Article Incubator: building interdisciplinary academic writing skills amongst PhD students

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Abstract— **The Article Incubator (AI) is a course intended for PhD students at the International Institute for Industrial Environmental Economics (IIIEE) at Lund University. The course provides a forum for students to discuss their current research, to develop academic writing skills, and to share best practices in academic publishing. The AI is coordinated by a senior researcher at the IIIEE, while maintaining a student-centred approach, where all course elements are supported by students' own contributions, reflections and experiences. In addition to sharing the article incubator as a pedagogical experience, we also seek to reflect upon ongoing challenges including how to successfully manage diverse student backgrounds and expectations in an interdisciplinary context.**

Index Terms— **feedback, interdisciplinarity, PhD course, student-based learning.**

I. Introduction

THE Article Incubator (AI) is a course intended for PhD students at the International Institute for Industrial Environmental Economics (IIIEE) at Lund University. The course provides a forum for students to discuss their current research, to develop academic writing skills, and to share best practices in academic publishing. In fulfilling the intended learning outcomes, PhD students strengthen their ability to develop relevant, coherent and compelling interdisciplinary research, by serving in the role as writer and peer reviewer. The 'incubator' operates as series of workshops, where students present and discuss their own journal manuscripts at different stages of development. Furthermore, each 'incubator' seminar introduces a theme for discussion.

The IIIEE has a reputation for its interdisciplinary sustainability research; thus, another purpose of the AI is to discuss the variety of perspectives, theories, methods and models used for analysing low carbon and resource efficient economies. Reflecting this interdisciplinary focus, the course has a mix of doctoral students from different disciplines, technical orientations and social backgrounds. Therefore, a key challenge is to leverage the broad knowledge base among doctoral students. The aim of this conference paper is to reflect upon experiences from designing, organizing and participate in the article incubator. What are weaknesses and strengths with a course like this and what can be learned from the process so far?

The aim is discussed in relation to the course's interdisciplinary and student-based approach and in relation to theories of interdisciplinarity and student-based learning. We also include responses from an evaluation of the AI that has been conducted during autumn 2018. The authors of this paper include the course coordinator and PhD students participating in the course, which give us an opportunity to reflect on the issues raised here from our different perspectives

II. Interdisciplinarity

The fundamental premise of the AI is an interdisciplinary approach that integrates technical, economic, social and other perspectives in various ways. This requires something of a shared understanding of what interdisciplinarity is. In a paper on interdisciplinary research, Bruun argues that a scientific discipline has a knowledge perspective and that interdisciplinarity is the confluence of different knowledge perspectives. This meeting can facilitate 1) integration of knowledge from another field, leading to a changed knowledge perspective; or 2) collaboration among scientific fields with discrete knowledge perspectives [1]. According to Bruun, there are three key components to interdisciplinary research: depth, breadth and synthesis.

--Depth refers to the extent of knowledge within a single knowledge perspective

--Breadth refers to how many fields of knowledge with which one is adequately familiar

--Synthesis refers to integration of a variety of perspectives into a "whole" and greater knowledge

If depth and breadth are the only components, this is according to Bruun a lesser degree of interdisciplinarity that he calls multidisciplinarity. Synthesis is also required to achieve interdisciplinarity, but synthesis itself is difficult to achieve. Transdisciplinarity is a term often used with similar meaning to interdisciplinarity, but implying a high degree of synthesis. For example Coast et al. [2] avers that transdisciplinarity is a situation of "a very high degree of integration where theories, models and methods merge" [2, p 500]. We will only refer to interdisciplinarity in the context of this paper. While perhaps not achieving as high a degree of synthesis as transdisciplinarity, interdisciplinarity still requires the development of a common language and concepts. Strober [3] emphasises that interdisciplinarity is a social process in which existing disciplinary social boundaries built up by cultures of language and ideas must be broken down [3]. However, these processes take time.

One of the aim with the AI is to contribute to this interdisciplinary social process.

The AI contributes to this aim by providing the PhD students with a platform where they can discuss a variety of perspectives, theories, methods and models for analysing sustainability transitions. Various research directions are included and represented in the course. The challenge is to exploit the broad knowledge base in the group. One strategy is to problematize and reflect about how research problems brought up during a course session can be framed within a larger perspective. In the evaluation of the AI, one student commented on the need to have a discussion that goes beyond the paper presented to make the course more valuable for all participants and not only the authors of the paper being discussed. It is important that students are able to find connections between different perspectives and fields explored by their peers, and their own work as this relates to the synthesis required of an interdisciplinary approach. However, this is not always easy to incorporate when the immediate focus is on how to improve or develop a student's particular paper. That said, many of the issues related to structure and writing approaches that are addressed regarding any particular paper do in fact have relevance for other students. The role of the moderator, or even more experienced students, could be developed to ensure that challenges that are general to academic writing and research discussed concerning a particular paper are also discussed. However, there remains a delicate balance to be struck between the moderator and senior researchers leading elements of the AI and its primarily student-centred approach.

III. STUDENT-CENTRED APPROACH

All course elements and assignments are based on the students' own reflections, knowledge and previous experience. The AI is designed in a way that not only requires but also encourages active participation by the students. When a text is presented or a theme is discussed the quality of the moment is dependent on the PhDs' reflections, questions and willingness to share their experiences. Student-centred learning is distinguished by giving students an opportunity to become aware of their preconceptions, to actively process information and to shape their knowledge in harmony with others [4]. Motivation is presumed and the students' opportunity to take personal responsibility for their own learning is a fundamental precept. The course is mandatory for all PhD students at IIIEE, which of course is also a motivation for them to make the course a valuable part of their PhD education.

In the evaluation of the course the PhD students were asked what they considered to be the strengths with the AI. One strength mentioned is that PhDs at different stages come together and learn from each other. The AI is seen as a 'safe space' where they can discuss more freely about different aspects of writing a paper or a kappa. Most students appreciated to have feedback on an early draft and to be able to discuss papers in different stages, where some present some loose initial ideas and others present almost final papers. The PhD students also think it is valuable to hear the comments given to other's paper because it contribute also to their own writing.

The AI seminars are built up around the PhD students' own drafts and discussion themes that vary according to what themes that the students feel most eager to focus on. This choice, driven by students, also becomes a way to encourage holistic deep learning, rather than more superficial learning [5, 6]. The students are able to better understand, and sometimes even challenge, each other's approaches in discussions. However, as mentioned, these discussions may not always be framed or understood by all students as relating constructively to larger issues in research and writing.

There is also a tension between the student-centred approach and those students who want more guidance from the moderator or experienced researchers. One student responded in the course evaluation that they found the input from their peers to be "arbitrary opinions" while another commented that students were too inexperienced to give quality feedback and that the course could benefit from input from more senior researchers. Putting the student-centred approach of the course in the context of peer review in the academic community, of which PhDs are already part, might further clarify the aims of the course for students.

The size of the student group is also important, as it is felt that a student-centred approach in the course only works if there are not too many in the group. On average IIIEE has around 10 PhDs and a critical issue is that it is difficult to involve and engage everyone when a group exceeds 6-8 students. That the AI still works quite well is due to the positive dynamic existing in the group. However, this can change and would have major impact on the discussion climate and to the possibility to have constructive feedback instead of more superficial feedback. The existing positive climate makes it possible to open the floor to a discussion of how to improve the course and have focus on which questions the students want to deal with during the coming seminars. This in turn serves a dual purpose: it makes the course meaningful to all participants and gives them an opportunity to reflect upon the competence they already have and in relation to what issues they need to develop their understandings.

IV. IMPROVING AI

A critical issue remains to make and maintain the course so that it is relevant for all participants. The course evaluation showed that most PhD students think the course is valuable and helps to develop their writing skills. However, there are also critical comments noting that more perspectives could be included in the group and that PhD students are too inexperienced to give enough qualified comments. This critique may relate to the fact the expectations on the course differ from the aim of student-centred learning. This would indicate that there is a need to have a more ongoing discussion on expectations and how students can manage challenges. The critique may also be a sound reflection that one course cannot alone give all the skills required, but must be seen as one of many tools in academic writing.

The course is also under development and will hopefully continue to be so. It takes time to find educational tools to make a course based on peer-review and constructive critique of each other's work both lively, concrete and

supportive. One critique that has been raised is that the feedback given to an author has been both disparate and scattered. To deal with scattered comments some of the more senior PhD students introduced a feedback form based on the elements of a typical academic article introduced in the academic writing course given at LTH (the IIIEE's faculty for PhD education). This has been tried once, and according to the evaluation, there are both positive and negative aspects to it. It contributes to a more structured discussion on a paper, but at the same time it can be hard to just discuss just one element of the article in isolation; for example, the introduction when the introduction connect so tightly to all other parts of a paper. This reflects the continuing challenge that there are always elements in academic writing that relate to broader issues affecting the entire article and even research process. How to structure the feedback and discussion around these larger issues remains a continuing challenge.

The interdisciplinary base for the course makes many perspectives on method, theory, analysis, etc. present which open up for diversified rather than unified comments. This is a strength and a weakness typical for an interdisciplinary environment. The course can contribute in that the different perspectives are presented and the texts become more transparent and concepts better defined. While discussions around interdisciplinarity challenges in the course often do not reach conclusions, arguably the discussions themselves have value for the students to explore and challenge their own perspectives.

V. CONCLUSION

In these closing remarks, we will summarise the lessons we have learnt from running and participating in the AI.

The PhD students of the course are in good position to benefit from the course because they know each other and meet each other on a daily basis. The close collaboration at the IIIEE probably makes it relatively easy for the group to have open discussions and quickly reach a trustful atmosphere. Moreover, the merits of interdisciplinarity are already well accepted at the IIIEE. This enables the group to avoid prolonged discussions of what our various perspectives could add, our definitions of various concepts, and what various methods can bring to sustainability research and can quickly begin discussing the content. This, we think, would have been more of a problem if the course would be open for any student to attend.

However, despite this, it is still a challenge to ensure that the course has an added value for all students and to maintain a positive dynamic atmosphere amongst the student group as students change over time. As the course is based on a student-centred perspective, active student participation is crucial to every element of the course. As a result, the course is vulnerable to an imbalance in group composition if some perspectives or individuals become too dominant or too many students remain passive. This would further impede achieving the synthesis that is key to interdisciplinarity. If a diversity of perspectives is lacking, one solution could be to involve more senior researchers at the IIIEE to ensure that the course cover a wide variety of perspectives.

Finally, we think that although there remain many elements that can be improved and developed, we have achieved a course that gives graduate students the opportunity to put their individual project into a wider interdisciplinary context and a platform where they can raise their own questions and problems to discuss them in a trustful environment.

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