

Interactive comment on “T-shaped competency profile for water professionals of the future” by S. Uhlenbrook and E. de Jong

Anonymous Referee #3

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Summary: The authors propose a T-shaped model for the design of university curricula in water related studies. They underline that a need for such a model is to adapt the competencies of university graduates to multidisciplinary challenge of future water related problems especially under anticipated global environmental changes. It is suggested that the T-shaped competency profile, which distinguishes between the vertical leg where higher cognitive skills in a particular field of study such as hydrology is achieved and the horizontal leg where cross disciplinary knowledge (at a lower cognitive level), and other soft competencies are achieved, be applied to all levels of higher education. The authors provide two case studies where T-shaped competency development either is being implemented or is advised.

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General comments: I think the emphasis on T-shaped competency profile is quite timely and appropriate. While idea that the authors have presented is not as innovative or new, I appreciate that academic research has started to discuss and debate the nature of competencies that will better prepare future water professionals for ever more challenging inter/cross disciplinary problems. I therefore strongly support the publication of this opinion article. However, I have some concerns that I hope the authors can incorporate.

Specific comments:

1) I have the impression that the authors' view of the challenges posed by future water related problems can be more holistic (or wider). Their view it appears is hydro-hydraulic centric with some references to other soft competencies. Case study 5.1 supports my impression, where it was difficult to locate how the horizontal/vertical bar covers crucial disciplines needed to understand what is meant by sustainability (how about political science, history, philosophy, development economics, econometrics, statistics, chemical engineering etc). The study of water is incomplete if its societal impacts/demands are ignored. In this regard, the authors' example of IHE water program as being T-shaped that facilitates cross fertilization of ideas or better communication of a problem at hand can still be made stronger. Probably the authors need to emphasize the context in which T-shaped profile is being implemented.

2) Do the authors think that as the context of the problem becomes multi-disciplinary (and no longer hydro-hydraulic centric), such as in the case of sustainable development of water resources, T-shaped competency profile is sufficient? Why not "pi" shaped? In my opinion, when one water professional with indepth training in hydrology talks to another professional say with indepth training in economics, both need sufficient training in mathematics (or probably something else) to collaborate on a "complex" cross/inter disciplinary problem with each other. The length of the connected horizontal bars of the two Ts of the hydrologist and the economist may be too long between the individual vertical bars that the connection may break under its own weight (imagine a bridge

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with too long span between two consecutive supporting pillars). To give an example: sustainability is perceived by many water professionals trained in hydrology/hydraulic engineering as a non-technical, soft objective. Meanwhile it is formally a difficult problem for a mathematical economist/mathematician delving in optimal control problems. One or two graduate level courses in general principles of financial engineering (such as cost benefit analysis etc) or general economics, that may go down well as developing the horizontal bar of T-shaped competency profile, will not be sufficient either for a hydrologist or a general economist to appreciate the problem and its policy implications for sustainable development of water resources.

3) Connected to my previous comment on the need to elaborate further on the context, if the designers of a curricula (say based on T-shaped competency development) were themselves disciplinarily trained (I-shaped), how can it be ensured that the design that they come up is not biased towards being an I-shape and is robust and serves the context of the curricula development (say for example: sustainable development of water resources) in the best possible manner?

4) Even if a robust T-shaped competency development based curricula has been designed, why should the students participate or enroll? Would there be incentive structure in place for the students so that they appreciate the reason behind such a design and make use of such curricula? Does the industry (both public and private) that hires graduates appreciate the complexity of future water problems and thus demands water professionals from the university with a T-shaped competency profile? I believe any proposal of curricula development aimed at improving skills or competencies set of graduates, such as developing T-shaped competency profile, should be proposed in cooperation or communication with the industry (if the motivation is to provide society with water professional better equipped to tackle more complex water resource problems of the future). This would create incentive for students to participate and the industry to hire the right configuration of skills, ultimately helping to solve complex environmental problems in the most efficient manner.

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