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How to cite:

Herodotou, Christothea; Papathoma, Tina; Davies, Gareth; Gaved, Mark and Scanlon, Eileen (2020). Interdisciplinary research in technology-enhanced learning: Strategies for effective working. In: International Conference of the Learning Sciences (ICLS 2020), 19-23 Jun 2020, Nashville, TN, USA.

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Version: Poster

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# Interdisciplinary research in technology-enhanced learning: Strategies for effective working

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**Abstract:** This study proposes strategies for effective working in teams where more than one discipline or fields are involved and addresses one of the major challenges in the field, that of the development of interdisciplinary skills and knowledge. Data from ten in-depth interviews provides insights about: (a) how interdisciplinary teams in technology-enhanced learning collaborate, (b) the challenges and obstacles they face, and (c) strategies for effective working. The need for awareness about the challenges of interdisciplinarity work and respective training are emphasized as a means to promote effective working in interdisciplinary teams.

## Introduction

Interdisciplinarity integrates methods and knowledge from more than one discipline, field, or body of knowledge (Huutoniemi, 2010). The focus of this paper is on interdisciplinary research in the area of Technology-Enhanced Learning (TEL). There is a growing recognition of the need for interdisciplinarity in solving complex research problems, and promoting innovation in TEL, an area presenting diverse technological, pedagogical and organizational challenges (Scanlon & Conole, 2018). The challenges and problems of interdisciplinary working (Masterson et al., 2019) are sometimes understated and underestimated; for example, there are particular challenges for early career researchers (Carmichael, 2009) when working in such teams such as their role or positioning in the project activities. Thylefors (2012) reported on the dominance of some professions over others with psychologists, physicians and teachers dominating team activities while paraprofessionals being less communicative despite the fact that they had the most experience and insights about clients.

## Methodology

We captured the experiences of ten academics, researchers, and practitioners (female=5; male=5) collaboratively working in TEL projects in diverse roles, and propose strategies for effective working in interdisciplinary projects. Interviews were face-to-face, audio-recorded and lasted approx. 40 min each. Thematic analysis (Braun & Clark, 2006) was adopted to analyse the data. The findings below are organised around four main themes: process, outcomes, challenges and strategies, and accompanying subthemes.

## Findings

**Process:** a) Management (leadership/coaching): Interviewees identified that effective management and leadership were significant especially in support of large interdisciplinary projects: *“project managers [can] help you with the research, [...] processes that they manage and they respect in a project of [...] size and volume”* (Interviewee 10, F). The presence of key actors was valued as well: *“a key thing is having[...] a lead who is working with you very closely to direct where we're going with the project”* (Interviewee 3, M); Hierarchies within organisations and cultures of leadership may affect how teams can work, for example where senior members of staff are given greater voice than junior members: *“being aware of this power aspect in the team is very important”* (Interviewee 8,F). b) Integration in a comprehensive and transparent system: Opportunities to share ideas were valued: *“if you give people the space to be creative, give them the time to think and to talk, they tend to come up with creative things”* (Interviewee 9, M) while collaboration should be actively managed: *“just bringing people with different backgrounds and put them together, that doesn't create collaboration or exchange of knowledge. We need to actively work on this aspect ... to improve and optimize this knowledge exchange”* (Interviewee 8, F). c) Communication: Communication was viewed as an ongoing process of development that can enabled all voices to be heard: *“people genuinely believe that they're having an opportunity to voice their opinions”* (Interviewee 5, M). Negotiating a common language was important even in what seemed at the outset to be a single discipline: *“the community of [practitioners] is very fragmented and each one of them is their own consultant, has their own personal language. So to try and impose a standardized language on them was very difficult”* (Interviewee 2, M).

**Outcomes:** a) Variability of goals: Project goals were refined over time, moved to different directions or other hidden goals emerged. For example, some projects had political agendas that drove their implementation or goals were not explicitly stated: *“there was also an underlying strand of monetization. So, they were looking to*

sell the software after they built it, whereas we don't particularly care about that" (Interviewee 3, M), b) Variability of criteria and indicators: Successful projects were described as those achieving a range of outputs or deliverables including publications, development of tools, interdisciplinary collaborations: "with actual publications, we had technological tools, we had very good collaborations with schools and students and it was very interesting and fascinating" (Interviewee 4, F), c) Effectiveness and Impact: The degree of achieving impact was related to factors including the role of the project leader: "they didn't trust that it would give unbiased [outcomes] around any topic. People just ignored it." (Interviewee 4, F); and the ways academics engaged with practitioners; "where we actually include practitioners in the research, and they've been involved in the research really from the beginning, so they've kind of helped shape it [...] I think what that does is actually create a really good relationship between us and the [practitioners]." (Interviewee 10, F).

**Challenges:** a) Effective working: Practitioners talked about not being able to assume the same authority that they had in their own disciplines. They had to develop the skill of knowing when to influence others through appeal and attraction (soft power) versus when to coerce by asserting their authority (hard power), b) Differences amongst involved stakeholders: "I think the organizations are structured in different ways [...] at times, [needs] to understand each other's organizational processes of why things are done in a particular way [...] some [practitioners] are very suspicious of academia." (Interviewee 10, F). These differences were identified in relation to (i) the organisational culture and regulations (ethics, data privacy etc.) of each organisation, (ii) ways of working such as processes of documentation (e.g. communication plan, project progress plan), (iii) approaches to hierarchy, (iv) language used and (v) individual attitudes, c) Power relationships: Another significant challenge was the recognition or acknowledgement of expertise across each discipline and its consideration during the project implementation. This was contrasted to imposing the agenda or expertise of one discipline to another: "I think the academics kind of thought that we were just paid software developers, who would do anything they said." (interviewee 2,M).

**Strategies:** a) Identification of common goals: "Absolutely helps to have a common goal because you've got to try and deliver something at the end of it. So, there is a reason to remain cohesive. If there was no reason, probably people would go their separate ways" (Interviewee 9, M), b) Close work with key actors: "a key thing is having[...] a lead who is working with you very closely to direct where we're going with the project", c) Scheduled regular meetings: "[give] people the space to be creative, give them the time to think and to talk" (Interviewee 1, M). Teams can work remotely, but "you need to bring people together occasionally just to give them a sense that they are part of a collective", d) Practitioners as researchers: "when we had a co-researcher that was from another [unit of the same organisation] and worked with the organization, they were less likely to put up barriers" (Interviewee 10,F), e) Engage staff with interdisciplinary expertise: "because my background is extensively [in the practitioner domain], and I have some academic knowledge. [...] I sit between the two conversations" (Interviewee 9, M).

## Conclusions

Simple notions of interdisciplinarity, such as a collaboration between departments, and a lack of an in-depth understanding of what this complex approach involves can threaten the effective implementation of projects, and limit their scope and suggested benefits. In this paper, we stressed the complex nature of working across disciplines and emphasized that authentic interdisciplinary is hard work (Scanlon & Conole, 2018). We encourage interdisciplinary teams to receive training about how to conduct and manage interdisciplinary research. Such training should make explicit how interdisciplinary teams work, the challenges often faced as well as ways of mitigating conflict and promoting communication within the team.

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