Diana Spieler, Hydrol. Earth Syst. Sci. Discuss.,
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In this contribution, Knoben and Spieler describe a teaching module on structural uncertainty in hydrological modelling. While I appreciate the attempt to provide this module to other hydrology teachers, I have several major concerns with the manuscript in its current status. I hope the authors can use my comments to redesign and improve their study and manuscript.

Major comments:

Selection of the two catchments in this study: I find the selection of the two catchments a bit problematic. Mainly, the two catchments vary in several aspects besides the so-called aridity fraction (e.g. size). This makes comparison difficult. Furthermore, one of the catchments reports zero-flows. Here it is important to note that the used model variants are by design not able to simulate zero-flows. The occurrence of zero-flows also makes the use of log-transformations for the computation of performance measures challenging.

I am also a bit confused by the selection of the two model variants, why just these two?

I am missing an evaluation of how successful the suggested module is. As it is now, basically the same claims that the authors make to motivate their module are also used to describe its success, which is not convincing. What would be needed is some form of evaluation by surveying students who took the class. I am also missing information on how many students and with which background participated in the course in Dresden.

The authors claim that their module could be added into 'any hydrology course with minimal effort' (P10L10). I'm afraid I have to disagree for several reasons:

- If at all, then it can be added to courses in hydrological modelling, but not all hydrology courses.
- If Matlab is not used in a particular class, including this module is by no means trivial
- Teaching materials are not provided; this would be important as a service to a potential teacher who wants to adapt this module in their course.

- The fixed selection of catchments and models might limit the utility of the module.

I would recommend describing the module first in generic terms. Both catchments and model variants could be left open to be selected as appropriate for a particular course. First of all, there is great value in using catchments that the students are familiar with. Using US catchments might not be the most pedagogical choice in many cases. Furthermore, depending on which programming language/modelling frameworks are used in a course, it might also be more useful to use an alternative to the option presented here. In a second step, a concrete implementation of the module could be described (=as it is described now) and guidance could be given on alternatives. Finally, it is crucial to evaluate the module in some way (e.g. student survey before-after)

Minor comments:

P3L26 (mathematically) accurate – I think you just mean 'better'. Note that a model can be mathematically accurate but still totally useless.

P5L10 Aridity fraction: please explain this term and how it is computed

P8L2: The statement that instructions are straightforward is followed by a 'fork and clone' statement that might be not at all straightforward to most readers.

P10L4: formalize? Do you mean formulate?

P10L30: Does this mean it was an one-day course in practice?

P11L16: sorry, but the choice of one single student can't be really used as a convincing argument

Figure 2 is hard to read and needs to be improved. I am also a bit wondering about the shown precip data, for me it does not look as if "on average 294 days have < 1 mm precipitation" from this figure