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Disciplinary Convergence in Scientific Collaboration: Using storytelling as a research integration mechanism

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Cross-disciplinary research is crucial for tackling 'wicked' problems like sustainability transitions. Nevertheless, scientific collaboration is often hampered by disciplinary divergence in communication. Storytelling has facilitated bonding and knowledge transfer among humans throughout history. We argue that storytelling and storytelling techniques can facilitate scientific collaboration as a common language vehicle. Well-designed research stories transcend highly specialised disciplinary vocabularies and are accessible to audiences from any background. Combining storytelling elements such as character and plot, we explore the further potential of storytelling as disciplinary convergence mechanism.

In this research presentation, we investigate the application of storytelling methods to the disciplinary convergence of researchers involved in a Dutch project through three workshops. This paper presents 1) a brief review of storytelling applications in cross-disciplinary research, 2) our approach to deploying storytelling methods for disciplinary convergence, and 3) the results of its application. Workshop participants indicated that employing storytelling

¹ <https://www.utwente.nl/en/et/dpm/>

² <https://www.tue.nl/en/our-university/departments/industrial-engineering-and-innovation-sciences/>

techniques helped them recognise their target audiences and enhanced their understanding of each other's research projects.

KEYWORDS: cross-disciplinary research, collaborative research, disciplinary convergence, storytelling, sustainability transitions, energy and mobility transitions

RSD TOPIC(S): Learning & Education, Methods & Methodology, Cases & Practices

Presentation summary

Modernism has brought about many of today's global issues on sustainability (Norgaard, 2006). Many of these issues, due to their 'wicked nature,' transcend the individual disciplines and consequently require a cross-disciplinary approach to be addressed (Brown et al., 2010; Waddock, 2013). The cross-disciplinary aspect demands collaboration among scientists. Scientific collaboration, however, has become challenging due to increasing abstraction and specialisation in its fields (Weingart, 2010). Scientists depend on their disciplinary languages for articulating research paradigms and sharing knowledge. A common language for universal communication could benefit the collaboration process (Dugle et al., 2020; Mumuni et al., 2016; Nurius & Kemp, 2019; O'Rourke & Robinson, 2020).

Storytelling, a social and cultural tradition of human history, could potentially be such a universal language (Madni, 2018). Due to its relatability, storytelling has been used to promote communication from science to society repeatedly, producing local community-wide knowledge in the process (Alizadeh et al., 2022; Corner & Clarke, 2017; Shenk & Gutowski, 2022). In addition to the inclusive linguistic capability, storytelling has supported human interaction by transferring thoughts and forging bonds and cooperation (Sibierska, 2017). Given that storytelling helps people understand each other's worldviews (Bae & Kim, 2020) and find common or overlapping elements in their professions (Talgorn et al., 2022), we posit that storytelling could prove a valuable tool for cross-disciplinary collaboration. Moreover, by placing specific research topics in a

wider story context, we theorise that storytelling can also benefit individual research quality by uncovering blind spots and implicit assumptions.

To make use of storytelling for collaborative research, two aspects require further understanding: (1) the practical methods for deploying storytelling as a common language medium and (2) its effectiveness for collaboration. With these insights, the method can be further improved for more effective collaboration facilitation. However, the state-of-the-art of using storytelling for scientific collaboration in the literature remains limited to general cases of storytelling-based education programs, and cases focused on creating storytelling-oriented artefacts (Brigham & Imbertson, 2020; Fisker & Heilmann, 2020; Gordon et al., 2018; Kerlow et al., 2020; Liao & Wang, 2020; Singer & Kruse, 2019; Topouzova, 2021). Though Talgorn et al. (2022) presented the impacts of having storytelling workshops in a cross-disciplinary collaboration setting, their work focused specifically on scientist-designer collaboration, not mutual collaboration amongst scientists. To address this knowledge gap, we develop and assess a practical approach to deploy storytelling as a common language for scientific collaboration.

Methods

We investigated how – using storytelling as a theoretical foundation – individual research projects could be broken down into simple elements that could be combined more easily (Figure 1). We designed three workshops to test the approach, challenging participants to translate their research into stories, refine their content and presentation collaboratively, and combine their story elements for a collective research story. This section presents our conceptual framework, workshop design and results.

Context

We investigate the use of storytelling for cross-disciplinary collaboration within a research group of 33 researchers based in the Netherlands.³ The team consist of researchers from various groups in the engineering and social science departments. From the project's initiation (2020) to date, no group-wide collaboration has taken place.

³ NEON (New Energy and mobility Outlook for the Netherlands): <https://neonresearch.nl/>

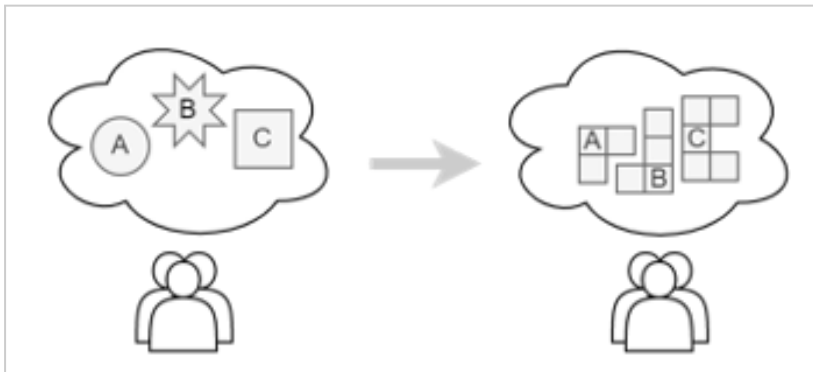


Figure 1. Reframing disciplinary research topics for collaborative needs.

Process: unpacking individual scientific research

We conceptualise scientific research as the product of different stakeholder needs. Using user stories, scientists can understand stakeholder needs, i.e., the desired research outputs (research interface). Consequently, the scientist can determine the necessary data and the most appropriate theories or methods to use (research foundation). Finally, the method for communicating the results of the research is decided based on stakeholder needs. A schematic overview of how a user story can be used in a research context is presented in Figure 2.

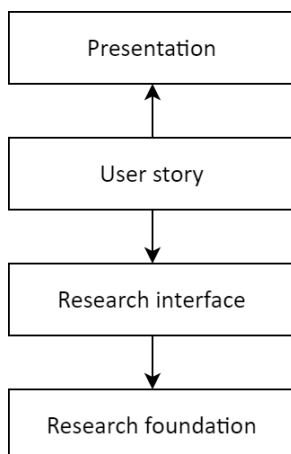


Figure 2. Schematic representation of the research design process based on stakeholder user stories.

Current state: conventional research integration

We hypothesised that conventionally, research integration would occur through the accumulation of individual research outputs to answer a later collectively established research question (Figure 3).

This hypothesised integration process has two caveats.

1. Research integration can only occur once researchers have acquired results. Given the low possibility that multiple researchers concurrently obtain the results, its collaborative integration would be impeded.
2. Only once the individual research outputs are available can the potential of the collaboration be seen, since only then the exact problem can be found to which the integral research provides an answer.

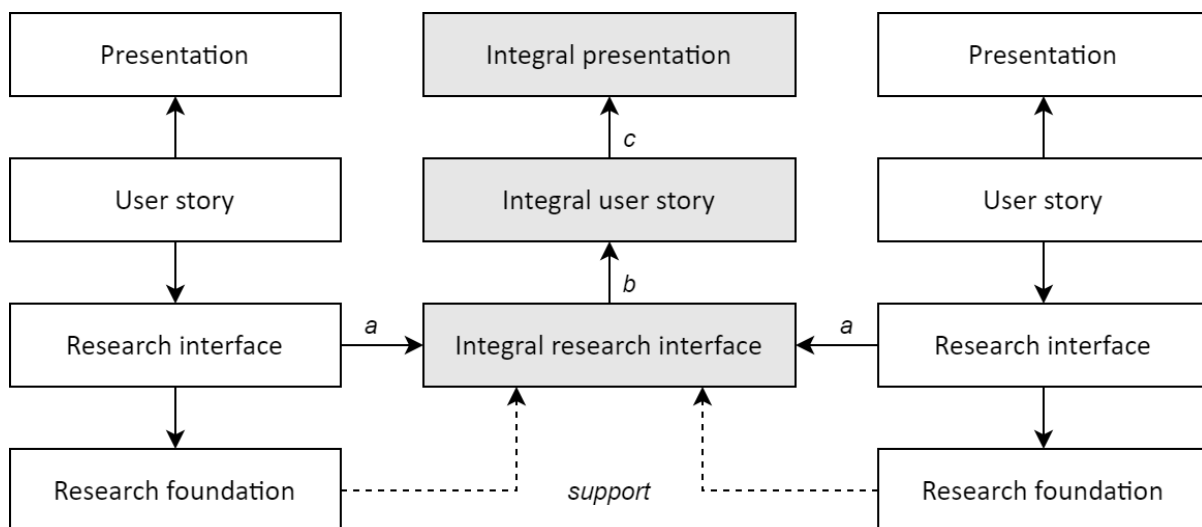


Figure 3: Conventional integration of research through a user story perspective.

Proposed: research integration ignited by integral research story formulation

Figure 4 illustrates our proposed mechanism for research integration. For effective collaboration, the initial step is for researchers to individually create stories concerning their research projects (a research story) using the user stories providing stakeholder needs (see Figure 3). The research story is considered a storified research project description. While user stories represent the needs and/or requirements of stakeholders, “as a [who], [what] is needed because [why],” the research story embodies how researchers would deal with the user stories in their research projects. So, the researchers describe the scientific conduct as a response to the user stories in a story-telling format—as story-tellers—using such storytelling elements as characters, plots and settings. We believe that researchers can effectively convey the essence of their overarching research problem by becoming storytellers.

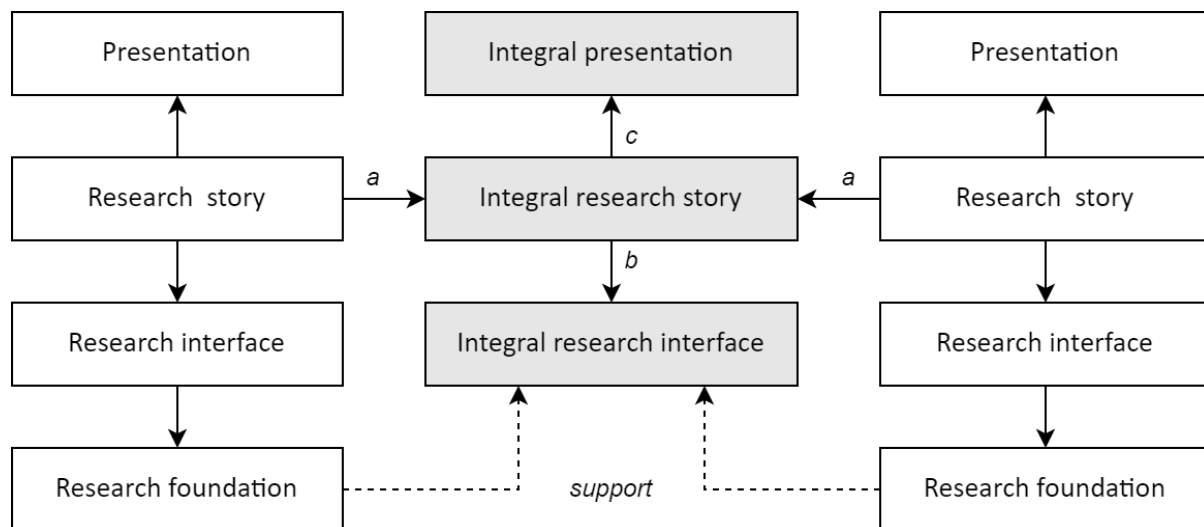


Figure 4. The proposed integration of research through a research story perspective.

Next, individual research stories can be integrated within a collaboration-design space (Figure 5). Forming an integral research story can be difficult unless the research team is highly mature to collaborate in a self-organised manner. With a research group inapt, designer(s) and/or design researchers can instantiate integral research stories together with researchers using designer(s)' interpretation or design the collaboration-design space in a way that researchers can proactively formulate integral research stories by themselves. Hence, integral research stories can become the foundation of cross-disciplinary collaboration research.

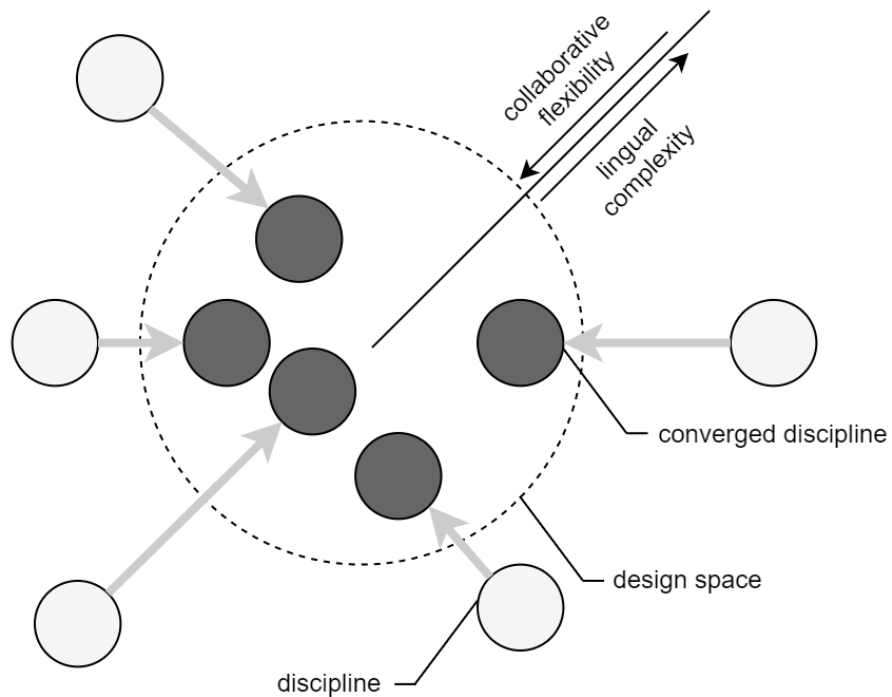


Figure 5. Disciplinary convergence and collaboration.

Workshop design

Three 2-hour workshops consisting of moderators' presentations, individual work, peer feedback rounds, and discussions were designed to explore the conceptual framework (see Figure 6 for a schematic outline).

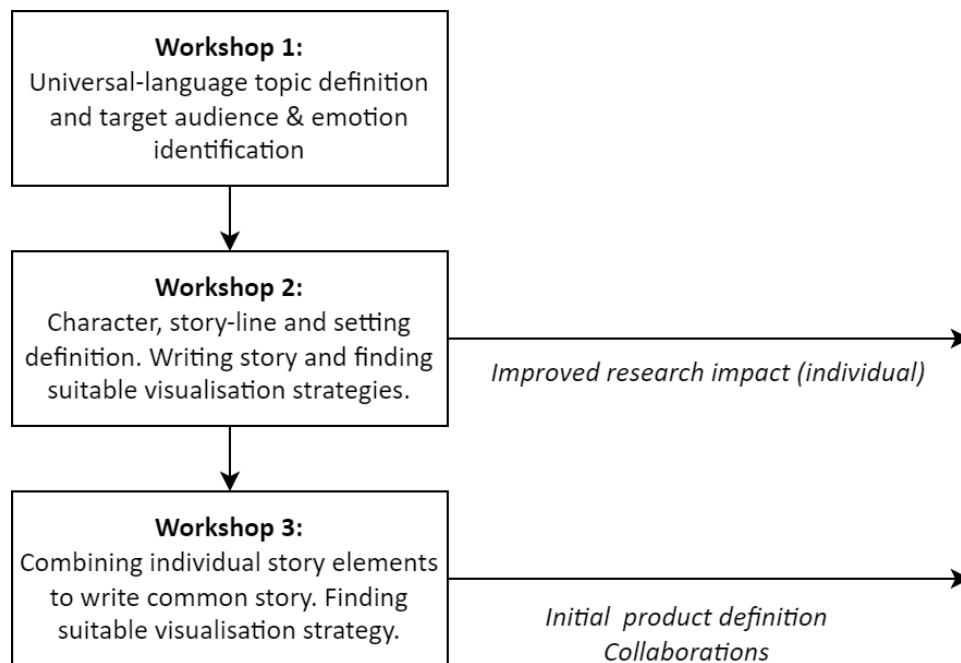


Figure 6. Diagram of the workshops, their contents, and outputs.

The first two workshops (respectively, 7 and 5 voluntary participants) challenged participants to develop their research stories (Figure 7). We adopted a visual storytelling canvas provided by Kernbach (2018) as a tool for the storification. Kernbach's storytelling canvas was straightforward to follow and easy to adapt for novice storytellers. Participants explored storytelling elements such as target audiences and emotions, but also research presentation strategies such as blog posts. We also conducted peer-review sessions to familiarise the researchers with each other's work.



Figure 7. Story-telling canvases as outputs of the second workshop session.

In the last workshop (9 voluntary participants), we designed the collaboration-design space to make participants create integral research stories. We introduced two icebreaking activities to be able to support participants in being creative and feeling safe enough to share different perspectives on the same matter. The first activity was a game (*Dixit*) where the participants were asked to describe an artwork using only one word and had the others guess which artwork the first participant was referring to. A point system discouraged participants from making obvious descriptions and forced them to think in more creative ways. The second ice-breaking activity was a short reflective session during which participants chose a question starting with “what-if”⁴ (e.g., “What if you could turn back time, what would you change, and why?”) and gave their personal answer to it. Next, to guide the development of integral research stories, we asked participants to make a set of cards naming their individual research story elements that were stakeholders, topic and/or technology, main characters, and setting. Then we asked to shuffle research cards with participants sitting next to each other except for the cards of stakeholders and technology and make pairs with whom they

⁴ We used a product found at <https://www.housevitamin.com/hv-return-2-sender-what-if-box.html>.

did not share the individual research cards. Paired researchers made integral research stories by using mixed cards and the storytelling canvas.

Validation

Besides enabling storytelling activities, we analysed the effectiveness of the first two workshops in terms of contributing to collaboration; qualitative and quantitative data were collected from semi-structured interviews and surveys. Concerning the results of the last workshop, workshop participants had a group discussion about the usefulness of developing an integral research story for their collaboration and the effectiveness of workshop design for approximately half an hour.

Results

Individual research storytelling and its impact on facilitating collaboration

While developing individual research stories, we observed that researchers were able to discuss underlying motivations behind their projects (e.g., supporting emerging technology developers).

The first workshop activities revolved around the re-definition of research topics, finding and choosing target audiences and exploring the emotion that, in these audiences, should be evoked for the most effective communication. With the redefinition of topics into simple and jargon-free one-liners, participants got a better understanding of each other's research. Yet, the time for group interaction could have been longer so that participants' presentations would have had more time to fall into place. The individual exercise and group presentations on target audiences and emotions made participants more aware of their audiences or led to discovering new ones instead. Results on audience engagement were mixed; only those who considered their research to be sufficiently progressed planned to engage with their audiences.

The second workshop did not enable collaboration. However, individual participants reported seeing clearly a bigger picture of their research field systematically as well as exploring more target audiences. This is in line with the earlier hypothesis that storytelling helps researchers take on a broader perspective. The utility of accessibly

described research stories when researchers happen to talk about domain-specific knowledge seemed yet questionable.

Integral research story development

Researchers managed to develop integral research stories but also wondered how to translate the integral stories into collaborative research projects as well as scientific papers. To facilitate this translation process, it was recommended to add elements closer to academic paper structures (e.g., keywords, submitted journals) to the storytelling canvas. Concerning the necessity of design researchers' intervention during the formulation of integral research stories, it turned out that the intervention is only needed when researchers experience difficulty in getting started.

Regarding the workshop design, researchers positively evaluated the two icebreaking activities as the activities let researchers be open to sharing their vulnerability and personal space, which we considered crucial for developing collaborative stories. Additionally, it was considered supportive that researchers were asked to interact with each other continuously, which contributed to asking and learning about each other's knowledge and different perspectives. Furthermore, the value of storytelling was evaluated as an organic way to explore each other's research project but also personal space, which led to interpersonal dynamic exploration. Not only training researchers to be capable of collaboration but also improving the academic research environment into a cross-disciplinary collaboration-friendly place was discussed as a practical implication.

Limitations and future research

As for the limitations of this research, we acknowledge the small number of workshop participants and the lack of generalizability of the results. Moreover, we also recognise that more elaborate data acquisition methods could have provided more grounded evaluations of the effectiveness of the various workshop components.

For future research, we have considered trying to introduce diverse formats of storytelling, such as making visual art to explore other storytelling tools than the storytelling canvas; expressing ideas with visual components like drawing might

stimulate authentic communication and effective exploration of complex phenomena beyond written and spoken word-oriented communication.

Additionally, storytelling-relevant design approaches such as discursive design could be a useful reference as an advanced storytelling facilitation tool. Activities related to academic research can be incorporated into workshop design, such as practising writing a scientific journal abstract and conducting a short presentation as ways of developing and presenting integral research stories, which can be directly beneficial to scientific collaboration.

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Contribution to the work for presentation

Younjung Choi: conceptualisation, workshop design and execution, workshop data processing, writing

Willem Klok: conceptualisation, workshop design and execution, workshop data processing, writing

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