Learning to Build Bridges: Promoting Skills for Complex Collaboration Across Professional and Cultural Boundaries

Sebastian Strauß (co-chair), Ruhr-University Bochum, sebastian.strauss@rub.de
Julia Eberle (co-chair), Ruhr-University Bochum, julia.eberle@rub.de
Isis Tunnigkeit, Ruhr-University Bochum, isis.tunnigkeit@rub.de
Leonie Fey vom Bovert, Ruhr-University Bochum, leonie.vombovert@rub.de
Marcel Schmittchen, Ruhr-University Bochum, marcel.schmittchen@rub.de
Arlind Avdullahu, Ruhr-University Bochum, arlind.avdullahu@rub.de
Nikol Rummel, Ruhr-University Bochum, nikol.rummel@rub.de
Matthias Witti, University Hospital LMU Munich, matthias.witti@med.uni-muenchen.de
Jan Zottmann, University Hospital LMU Munich, jan.zottmann@med.uni-muenchen.de
Birgit Wershofen, University Hospital LMU Munich, birgit.wershofen@med.uni-muenchen.de
Frank Fischer, Ludwig-Maximilians-University Munich, frank.fischer@psy.lmu.de
Martin R. Fischer, University Hospital LMU Munich, martin.fischer@med.uni-muenchen.de
Anuli Ndubuisi, University of Toronto, anuli.ndubuisi@mail.utoronto.ca
Jim Slotta, University of Toronto, jim.slotta@utoronto.ca
Elham Marzi, University of Toronto, elham.marzi@utoronto.ca
Marcela Borge, Pennsylvania State University, mbs15@psu.edu
Tugce Aldemir, Pennsylvania State University, tfa5065@psu.edu
José Soto, Pennsylvania State University, jas95@psu.edu
Carolyn Rosé (discussant), Carnegie Mellon University, cprose@cs.cmu.edu

Abstract: Collaborating effectively with people with diverse professional/cultural backgrounds is a core skill in a globalized world. To prepare students, we need to understand how skills for interprofessional, and multicultural collaboration can best be (1) defined, (2) measured, (3) developed (4), and fostered. Thus, this symposium seeks to identify shared challenges and potential synergies in research on interprofessional and multicultural collaboration. So far, researchers in these two areas have been working in parallel instead of pooling expertise. We argue that bringing together expertise from these two fields can advance educational theory and inform practice on collaborative learning and problem-solving. In this symposium we bring together experts from both fields who present selected theoretical frameworks and share empirical evidence. The symposium ends with an interactive discussion, lead by a leading scholar in the field, asking the question how we can prepare students for collaboration in authentic and complex settings.

Introduction

Global challenges, such as the COVID-19 pandemic, regional conflicts, or the climate crisis cannot be tackled by individuals. Similarly, projects of smaller scale, for example treating a cancer patient, planning a new opera house, or programming an app require complex collaboration and thoughtful communication between highly skilled but diverse people with different backgrounds and expertise. Consequently, we need to prepare students for collaboration in complex settings (OECD & Asia Society, 2018). The CSCL community has long been aware of the importance of collaboration for acquiring domain-specific knowledge and how technology can afford collaborative learning. However, the question how we can prepare learners for complex collaboration in authentic, highly diverse settings, has not yet received much research attention. In this symposium, we address this timely topic.

The symposium focuses on collaboration in complex settings and zooms in on two causes for complexity and the necessary skills to work with them. Firstly, we focus on interprofessional collaboration which deals with boundaries between different professions, which come with diverging sets of professional knowledge, technical terms, epistemologies, and practices. These boundaries require *interprofessional collaboration skills*, understood as the ability to form an effective partnership between people with different professional backgrounds who work on a common goal (Bridges, Davidson, Odegard, Maki, & Tomkowiak, 2011). Secondly, multicultural collaboration that addresses boundaries between diverse cultures, each of which bring to the table different values, cultural identities, ways to make sense of the world and navigate everyday practices. These boundaries require *multicultural collaboration skills*, understood as the ability to collaborate effectively with people of different cultural backgrounds (Borge, Ong, & Rosé, 2018). In this symposium, we will focus on the interaction between individuals

and use the terms "interprofessional" and "multicultural", regardless of the degree to which the results of the collaboration still allow to distinguish the background of the collaborators' contributions. Zooming in on the crucial sets of skills identified by each of the research strands, we find that research on interprofessional collaboration emphasizes the need for establishing a shared understanding of concepts (Clark & Brennan, 1991), pooling and synthesizing unshared information to make decisions (Brodbeck, Kerschreiter, Mojzisch, & Schulz-Hardt, 2007) or negotiating and co-constructing knowledge (Liu, Hao, Davier, Kyllonen, & Zapata-Rivera, 2016). Additionally, the members of the group need to monitor their collaboration, and engage in regulation activities if necessary (Hadwin & Oshige, 2011). Research on multicultural collaboration, in contrast, emphasizes skills such as reflecting critically to evaluate the role of social identities and structural dynamics in daily life (Watt, 2007), acquiring cultural knowledge for interaction (Bird & Osland, 2005), or explicating boundaries (Akkerman & Bakker, 2011).

While it is useful to distinguish between these two causes for complexity from an analytical perspective, we posit that collaboration in authentic contexts rarely requires *either* interprofessional *or* multicultural collaboration. Instead, both skill sets may be needed for effective collaboration. This becomes evident when searching for commonalities between the two research fields. For example, becoming aware and acknowledging each other's perspective and ways to make sense of the world is not only key during multicultural collaboration, but also in interprofessional contexts (Reeves, Perrier, Goldman, Della Freeth, & Zwarenstein, 2013). Furthermore, it is crucial for both to achieve a common ground of concepts or the joint goal, have difficult dialogue (Soto et al., 2021), or to co-construct knowledge (Weinberger & Fischer, 2006). Finally, developing social cohesion and trust among group members generally promotes collaboration in both fields (Bird & Osland, 2005; Borge et al., 2018).

Until now, experts from both interprofessional and multicultural collaboration have mostly been working independently, though clearly commonalities exist and synergies appear very promising. Therefore, this symposium brings together experts from both fields to examine (1) how skills for complex collaboration can best be defined and of what components they consist, (2) how we can measure these skills, (3) how these skills develop, and (4) how we can help students acquire the skills for complex collaboration. To answer these questions, we will discuss empirical studies and theoretical frameworks on interprofessional and multicultural collaboration. The symposium is structured as follows: Contributions 1 and 2 present research from the field of interprofessional collaboration, whereas contributions 3 and 4 cover the field of multicultural collaboration. For each field of research, we present one selected theoretical framework, and one intervention or training study.

In the first contribution, *Witti, Zottmann, Wershofen, Fischer, and Fischer* propose a theoretical framework for interprofessional collaboration in medical contexts. Their framework encompasses an interdisciplinary model of the acquisition of diagnostic competences, a theory of cognitive scripts, as well as skills that are necessary for effective collaborative problem-solving. It provides a detailed framework that allows to describe and analyze the boundary conditions and processes during effective collaboration, and highlights potential aspects that educators can leverage to promote effective collaboration and, thus, help learners acquire collaboration skills. Hence, this work makes a strong contribution to the symposium by addressing and defining skills and their components, which serve as a basis for developing means to measure and support the development of collaboration skills. In the second contribution, *Strauß, Eberle, Tunnigkeit, vom Bovert, Schmittchen, Avdullahu, and Rummel* report the results of an experimental intervention study that aims at fostering students' interprofessional collaboration skills. In their experiment, the authors investigate the differential effects of a collaboration script and a group awareness tool on the quality of the collaboration process and students' collaboration skills. This contribution touches upon all three questions of the symposium by discussing relevant skills, and how we can measure and support them effectively. In the third contribution, *Borge, Aldemir, and Soto* present a theoretical framework for multi-cultural collaboration based on results of five years of data collection. The authors argue for expanding our current understanding of processes that are relevant for multi-cultural collaboration. Given that discussion-based interventions can promote multi-cultural competences, the authors suggest including these processes into our teaching. The authors further call for developing measures that help students monitor their sense-making processes. In sum, their contribution addresses three questions of the symposium by using empirical evidence to help shape our understanding of what skills are crucial for successful collaboration, how we can measure them, and which activities can promote these skills. In the fourth contribution, *Ndubuisi, Slotta, and Marzi* present results of a design-based study, in which they implemented an Intercultural Competency Module program on global team working, intercultural communication and project management. During this curriculum, students from different countries, universities and disciplines collaborate online to develop solutions to real-world engineering challenges. Focus group discussions revealed that students developed intercultural awareness, appreciation for diversity, trust, intercultural communication skills, as well as planning skills. This study provides a strong focus on the facilitation of collaboration skills, bringing in an educator's perspective and proposing crucial collaboration skills as well as a pedagogical model to foster them. Lastly, *Carolyn Rosé* will discuss the individual contributions and tie together their findings to provide a broader perspective on complex collaboration.

A Proposal for a Framework Concept to Analyze and Promote Interprofessional Collaborative Activities

Matthias Witti, Jan Zottmann, Birgit Wershofen, Frank Fischer, & Martin R. Fischer

The German health care system is facing drastic changes due to demographic changes. New care concepts as well as collaboration between all professional groups in everyday clinical practice increase in relevance. One way to achieve this is strengthening competence-oriented teaching, intensifying practice orientation and incorporating interprofessional content (Walkenhorst et al., 2015). Several competence frameworks what were motivated by health policy frameworks already include interprofessional education. These conceptual frameworks particularly focus on aspects such as ethics and values, teamwork, leadership, conflict resolution, communication, mutual respect, role clarity, and patient-centeredness (Thistlethwaite et al., 2014). However, interprofessional education still lacks a conceptual framework that allows to map collaborative problem-solving processes across the different professions that are relevant in health care. Against this backdrop, we propose a new framework concept that allows to represent and operationalizes collaborative problem-solving competencies in the context of interprofessional education for health care (see Figure 1).

Figure 1. *Conceptual Framework for interprofessional health education and care.*
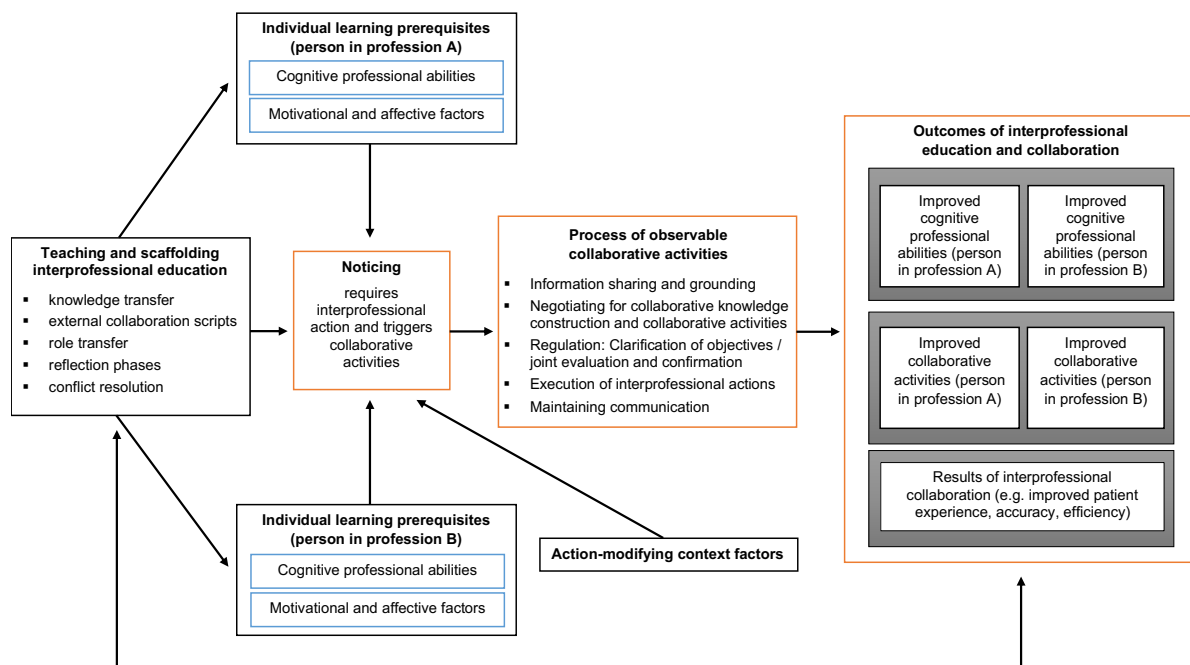
Our framework concept is based on three theoretical strands: The first is an interdisciplinary model of the acquisition and fostering of diagnostic competencies (Heitzman et al., 2019). The second strand draws on cognitive structures like illness scripts, and internal collaboration scripts, which can be understood as an individual's current knowledge of implicit and explicit rules for effective and efficient collaboration (e.g., Kiesewetter et al., 2016). The third strand encompasses collaborative problem-solving skills that are crucial when two or more health professionals pool and orchestrate their knowledge and skills to solve a shared problem. This framework concept is intended to serve as a basis for analyzing and promoting interprofessional collaborative problem-solving competencies at the micro-level (e.g., patient handover), the meso-level (e.g., team composition and health care context), and the macro-level (e.g., health care system). More specifically, the framework concept represents the process of interprofessional learning and interaction process (interprofessional education) which involves two different health care providers (person A and B) who enter the situation with different learning prerequisites (Heitzman et al., 2019). The process begins when two persons recognize an interprofessional problem (noticing) (Goodwin, 1994; Seidel & Stürmer, 2014). Then, observable collaborative activities such as grounding or information pooling (Liu et al., 2016) occur, which are at the core of our framework concept. These interactions then affect whether the persons acquire new skills and solve the problem. While emphasizing the central role of interaction, the frame-

work also acknowledges the influence of the (teaching) context which influences the actions of the persons involved. Similarly, individual learning prerequisites and the teaching context interact during learning activities (Heitzman et al., 2019).

Training Those Who Build Bridges: Fostering Interprofessional Collaboration Skills with Collaboration Scripts and Group Awareness Tools

Sebastian Strauß, Julia Eberle, Isis Tunnigkeit, Leonie Fey vom Bovert, Marcel Schmittchen, Arlind Avdullahu, & Nikol Rummel

Planning and executing large civil engineering projects require interprofessional collaboration, for example between architects, structural engineers, and fire safety engineers. Ineffective collaboration during these projects has dire consequences and practitioners describe certain parts of the collaborations as highly stressful. From a theoretical lens, this context of collaboration requires pooling of unshared information, combining information, negotiating competing solutions, and making decisions are necessary activities (Brodbeck et al., 2007). Our study, therefore, aims at developing an approach to prepare civil engineering students for these challenges at their future workplace. To determine how to best promote effective collaboration in civil engineering students, we compare the effects of a collaboration script, with effects of a group awareness tool (GAT, Bodemer, Janssen, & Schnaubert, 2018). While the benefits of external collaboration scripts on collaboration skills have been demonstrated repeatedly (Radkowitsch, Vogel, & Fischer, 2020), the less directive approach of using reflection stimulated by a GAT has not yet been investigated as an instructional approach to foster collaboration skills. Thus, our study addresses a potentially highly useful intervention approach.

Method and procedure

To investigate our research question, we conducted a laboratory experiment in which university students collaborated via an online conferencing tool. Students collaborated on two problems that imitated the challenges of interprofessional collaboration on civil engineering projects without requiring a background in civil engineering. Participants were first randomly assigned to one of three experimental conditions (control condition, collaboration script, and GAT) and then randomly assigned to a group of three within their condition. Groups worked on two problems and had to pool their unshared information in discussing alternative solutions to a civil engineering problem, which required to find ways to integrate new demands into a 2D-model of a kindergarten to-be built. Within the groups, participants took on one of three roles (architect, daycare management, or fire and health protection), which came with a set of unshared information that was crucial for developing a joint solution.

During the experiment, participants first filled out a pre-questionnaire and watched a short video about general strategies for effective collaboration. Then, participants collaborated on the first problem for 30 minutes (learning phase). Depending on their experimental condition, groups received (a) *no collaboration support* during this phase, (b) a *collaboration script* that structured the problem-solving process, prompted students to use the collaboration strategies, and provided explicit descriptions of collaboration strategies, or (c) no support during collaboration, but a *GAT and collaborative reflection activity* after working on the problem. This reflection activity encompassed a questionnaire that probed students' perception of how well their group performed in terms of the collaboration strategies. The results of this questionnaire were then visualized to the group so that the group could view them (i.e., the GAT) and discuss whether they needed to adapt their collaboration during the second problem. The results of this discussion were noted down by the group. The collaboration script and the GAT included collaboration strategies that were derived from the model of effective collaboration proposed by Meier, Spada, and Rummel (2007): Coordination, grounding, information pooling, evaluating potential solutions, time management, as well as documenting arguments and results. Next, all participants filled in a mid-questionnaire. Afterwards, all groups worked on the second problem for 30 minutes (testing-phase). In this phase, groups in all conditions did not receive any collaboration support. Eventually, participants filled out the post-questionnaire. The collaboration in the learning and testing phase was recorded on video.

Results and discussion

In total, 150 university students (50 groups) participated in the study. Planned contrasts on the written knowledge test after the learning phase revealed that students who received support during collaboration, that is, a GAT (M = 6.94; SD = 2.57) or a script (M = 5.78; SD = 2.61) reached a significantly larger amount of knowledge than students in the control condition (M = 4.76; SD = 2.17), t(145) = -3.65; p < 0.01, and that students in the GAT condition reached higher scores than students in the script condition (t(145) = -2.37; p = 0.02). In future analyses, we plan to contrast the acquisition of explicit knowledge with the quality of the interaction processes in the testing-

solving phase. Regarding the learning process, participants rated the quality of their collaboration processes in general as good, again with the highest values in the GAT condition. A second set of planned contrasts revealed that students in the control condition reported significantly higher cognitive load after the learning phase (M = 4.40; SD = 1.25), than students who received a collaboration script (M = 3.84; SD = 1.42) or a GAT (M = 3.92; SD = 1.23) (t(147) = 2.25; p = 0.03). The script and GAT condition did not differ in cognitive load (t(147) = -0.30; p = 0.76). Our analyses further indicated moderate levels of self-efficacy regarding collaborative learning before and after working collaboratively on the two problems. This result suggests that students feel prepared for collaboration although this may not correlate with their actual skills. Further, comparing students' presumptions whether collaboration skills can be learned or are rather stable, we find that participants perceive collaboration skills to be more malleable afterwards. We hypothesize that students' presumptions play a moderating role in the process of acquiring collaboration skills and will test this assumption in the future to explore possibly differential effects of the different forms of collaboration support.

In sum, our experiment contributes to an understanding of how to foster interprofessional collaboration skills. Specifically, we made a first attempt to understand the differential effects of a relatively directive approach (i.e., collaboration scripts) compared to a more individualized and self-directed approach (i.e., GAT and self-reflection). In future analyses, we will analyze the video data of the collaboration process to shed light on how participants utilized the support during collaboration and explore the relationship between students' perceptions, more objective ratings of collaboration process, and learning outcomes. Further, we will investigate learners' motivation and confidence to engage in this type of collaboration as well as their knowledge and ability to collaborate effectively. The results of our study will ultimately inform the design of a training for interprofessional collaboration skills that will be implemented in a course for civil engineering students.

Towards a Framework for Multi-Cultural Collaborative Competence

Marcela Borge, Tugce Aldemir, & José Soto

The field of CSCL has long valued collective sense-making activity (Stahl, 2006). As a result, we have devised tools to support sense-making activity and corresponding frameworks to measure it (Borge & Rosé, 2021). However, existing methods for evaluating collaborative processes prioritize cognitive aspects of learning and largely overlook socio-emotional aspects of collaboration (Isohätälä, Näykki, Järvelä, Baker, & Lund, 2021). While cognitive learning aims are important for extending content-based knowledge, they may not address needs specific to collective sense-making for the developing knowledge and skills associated with multicultural competence (MC): a set of knowledge and skills required to work effectively across cultural lines (Mio, Barker, Domenech Rodríguez, & Gonzales, 2019). MC includes knowledge about one's own identity, awareness and appreciation of others' identities, the skills to engage in shared meaning-making about cultural differences, and carry out critical reflection to evaluate the role of social identities and structural dynamics in daily life (Watt, 2007). One prominent intervention designed to develop MC is Intergroup Dialogue (IGD): structured, face-to-face discussions with participants from diverse social identity groups who discuss politically charged topics with the support of trained facilitators (Gurin, Nagda, & Zuniga, 2013). Though IGD has been shown to help develop MC, we argue that the need for (1) an analytical framework to assess the quality of difficult dialogues and (2) more accessible and democratized educational interventions as IGD demand long-term investments and a trained facilitator (e.g., Frantell, Miles, & Ruwe, 2019). Over the last five years, we have been working to bridge research in CSCL with that in multicultural psychology to meet the aforementioned needs. In this symposium, we share some of our initial findings with the aim of pushing this work forward within the CSCL community.

Context and method

We have been examining collaborative sense-making processes in the context of required small-group discussions within a multicultural psychology course. The course was delivered at a northeast university in the USA and was designed to introduce the concepts such as race, bias, and cultural competence and guide students to explore the meaning and value of these concepts vis-à-vis various topics in psychology. As part of the course, students were divided into diverse teams and tasked with discussing politically-charged topics over three time points. Discussions were held in a collaborative environment called CREATE that helps students reflect on and evaluate the quality of their sense-making processes using reflective tools that break down collaborative sense-making activities into six measurable criteria. CREATE then pushes learners to compare existing processes to desired processes related to these criteria. We have been collecting data over five years that include pre and post MC assessments, student perceptions of learning, a database of group discussions over time about politically charged topics, and teams' reflective evaluations about their ongoing processes.

Results and discussion

Thus far, we found preliminary evidence that these discussion activities helped promote cultural identity among White students with little previous MC experience (Soto et al., 2021). We also found that our original definitions of collaboration quality did not fully address (1) the types of behaviors promoted by research on intergroup dialogue and (2) the types of complex discussions that took place between student groups. As such, one of our aims is to develop concrete measures of multicultural communication patterns that students can use to assess their own discussions for the purpose of improving on future discussions. For example, our existing framework of general collaborative competence (GCC) follows a trend in CSCL of favoring language as an indicator of knowledge building about a schooling domain. We overemphasize "transactions" of factual information bits between individuals and argumentative logic over critical reflection, lived experiences, and meaningful emotional responses to lived experiences (e.g., critical consciousness needed for multicultural competence; Watt, 2007). As a result, the GCC model focused on cognitive processes (Borge et al., 2018) while failing to account for processes needed for MC. Building on recent studies of students' discussion, we argue for the need to revise and repurpose CSCL communication processes to focus on desired IGD practices. Two such practices include: (1) critical reflection of diverse narratives/perspectives and (2) exploring differences and commonalities of narratives and perspectives. The former is defined as identifying the factors shaping multiple perspectives, characterizing the dynamics between narratives and perspectives, reflecting on how narratives influence perspectives, or identifying self-biases and privileges. The latter is defined as inquiring and sharing team members' narratives to explain, contextualize, or support discussion topics or identifying commonalities or/and differences in members' narratives and perspectives. Both practices are essential for developing MCC as part of collaborative sense-making discussions, and our research indicates that learners carry these processes out to varying levels of sophistication. As such, it is possible that models of competence associated with these practices combined with technological, reflective support could help students improve how they carry out these practices over time.

InVEST: Preparing Engineering Students for Global Collaboration

Anuli Ndubuisi, Jim Slotta & Elham Marzi

The Accreditation Board for Engineering and Technology (2019) (ABET) standards requires engineering institutions to prepare students to consider the impact of engineering solutions in global contexts. As the world becomes increasingly globalized, digitized, and interconnected, there will be a huge need for "global" engineers, that is, engineers who can think globally, act locally, and collaborate with international partners from diverse cultures to tackle society's problems. Although engineering educators recognize and accept the need to equip future engineers with global competencies that will enable them to collaborate effectively with diverse peers across cultural and geographic boundaries, there still exists a demand gap within the industry (Warnick, 2011). Unfortunately, uptake of international education programs (IEPs) has been relatively poor and uneven due to challenges such as scalability, inequitable access to diverse student population, safety concerns, and the recent COVID 19 travel restrictions (Institute of International Education, 2019; Ndubuisi, Marzi, & Slotta, 2022). In response, the International Virtual Engineering Student Teams (InVEST) project created global virtual team projects comprised of diverse students from various institutions around the world to tackle technical challenges situated in global contexts. This contribution reports on three iterations of the InVEST program and examines students' perception of learning global competence within a global setting.

Method: The virtual international project program

The students were supported with an Intercultural Competency Module (ICM) program on global team working, intercultural communication, trust, conflict management, decision-making concepts, and project management concepts. The ICM program aimed to enhance students' sensitivity in intercultural situations, relationship building, communication, and collaboration skills. It also strived to improve students' interpersonal skills such as empathy, listening, open-mindedness and respectfulness. The design of the ICM program was based on Kolb's (1984) model and the Knowledge Community and Inquiry (KCI) pedagogical model (Slotta, Quintana, & Moher, 2018) to create an online experiential and learning community curriculum. The three ICM offerings were delivered to 11 virtual project teams involving 41 engineering students from 15 countries, 10 disciplines, 7 universities, and 1 firm. Employing design-based research (Bannan-Ritland, 2003), the three instances were delivered by the same instructors and using similar learning approaches, learning materials, and instruments. The 9-week ICM program comprised five modules delivered at two-weekly intervals that engaged students in knowledge construction and scenario-based learning exercises that simulated engineering coordination in a real-world context such as managing cultural differences in the workplace. This approach enabled students to participate in perspective turn-taking, build a community knowledge base of diverse viewpoints and utilize the knowledge base to develop an action

plan for their teams during the synchronous sessions. Thereafter, they applied their newly constructed knowledge in their virtual project teams, reflected on their actions, and updated the team action plan with each cycle. A mixed method approach was utilized for data collection comprising pre-test of student's prior knowledge and experience, post-test of students' perceptions of their ICM learning, and focus group discussion of project experiences. Then content analysis method was utilized to categorize, code, and analyze the collected data across the three ICM instances to identify themes in students' experiences.

Findings and discussion

Across the three instances of the program, students' pre-instruction questionnaires revealed that most did not appreciate the significance of intercultural competence in a global virtual team environment and only 36% had prior experience working with international multicultural team members. In contrast, their post-instruction response showed that they were highly satisfied with the program (average rating of 95% - either "excellent" or "very good"). Overall, we found improved appreciation of intercultural interactions, empathy and relationship building in communication. To understand students' perceived benefits of the program, a thematic analysis of focus group discussion content yielded five major themes: *(a) Improved intercultural awareness and understanding* as students' responses showed that they recognized similarities in cultural values of team members and understood its impact on their worldview, *(b) Evidence of diversity appreciation* as students leveraged diversity of cultures, knowledge, and perspectives in their team and appreciated the cultures of the target communities where their project is situated, *(c) Project planning and coordination* as students utilized information communication technologies (ICT) to manage time zone difference challenges and for project management activities, *(d) Enhanced intercultural communication* as students built a sense of community in their teams, engaged in social interactions, established rapport, and heightened their interpersonal empathy, and *(e) Evidence of social cohesion, trust, and commitment* as students promoted intercultural experiences, earned the swift trust of their peers, built social cohesion that supported their virtual team collaboration and remained committed to the project team goals.

This study is significant as it explores how educators can support students to listen, respect and learn from multicultural peers in group settings. In addition, it offers an approach for educators to promote inclusive collaboration skills, internationalize their curricula, and provide diverse students access to international experiences. Future studies will investigate students' collaborative projects experiences and their learning approaches across boundaries.

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