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# Teaching students to collaborate – insights from interprofessional education development

## Abstract

Since (interdisciplinary) collaboration skills are considered essential to thrive in an unpredictable and uncertain future, higher education is demanded to train students to develop collaboration fluency. However, there are no clear guidelines for effective collaboration skills trainings. Thus, different ideas and reflections on theoretically underpinned pedagogical designs, assessment approaches and the alternating role of teachers (experts vs facilitators) are given and – where possible – illustrated with our experience in developing and implementing interprofessional education. Implications for teachers and higher education institutions are derived.

## Keywords

future skills, collaboration skills training, interdisciplinary, assessment, facilitation

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# 1 The role of collaboration skills in future higher education

Challenges and work in a more and more knowledge-based society of the 21<sup>st</sup> century are supposed to involve more complex, human interactive, and/or non-routine skills. So-called future skills or 21<sup>st</sup> century skills are often considered as new and different abilities which are essential to tackle the individual and collective challenges of the 21<sup>st</sup> century successfully (ROTHERHAM & WILLINGHAM, 2009). Critics of the 21<sup>st</sup> century skills movement argue that these skills (e.g. critical thinking, collaboration, problem solving) are not new – what is actually new is the extend to which success in the future will depend on having acquired and developed these skills (ROTHERHAM & WILLINGHAM, 2009). So the real issue is that so far, not all students are intentionally and effectively taught these skills (ROTHERHAM & WILLINGHAM, 2009).

There are numerous frameworks proposing future skills that students should acquire and develop to cope with the VUCA (i.e. volatile, uncertain, complex, ambiguous) future (KOTSIOU et al., 2022). In these frameworks, “future skills” is often used as an umbrella term referring not only to skills but also attitudes, competencies and knowledge (KOTSIOU et al., 2022). Future skills approaches (cf. Table 1) range from the straightforward 4Cs (P21, 2006) to more elaborated ones, e.g. distinguishing between foundational literacies – competencies – character qualities (WORLD ECONOMIC FORUM, 2015) to future skills profiles subsuming individual related competences (EHLERS, 2022) or meta-categories clustering groups of closely related skills (KOTSIOU et al., 2022).

Table 1: Examples of different approaches in future skills frameworks

<b>4Cs</b> (several frame- works, e.g. P21, 2006)	<b>21st-century skills</b> (WORLD ECO- NOMIC FORUM, 2015)	<b>Future skills profiles</b> (EHLERS, 2022)	<b>Future skills meta-categories</b> (KOTSIOU et al., 2022)
1. Creativity	Foundational liter- acies	1. Learning literacy	1. Higher-order thinking skills
2. Critical thinking	1. Literacy	2. Self-efficacy	2. Dialogue skills
3. Collabora- tion	2. Numeracy	3. Self-determination	3. Digital and STEM <sup>a</sup> literacy
4. Communi- cation	3. Scientific liter- acy	4. Self-competence	4. Values
	4. ICT <sup>b</sup> literacy	5. Reflective compe- tence	5. Self-manage- ment
	5. Financial liter- acy	6. Decision compe- tence	6. Lifelong learn- ing
	6. Cultural & civic literacy	7. Initiative & perfor- mance competence	7. Enterprise skills
	Competencies	8. Ambiguity compe- tence	8. Leadership
	7. Critical-think- ing/prob- lem-solving	9. Ethical competence	9. Flexibility
	8. Creativity	10. Design-Thinking competence	
	9. Communication	11. Innovation compe- tence	
	10. Collaboration	12. Systems compe- tence	
	Character qualities	13. Digital literacy	
	11. Curiosity	14. Sensemaking	
	12. Initiative	15. Future & design competence	
	13. Persistence/grit	16. Cooperation com- petence	
	14. Adaptability	17. Communication competence	
	15. Leadership		
	16. Social & cultur- al awareness		

<sup>a</sup>Science, technology, engineering, and mathematics. <sup>b</sup>Information and communication technology.

The call for integrating future skills into curriculum has intensified in face of the recent environmental and health crises and the uncertainty of how to deal with them successfully (UNESCO, 2020). Educational institutions are asked to heighten their students' awareness of unknown, but upcoming complex situations and tasks and providing them with adequate skills and competences to master them (KOTSIOU et al., 2022). Students need to be aware that a knowledge-based society demands lifelong learning, knowledge development and sharing of knowledge (VAN WEERT, 2006). Joint knowledge construction can happen through dealing with cognitive perturbations and integrating different perspectives, challenging one's existing views (PIAGET, 1985) and/or happens through social interactions such as guidance by more skilled or knowledgeable people as stated in VYGOTSKY's (1978) concept of zone of proximal development. Social psychology assumes that the co-construction of knowledge is based on interactively exchanging and integrating different information and views and elaborating on them (cf. KOPP & MANDL, 2017). These approaches are considered suitable for finding solutions to any 'grand challenge' as this requires transdisciplinary and intersectoral collaboration (UNESCO, 2020).

By transgressing and transcending disciplinary boundaries, "transdisciplinary" approaches are based on interaction between, across and beyond disciplines, and thus, are considered most likely to respond to new demands and imperatives (NICOLESCU, 2014; RUSSEL, WICKSON & CAREW, 2008). This implies that future skills promoting transdisciplinarity are generic and not job-specific, i.e. relevant for many, if not all, disciplines (KOTSIOU et al., 2022). According to current views, the main difference between transdisciplinary and interdisciplinarity approaches is that the transdisciplinary ones also involve people from outside academia (SOWCIK & SEEMILLER, 2023). As the focus in higher education is usually on interdisciplinarity, we will use this term hereafter.

Collaboration skills are mentioned in most future skills frameworks, even the ones published early this century such as Framework for 21<sup>st</sup> Century Learning (P21, 2006) or Organisation for Economic Cooperation and Development Competencies (OECD, 2005). The analysis of future skills mentioned in 12 studies focussing on Germany identified collaboration as only competence mentioned in all studies (EHLERS, 2022). A recent review of 99 future skills frameworks revealing collaboration as the fourth most-mentioned future skill (after critical thinking, problem-solving, creativity and communication), suggests that it continues to be consid-

ered key for the learner’s achievement and should therefore become an integral part in education (KOTSIOU et al., 2022). This means that collaboration skills need to be systematically acquired or developed in authentic settings in higher education, ideally giving all students the opportunity to become “fluent” in collaboration – not only in monodisciplinary, but also in interdisciplinary teams. Collaboration fluency is defined as

“teamwork proficiency that has reached the unconscious ability to work cooperatively with virtual and real partners...to create original...products.”

(JUKES, MACLEAN & MCCLURE, 2011, p. 7)

Interdisciplinary collaboration fluency is a very ambitious learning outcome for higher education. To tackle this, it is imperative to understand that collaboration skills trainings complementing undergraduate and postgraduate courses require a certain level of prerequisite discipline-specific knowledge and skills. Only when each student can provide their input and contribute to the team project, interdisciplinary collaboration can occur.

We will look more closely at collaboration skills, how they could be taught and assessed. Our reflections about developing collaboration skills trainings in higher education will be illustrated with our experience in developing interprofessional education at Mannheim.

## 2 Teaching students to collaborate

Group learning has long been part of higher education as it is regarded as an effective means of active learning which benefits student learning, e.g. deeper understanding through more information from varied resources, stimulation of creativity, development of communicative skills (BURDETT, 2003; BURKE, 2011). Often the terms collaborative learning and cooperative learning are differentiated. As there are no universal definitions of these terms (DILLENBOURG, 1999), different views exist on the difference between the two, e.g. regarding the degree of structure imposed on learning activities (BRUFFEE, 1995). However, this theoretical differentiation is difficult to draw in practice as many group processes include collaboration as well as cooperation (JEONG & HMELO-SILVER, 2019). As an exact differentiation between the terms is not important for this paper, collaborative learning will be used as an umbrella term hereafter (YANG, 2023).

QUINN (2012) states that working in groups does not automatically involve productive learning and enhance collaboration skills. It is not surprising to observe that students, having been growing up in individualistic or even competitive learning environments (cf. JOHNSON & JOHNSON, 2013) and are now being asked to collaborate with their group members, often discuss tasks after doing them individually or only work together when a task cannot be done individually (ANDERSEN & KORPÅS, 2022). This suggests that students usually have little or no opportunity to experience collaboration.

### 2.1 The nature of collaboration skills

Collaboration can be broadly defined as joint efforts to achieve a group goal (DE VREEDE, BRIGGS & MASSEY, 2009). It is the process of combining different perspectives to better understand a problem and the outcome/product, i.e. the collaboratively developed solution that goes beyond an individual's scope or vision (GARDNER, 2005). There are various concepts and frameworks that describe the skills and competencies needed to establish successful collaboration, i.e. building and fostering fruitful relationships among the collaborators. While FOSTER-FISHMAN et al. (2001) regard the ability to resolve conflict, communication skills, the ability to understand other perspectives and expertise in the problem area(s) as core

competencies for collaboration, GETHA-TAYLOR (2008) identified interpersonal understanding, teamwork & cooperation and team leadership as the most significant competencies for effective collaboration. KOTSIOU et al. (2022) consider collaboration as part of their meta-category “dialogue skills” which consists of eight skills groups derived from the review of 99 future skills frameworks (KOTSIOU et al., 2022, Appendix 2).

This meta-category indicates the many facets related to collaboration and demonstrates that a set of skills groups (communication, interpersonal interaction, relationship-building, social awareness) is needed to master collaboration fluency. As this implies that these “auxiliary” skills are also involved when developing collaboration skills – either as a prerequisite or as “by-product” –, they must be taken into account when developing collaboration skills trainings.

## **2.2 Design basics of collaboration skills training**

The development of future skills can be embedded into existing educational approaches and theories, especially those that emphasizes active student-centred learning (KOTSIOU et al., 2022). The elements of the experiential learning cycle (KOLB, 1984) and collaborative/cooperative learning (JOHNSON & JOHNSON, 2009) summarized in Table 2 are considered particularly suitable for the design of collaboration skills trainings. They enable students to actively develop a rich, meaningful understanding of collaboration as well as skills to jointly tackle problems in the future.

Table 2: Basic theoretical underpinnings for collaboration skills trainings

<b>Experiential learning cycle (KOLB, 1984)</b>	<b>Cooperative learning (JOHNSON &amp; JOHNSON, 2009)</b>
<ul style="list-style-type: none"> <li>• Stage 1: encountering a concrete experience</li> <li>• Stage 2: reflection on this concrete experience</li> <li>• Stage 3: formation of abstract concepts and generalizations</li> <li>• Stage 4: application or testing of concepts and generalizations in future situations</li> </ul>	<ul style="list-style-type: none"> <li>• Positive interdependence: awareness that the group members are linked together and must rely on one another to succeed in achieving the goal</li> <li>• Direct promotive interaction: supportive behaviour among the group members</li> <li>• Individual accountability &amp; personal responsibility: feeling of responsibility for one's own contribution to the group work as well as facilitating the work of the other members</li> <li>• Appropriate use of social skills: use of interpersonal &amp; teamwork skills</li> <li>• Group processing: reflection &amp; assessment of the group processes</li> </ul>

### 3 Interprofessional education as an example of collaboration skills training

As the complexity in healthcare continually increases, the call for interdisciplinary and especially interprofessional collaboration is growing. While “interdisciplinary” means that people from two or more medical disciplines (e.g. surgery, radiology, paediatrics) are involved, “interprofessional” follows the same concept and only differs in that it refers to the collaboration of different health professions (e.g. doctors, nurses, physiotherapists).



Interprofessional education (IPE) is regarded as a suitable means to prepare students for successful work in teams and settings where collaboration is key for the patients, their care and safety (CUFF, 2013; IPEC, 2011). In IPE, students of two or more different health professions learn with, from and about each other to improve collaboration and the quality of care (BARR, 2002). The interprofessional core competencies to be acquired belong to the domains values/ethics, roles/responsibilities, interprofessional communication and teams/teamwork (IPEC, 2011). Although IPE is getting more and more an integral part of the different health professional curricula, barriers such as focus on the own profession, unclear roles, budget concerns, time and organisational constraints, only optional classes (HOMEYER et al., 2018) continue to impede that ALL health professional students are trained to develop collaboration fluency for providing successful collaborative patient care. Position papers (WALKENHORST et al., 2015; KAAP-FRÖHLICH et al., 2022) confirm this situation for IPE in the German-speaking countries.

At Mannheim, there are compulsory IPE sessions including a clinical placement on an interprofessional training ward for medical, nursing and physiotherapy students (METTE et al., 2016, 2019, 2021). On the training ward, interprofessional student teams are responsible for real patients and are demanded to provide interprofessional collaborative patient care, supervised by experienced and trained health professions educators.

IPE aims to break down “professional silos while enhancing collaborative and non-hierarchical relationships” (FRENK et al., 2010, p. 1924) and improve student learning and experience as well as patient experiences and outcomes (FIELD et al., 2020). Therefore, our experience with IPE development (the term “interprofessional” will only be used in this context) serves as a starting point for reflecting on developing collaboration skills training. Although we are aware that we are still at the beginning of creating and implementing collaboration skills trainings, we try to find ways to increase their effectiveness.

### **3.1 Applying the design basics**

After having defined the learning objectives of the collaboration skills training and analysed the learning conditions (e.g. participating target groups, number of participants/disciplines/professions and available time, room and equipment), teachers must

select a suitable pedagogical approach, e.g. peer-assisted learning, problem-based learning, agile learning etc. (BAHREHVA, 2022). It is necessary for teachers to develop assignments or projects that are relevant for all participating disciplines or professions. They should be complex, open-ended, real-world problems that avoid intra-group competition and instead create a positive interdependence between the disciplines and promote a team feeling (SMITH et al., 2022). A crucial learning element in collaboration skills training is the reflection and assessment of the experienced collaboration processes. This needs to be explored to activate the latter stages of the learning cycle and made explicit to the learners.

### **3.1.1 Interprofessional learning**

Our experience with the design of IPE sessions according to the theoretical underpinnings mentioned above has been positive. The sessions are regularly evaluated to test and ensure good education for students to learn with, from and about other health professions. However, the development of the tasks requiring positive interdependence between the group members (e.g. medical students and physiotherapy students) is difficult to achieve. There are e.g. classroom-based IPE sessions using reciprocal peer tutoring to practise orthopaedic examination techniques and to reflect about the same or different knowledge and skills of the participating health professions. Though these hands-on IPE sessions are highly appreciated by the students, more for their technical content than the reflexive part, the peer tutoring approach only allows to develop some collaboration-supporting dialogue skills, primarily communication skills. As collaboration between the professions to reach a shared goal is not the learning objective, these sessions are of preparatory nature for collaboration skills training. Other findings confirm that classroom-based IPE improves student understanding of IPE principles and attitude towards interprofessional collaboration (e.g. ANDERSON et al., 2011).

To learn and develop collaboration skills, students must go beyond acquiring theoretical interprofessional knowledge and practise real-world collaboration in interprofessional clinical environments (MCCORMACK TUTT, 2019). Medical, nursing and physiotherapy students can do so during a clinical placement on our interprofessional training ward. By working in an interprofessional student team and being responsible for real patients, genuine positive interdependence exists among the team members which requires them to contribute their profession-specific knowledge and

skills to provide good patient care. This real-world context and the common goal of optimal patient care promote the development of collaboration skills. As such training wards are a form of educational instruction, time slots for interprofessional encounters, interaction, communication and reflection are part of the clinical placement. Moreover, student learning and collaboration are facilitated by experienced health professionals who – from the background – not only assure patient safety and high-quality patient care, but also enable experiential learning. Learning on interprofessional training wards can be regarded as a form of effective problem-based learning as it meets the following requirements (SMITH et al., 2022):

- problems embedded in rich and relevant learning contexts,
- flexible knowledge, skills, and capabilities,
- active and strategic metacognitive reasoning,
- collaboration based on intrinsic motivation.

### **3.1.2 Agile learning**

Another promising approach to collaboration skills training could be agile learning. Scrum, an agile team approach with its origin in software development management, has been adapted for education (eduScrum®) encouraging self-organised, self-directed, transparent, collaborative, reflexive, student-centred learning in teams. As described in the eduScrum® guide (WIJNANDS et al., 2020), the teacher determines what is to be learned (i.e. learning objectives), why and which criteria are relevant for assessing the quality of the team product. It is up to each interdisciplinary student team to determine and organise how to reach the learning objectives (i.e. processes, techniques, tools etc.), hence, the students are required to take on the responsibility for their learning process (WIJNANDS et al., 2020). The active, co-creative experience of collaboration is completed by reviews and retrospective, in which the student teams reflect and evaluate the collaboration experience (content and personal development) and infer aspects for improving collaboration (WIJNANDS et al., 2020).

EduScrum® requires students to use and develop their collaboration skills and the related dialogue skills plus the skills of all other meta-categories identified by KOTSIOU et al. (2022, Appendix 2): higher order thinking skills, digital and STEM

literacy (e.g. using digital tools, internet research etc.), values, self-management, lifelong learning, innovation, leadership and flexibility. So, eduScrum® seems to be a suitable framework for collaboration skills training. It could also be applied to IPE. Elements of eduScrum® could enhance the collaboration experience on interprofessional training wards, e.g. increasing the transparency in planning and reviewing interprofessional patient care through interprofessional board meetings, stronger focus on retrospective and feedback among the team members. Also, outside clinical settings, agile learning with authentic patient cases, e.g. grasping the patient case from different perspectives and developing individualized treatment plans (interprofessional clinical reasoning), contribute to develop collaboration skills.

### **3.2 The role of teachers in collaboration skills trainings**

Although collaboration skills trainings are student-centred, teachers play a key role: they must be able to switch between teaching students, i.e. providing knowledge and skills as an expert, and facilitating student-learning, i.e. supporting experiential learning (ANDERSON & KORPÅS, 2022; CARLSON, PILHAMMAR & WANN-HANSSON, 2011).

When assigning the students to interdisciplinary teams and explaining the ‘what’ and ‘why’ of the projects, teachers instruct students by providing expert knowledge (HARDEN & CROSBY, 2000). They also need to pay attention to creating favourable conditions for collaboration learning experiences, i.e. small, non-hierarchical and interdisciplinarily balanced groups, no time constraints, enough room and equipment for team collaboration. The physical environment has an impact on human interaction (GRAETZ & GOLIBER, 2002). Current higher education, still relying heavily on lectures and seminars in classrooms or lecture halls with seating and (folding) desks designed for students to sit quietly and listen to the teacher at the front, rather inhibits collaboration (GRAETZ & GOLIBER, 2002). So, students used to rather passive instruction often disapprove of active teaching strategies as they experience an increased cognitive effort and perceive lower learning (DESLAURIERS et al., 2019). This means that teachers cannot assume that the students have sufficient active learning experience, motivation and dialogue skills (cf. KOTSIYOU et al., 2022, Appendix 2) to achieve good collaboration in interdisciplinary groups whose members usually do not know each other well before (BURKE, 2011). To

avoid negative collaboration experiences, preparatory explanations, material, activities or instruction and support might be necessary. Therefore, it is crucial to inform the student teams (and track during their work) that applying theoretical process knowledge to develop collaboration skills is of equal importance as the final group product (STEGHÖFER et al., 2016).

Once the student teams start their project, teachers must become facilitators and encourage self-directed learning, observe the interdisciplinary student teams and give feedback (HARDEN & CROSBY, 2000). Facilitators support the students to

- immerse themselves in their team,
- integrate their discipline-specific knowledge and skills in the collaboration tasks,
- revisit, review, reflect on, interpret and draw conclusions from their actions and observations,
- test new behaviour and skills (KOLB, 1984).

Adopting the role of a facilitator demands a shift in mindset from the teachers and the willingness to modify their teaching behaviour, which usually does not come naturally and thus, needs to be explicitly trained (LEKALAKALA-MOKGELE, 2006). They must also believe in and be committed to interdisciplinary collaboration to authentically facilitate collaboration skills trainings (CARLSON, PILHAMMAR & WANN-HANSSON, 2011).

### **3.3 Assessment of collaboration fluency**

Assessment is considered necessary to verify successful learning. Usually, each student's performance (knowledge and/or skills) is individually assessed in examinations. It is challenging, though, to assess the level and development of a multifaceted construct like collaboration fluency. When designing collaboration skills trainings, teachers need to decide who assesses what and how. Only products and observable processes or actions are assessable. There are different options for assessing collaboration fluency (e.g. BURKE, 2011; TARAS, 2010; CTI, 2023):

- What: final product, collaboration process, collaboration skills level

- Who: teacher assessment, peer assessment, self-assessment
- How: one grade for all group members, one grade for each group member

It is not enough to assess the product to check whether and to what extent students have achieved collaboration fluency. Teachers can also combine several options and decide on the weight that each option contributes to the final assessment result or grade. As with all assessments, it is important that the requirements and criteria are transparent for the students from the beginning. This helps students to focus their efforts and achieve better work performance and results (BURKE, 2011).

A suitable assessment for collaboration fluency could be an adaptation of an objective structured clinical examination (OSCE). An OSCE, originally developed in medical education, consists of a series of stations with different scenarios in which students have to perform adequately (HARDEN, 1988). It is a highly reliable, standardised form to assess student performance, i.e. application of professional knowledge and skills, by observing and rating students interacting with trained actors, the so-called standardized patients (CUSCHIERI et al., 1979; HARDEN, 1988). By developing several OSCE stations, checking if and to what extent students apply collaboration skills when interacting with trained actors in different situations, student collaboration fluency could be assessed. Rotating through different stations allows to assess various skills relevant for collaboration, thus, giving a more comprehensive picture of the student level of collaboration fluency. Several stations of so-called TOSCEs (Team Observed Structured Clinical Encounter) have been developed and tested to assess interprofessional team competencies (BROWNIE et al., 2023). TOSCEs are examples from healthcare and can give guidance for other contexts. However, adaptations and clear guidelines for assessors are needed to be able to effectively assess the various facets of interdisciplinary collaboration fluency on individual as well as team levels.

## **4 Interdisciplinary collaboration skills trainings – implications for higher education**

Going along with WADDELL's (2015) statement that “collaboration fluency is an expectation of 21<sup>st</sup> century learners” (p. 8), institutions of higher education have to find ways to train students accordingly. Being able to collaborate successfully in interdisciplinary teams will become even more important (and easier with the advancing digitalization) because sharing, managing and negotiating different perspectives to construct new knowledge together (PIAGET, 1985) are considered decisive to successfully tackle future challenges.

To produce collaboration fluent graduates, teachers from different faculties need to jointly develop effective collaboration skills trainings including suitable assessment. They must ensure that authentic projects relevant for all students are pedagogically designed. It is helpful to involve an independent academic unit such as a teaching and learning centre to support faculty development, the coordination of a cross-faculty network and a structured development and implementation of collaboration skills trainings in all faculties.

A huge challenge will be to implement compulsory trainings across different – if possible, all – undergraduate and postgraduate courses. Collaboration fluency demands multiple trainings in different constellations with different problems to test and train to collaborate successfully in various contexts. For this to achieve, it needs commitment to the cause to overcome barriers such as organizational, discipline-specific, faculty member-specific etc. issues. Faculty development is also needed to train teachers to shift comfortably and deliberately between teaching and facilitating.

From our experience with implementing IPE to prepare future health professionals for effective collaboration, we can confirm that factors such as resources, time and above all a firm, long-term commitment from all people involved are crucial for success. It is demanding to develop, test and revise effective collaboration skills trainings and assessments. Although we have taken the first steps towards “teaching” collaboration skills, more focus and elaboration of the trainings are needed, especially with regard to assessing collaboration skills fluency.

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## Acknowledgement

We would like to thank Dr. Elisabeth Narciß for her critical review and feedback on the article.

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