

Interactive comment on “Hydroinformatics education – The Water Informatics in Science and Engineering (WISE) Centre for Doctoral Training” by Thorsten Wagener et al.

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RESPONSE TO REVIEWER 1

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GENERAL COMMENTS

COMMENT: I have very much enjoyed reading this paper. I believe doctoral programmes of this nature will be increasing in number in the near future, and papers such as these are of great relevance to the scientific community to learn from the outcomes and experiences of such programmes. The paper is very well written and it explains

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thoroughly the need and benefits of the presented programme. It is very important to share the success story of this programme; however, I also think it is as much important for the community to learn about the difficulties and challenges, which I believe could be a little bit more specified in the paper. In general, this paper provides a great set of ideas for the community to benefit from and hopefully it will inspire academic institutions to create evenly innovative and interdisciplinary doctoral programmes.

RESPONSE: Thank you for the positive comments. Adding more discussion on the difficulties and challenges we encountered is indeed a good idea. There are issues like student recruitment and retention that are worth stressing, or the changes we made in response to student comments that we should discuss further. We will add text on these and related issues to the lessons learned section of the paper.

SPECIFIC COMMENTS

COMMENT: Paragraph 3.1 ‘student participation and feedback’: Here it is explained that surveys and individual feedback are important in the programme for improvement. It is nice to read that 70% of the students feel happy, however it might be interesting to know why 30% feels less than happy. Is this related to the programme? For example, is it particularly challenging (e.g. in comparison with a traditional PhD, this programme might be more intense/stressful due to a lot of training, meetings, conferences, ..), did the students have different expectations, etc. I also read that cohorts become “happier” and it is considered that the improvements of the programme have something to do with this.

RESPONSE: In our student survey we found that 27% of students overall assessed themselves as “okay”. No student felt “very unhappy” and only 2 students (3%) felt “unhappy”, with the reasons for this being known and appropriate support being provided (i. personal reasons; ii. significant project source code errors, subsequently rectified). As stated in our paper, initial data suggests a relationship between stage of PhD programme and general “happiness”. We find that each new cohort was happier than the

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previous one – hopefully because we improved areas of concern based on student input. We further find that students get significantly more stressed (and less happy) when they come close to their submission time (or end of funding). The WISE CDT invites all students to complete a wide-ranging evaluation survey on completion of the programme, which asks for their feedback on both positive and negative aspects, plus areas for improvement. We will extend the discussion of these results, while accounting for the impact of the pandemic on this evaluation. One issue that is very clear, is that the student very much like the first year of the PhD (with teaching) where they regularly work in a cohort and have a much stronger shared experience than in traditional individual PhD projects.

COMMENT: Could you give some examples of lessons learnt and such improvements throughout the programme (are they administrative, logistic, technical, social, ..)? What did students particularly indicate in the surveys/feedback that should be improved?

RESPONSE: Here are the main actions undertaken in response to student feedback, which we will outline further in the revised manuscript: • Enhanced student support/administrative support; • Seeking Chartered Institution of Water and Environmental Management (CIWEM) accreditation to meet the needs of students without a formal engineering background (they found that this will help their employability with engineering companies); • Amendments to content of 1st year Postgraduate School programme; • Enhancements to transferable skills modules, e.g. viva preparation, careers guidance; • Broadening the Industry Day focus/guests to cover the breadth of students' research interests; • Website enhancements – secure library of CDT templates/guidance; • Ongoing engagement with alumni, including in CDT events, e.g. talks to current students; • Involving students in planning of CDT events.

Student representatives for all cohorts participate in the Open Business section of our regular Programme Management Group meetings to feed in comments and questions from their peers, to propose ideas and to contribute to discussion on planning and programme improvements.

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A continuing challenge for students is that the 4 WISE universities' have different regulations / procedures for PhD progression, annual reviews etc. This is unfortunately something we cannot change. To mitigate this issue, we have strengthened our CDT communications with students and have regular partnership meetings, including administrative and finance colleagues.

COMMENT: I think in the final paragraph 5 'Conclusions and lessons learnt', there could be some more attention to the challenges that were faced during the programme and how they were solved, or how they remain a challenge in this type of programmes. I refer to you the paper "Serlet et al (2020) SMART Research: Toward Interdisciplinary River Science in Europe. Front. Environ. Sci., <https://doi.org/10.3389/fenvs.2020.00063>" which describes an interdisciplinary doctoral programme (SMART EMJD) that was very successful but also faced many challenges due to a very ambitious set of goals.

RESPONSE: Thank you for the suggested reference. We will include the reference and use it as inspiration to extend our discussion of challenges. It looks like our goals (in terms of interdisciplinarity) were not quite as ambitious as in SMART. However, we used the reviewer's comments to review our student guided changes to the program (listed above). We will include and discuss those in the revised manuscript.

COMMENT: The wide interaction of the doctoral students with researchers, industry, practitioners, .. is really a successful key point in this programme and could be more highlighted in the abstract. I really appreciate the out-of-the box type of thinking that was implemented, e.g. the story of the workshop where artists and students collaborated and was then used to integrate the general public.

RESPONSE: Thank you. We will add more on our students' interactions beyond academia, including the art project and industry interactions.

COMMENT: In line 80 it is written that most students entered the programme after finishing a Master's degree, while some with a Bachelor's degree. Given the age of

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some students, I would think there are also students who have a working experience? It could be interesting to add this.

RESPONSE: Yes, there are. We will add some information on the work experience of our students.

COMMENT: Considering the wide range of backgrounds of the students, does this reflect in an equally wide range of thesis topics? In an interdisciplinary programme it can be challenging to have students collaborating e.g. in publications due to a wide range of topics – in contrast to students working in a traditional PhD setting within a team of people working on a single subject.

RESPONSE: Students in WISE work on a range of topics. This diversity is likely driven both by their own interests as well as by the diversity of supervisors and their research areas. The connecting tissue (if you like) between the students is the Hydroinformatics aspect of their work. Even though they apply their Hydroinformatics skills to (potentially very) different application areas, they nonetheless regularly share the same computational tools to do so, e.g., optimization and machine learning algorithms or software for uncertainty analysis. For example, students might apply the same sensitivity analysis software to investigate the role of uncertainty in a water treatment model, in a global flood inundation model or in groundwater model. The use of similar tools and methods was one avenue that created connections even for disparate research topics.

COMMENT: Did you find specific challenges for integrating the industry on an academic level? I think it is quite 'new' for academic programmes to reach out to the industry on the level of doctoral programmes, particularly for certain disciplines. Are there any recommendations you can give if institutions would like to achieve the same in other countries? Did you make contact yourself, did you advertise the programme, .. ?

RESPONSE: The UK has quite a strong history of academia-industry interactions, including in the context of PhD-level research. Having said this, there is certainly always

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a training element in which the academics (and students) have to understand what is considered relevant in the operational world, while industry partners have to understand that even solving their most pressing problem might not always constitute a scientific advancement. Defining a project that is both scientifically novel and operationally relevant is not trivial. One aspect (that we will add to the text) is that the increasing availability of funding to add impact (beyond academia) to a PhD project. Funding sources have been available in recent years to either buy out students for shorter periods (say 3 months) or to add time after the PhD funding has seized so that a better translation of the research work to industry can take place.

COMMENT: I am a bit confused about the number of students, line 75 states 84 students were recruited, line 73 states “all 63 current students”, and in the abstract it is said over 70 PhD students will graduate. Perhaps you can also indicate how many students dropped out from 84 recruited?

RESPONSE: We will reconcile and update the numbers in the revised paper.

COMMENT: I did not understand from the paper if the programme is finished, has a limited duration or it will continue indefinitely?

RESPONSE: The student recruitment of new students has finished, but not all students have graduated yet. The latest group of students was recruited in 2018 and is expected to finish in 2022.

COMMENT: Did the programme have funding to include a living allowance for the students? Increasingly, the term “doctoral candidate” is being used instead of “doctoral student”. This is a little bit related to the culture and local regulations (status). Since the European Commission uses the term doctoral candidate, I would recommend this term.

RESPONSE: Yes, all students received funding to cover both living allowance and tuition fees. Doctoral candidate is certainly the more generic term given that doctoral

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candidates are considered students in some countries and not in others. We will adjust this.

COMMENT: Technical corrections: Line 95 there is a dash, while in line 96 there is a bracket.

RESPONSE: We will correct this.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-475>, 2020.

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