

# Soft skills in design education, identification, classification, and relations: Proposal of a conceptual map

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## **Abstract**

Soft skills are interpersonal, social, and emotional competencies, transversal to various fields of knowledge and life. In the Knowledge Age, soft skills play an essential role in the differentiation of human work. Nevertheless, in design education, there are still few studies on soft skills. This study brings a conceptual map of soft skills in design education. It refers to a mixed-methods research conducted through a survey involving 93 teachers of high education design courses in 26 countries. We combined the survey results with a literature review analysis aimed at defining constructs and identifying their relationship. Finally, we propose a classification for soft skills as being Collective/Individual and Cognitive-Metacognitive/Interpersonal-Social. Our research recognises the connections and interdependence among skills, allowing us to settle different groups and establish relations among other skills. Furthermore, based on literature, we identified a hierarchy of gateways skills and high order skills and pointed out their connections. Additionally, a conceptual map was created, including the 20 primary soft skills in design education, their proposed classification, and the links between the skills. The result can help teachers and students know the primary soft skills in design education and develop teaching-learning approaches to acquire soft skills during their university training.

## **Keywords**

Soft skills, 21century skills, life skills, design education, teaching design

## **Introduction: The importance of soft skills in design education**

Soft skills are interpersonal, social, and emotional skills. They are transversal to various fields of knowledge and life. There are different labels to refer to these skills: 21-century skills (Organisation for Economic Co-operation and Development [OECD], 2005), life skills (World Health Organization [WHO], 1994), generic skills (Virtanen & Tynjälä, 2018), or key skills (Rychen & Salganik, 2003). Despite the various names and the lack of consensus in the literature on their classification, employers have increasingly sought these skills (Majid et al., 2012; Succi & Canovi, 2020). For this study, we use the proposition: "Soft skills represent a dynamic combination of cognitive and meta-cognitive skills, interpersonal, intellectual and practical skills." (Haselberger et al., 2010, p.73). They are often related to working in groups, thinking systematically, collaborating, and developing self-regulation and socio-emotional skills. They are referred continuously as differentiators in the contemporary context (Rychen, 2016; OECD, 2009), characterised by increasing complexity, constant change in everyday life, and technological advancement that gradually replaces human labour with algorithms (Harari, 2018). At the same time, the number and complexity of the crises we have to deal with are growing: the economic crisis, the environmental crisis and recently, the health crisis. These

realities require increasingly resilient, flexible, adaptable, and emotionally intelligent individuals.

Faced with this scenario in which modern development concepts are no longer sufficient to explain and direct human action, it is necessary to question the teaching-learning models, contents, and skills intended to be developed in young people in training. Many studies have highlighted the importance of developing personal, emotional, and subjective skills. In design education is not different; there is a need to update teaching as well as the skills needed by designers of the 21st century has been indicated by researchers in the field (Meyer & Norman, 2020; Norman, 2010; Friedman, 2012; Frascara, 2018; Findeli, 2001). Design schools need to train students in complex thinking (Norman, 2010), teaching research skills, and emphasising interdisciplinary, teamwork, and work anchored in reality (Frascara, 2018). Norman argues that the problems of the contemporary design context involve constantly changing relationships, and consequently, we deal with multiple interdependent variables. Davis (2017) advocates the need for new design educational paradigms that break with modern design schools' traditions and focus on intellectual flexibility and human values.

There are few studies on soft skills in design education<sup>1</sup> (Freitas & Almendra, in press) despite the growing need to train critical and empathetic designers who work collaboratively and have a systemic vision. Furthermore, faced with technological changes that impact the labour market, it is necessary to train designers who are increasingly flexible and prepared for the constant changes in this market, enabling them to adapt quickly to the individual's changing needs in the contemporary global context. So, in the context of contemporary design work, in which professionals must develop user-centred solutions and integrate increasingly multidisciplinary teams, soft skills are competencies that must be taught in higher education courses.

In a recent study conducted by Spitz (2021) to examine how the international community construes the future of design education, interpersonal communication skills were highlighted as a central component of design education. The necessity of learning critical thought, empathy and teamworking were also pointed out. The study also pinpointed the importance of lifelong learning "supported by a stronger interlocking of practice and education." (Spitz, 2021, p. 21).

Frascara (2018) states the importance of various soft skills such as:

- empathy, necessary to get to know users
- systematic thinking, "capable of discovering connections, differences and similarities in complex problems, beyond the usual"<sup>2</sup> (Frascara, 2018, p. 22)
- teamworking, to form interdisciplinary teams and manage interpersonal relationships to improve their performance with the team and with customers

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<sup>1</sup> In a systematic study in 2019, we identified only 11 articles that mentioned soft skills in design education.

<sup>2</sup> In the original: "(...) capaz de descubrir conexiones, diferencias y similitudes em problemas complejos, por encima de lo habitual"

In other words, to be a good designer, it is essential to understand society, culture, history and people's behaviour dynamics and develop soft skills. To achieve this educational purpose, the author suggests using the problem-based approach.

Problem-based education has emerged as a frequent pedagogical practice in studies on the teaching and learning of soft skills (England et al., 2020; Virtanen & Tynjälä, 2018). This type of pedagogical approach brings students closer to reality, enabling them to face problems in a complex way rather than in a controlled and falsely simplified context (Frascara, 2018). It is an approach stemming from critical pedagogy, which proposes to see education as a transformative practice and emphasises subjects' autonomy as builders of their knowledge through a dialectical method between individuals and the environment (Freire, 1997). In this approach, learning is seen as a multi-factorial process that varies from subject to subject. It is characteristic of being started by the learner, having it as the centre of the process. (Moran, 2018).

Problem-based education is a kind of Active methodology. This approach is different from the deductive methods, which are teacher-centred and based on the teacher's transmission for later application by the student. The Active Methodologies are learning strategies centred in the student role; they may be hybrid and combine different methods. These methodologies have been indicated as favourable to the development of soft skills (Virtanen & Tynjälä, 2018) as they provide contextualised learning, increase protagonism and student participation, continued teacher training, flexibility and can be integrated and less dependent on disciplinary curricula (Moran, 2015). To this teaching approach, the professor has to convey their role as information providers to facilitators guide

*The key elements of active learning are student involvement in the learning process and critical reflection on course material. Unlike the teacher-centred approach, where students simply listen to lectures and take notes, in active learning, students engage with the course material, participate in the class, and collaborate with others. The process affords students the opportunity to explore and develop new concepts through meaningful discussions and problem-solving situations. (Frey, 2018, p. 2).*

Active learning uses real problems contexts and promotes social interactions. The students have to work collaboratively. These characteristics allow peer learning and promote the increase and the growth of soft skills (Kember & Leung, 2005)

This research aimed to understand the perception of design teachers about the importance of soft skills in design, measuring the importance and weight that each one attributes to all of the proposed skills. We also surveyed the methods that professors use to teach these skills and classified them. We created a conceptual map about soft skills in Design Education that brings an arrangement and visualises their relations from the results. We also identified some pedagogical practices and strategies in design teaching to enable students' skills development.

## Methods

This is quantitative and qualitative research. It has been developed through a literature review about competencies and combined with a questionnaire survey. We based this study on the results of a systematic review of literature carried out previously. In this review, we analysed the soft skills related to design studies that identified 49 skills. We selected the 17 most cited

skills and added three skills identified by the OECD (2018) as necessary to face the challenges of the 21st century. The skills added from the OECD report were Curiosity, Learning to Learn and Systematic Thinking. We selected these competencies because they were cited by more than one study in the systematic review. Next, we observe the competencies indicated by the OECD that were not included among the 17 identified in the previous study.

The survey was mainly composed of closed-ended and scale questions. The main question was about the importance of soft skills, where the teacher was asked to assess the level of contribution of each skill to the teaching subjects in the design course. These questions used the Likert Scale and asked teachers to evaluate the importance of the skills for the topics they taught, indicating 1 for not contributing, 2 for contributing little, 3 for contributing sometimes, 4 for contributing and 5 for contributing a lot. The last part of the questionnaire asked if the professors used any methodological practices that enable teaching soft skills and if so, the teacher was asked to describe the approach. In this last question, the answers were open.

The research was carried out with professors who work in higher education courses in design. The sampling was non-probabilistic, and we used two techniques to compose: the snowball technique and the targeted mailing technique. The snowball technique consisted of sending the questionnaire by email to some teachers working in design courses requesting them to send it to other teachers involved in design education. The method of targeted mailing happened by identifying several design courses in several countries and contacting them by email. We also identified researchers using the mailing list of some design conferences. We sent 432 emails containing the link to the questionnaire, which resulted in 93 responses.

## Results

### Literature review results

In the previous study cited, we identified that competencies are usually mentioned without defining the constructs. For this reason, we aim to define the constructs on the competencies operated in the study. This research resulted in table 1 that shows the definitions in a summarised way.

**Table 1. Soft Skills operated in the study and its conceptual definitions**

Communication: to understand and make oneself understood through exchanges of messages (van Dijk & van Deursen, 2014, p. 2).
Critical Thinking: To reason well, construct and evaluate various arguments, data, reasons and inferences (Paul & Elder, 2007, p. 6).
Creativity: To go beyond what exists today and to generate and implement new ideas (Ward, 2004, p. 175-176).
Problem Solving: To overcome obstacles and move from an initial state to a target state (Chicago State University, 2020).
Curiosity: The desire to learn or know about everything; Ability to be inquisitive (Baxter & Switzky, 2008, p.460).
Research and Exploration: Multifaceted competence allows one to know objective reality through scientific instruments and to have reliable information about it (Prokhorchuk, 2014, p. 442).
Decision Making: To follow normative principles when making decisions (Parker et al., 2018, p.380).

Open-Mindedness: The ability to be receptive to emerging possibilities, share ideas, and consider different perspectives (Cegarra-Navarro & Cepeda-Carrión, 2008, p. 196).
Systematic Thinking: The ability to observe, think, model, simulate, analyse, design and synthesise components, functions, connections, structures, inter-relationships and dynamics between disciplines, processes, organisations, people, trends and cultures (Gallón, 2019, p. 1).
Empathy: Ability to take on the other person's role and imagine the situation from their perspective (OECD, 2005, p. 12).
Collaboration: The ability to participate in the process of shared creation (John-Steiner, 2011, p. 222).
Participation: Ability to participate in or be involved in something (Cambridge Dictionary, 2020).
Flexibility/Adaptability: The ability to produce thoughts from different perspectives or to change approaches to problem-solving (Kaya, 2020, p.505).
Learning to Learn: Ability to pursue and persist in learning, to organise one's own knowledge (European Council, 2006, p.16).
Teamworking: The ability to work together, communicate effectively, anticipate, and meet each other's demands, and inspire confidence, resulting in coordinated collective action (Salas & Cannon-Bowers, 2001, p. 15489).
Self-direction/ Self-management: Ability to regulate your emotions, thoughts and behaviour effectively in different situations (Transforming Education, 2014, p. 1).
Ethic/Compromise: The ability and willingness to be moral, to consider the needs, goals, and perspectives in their own decisions (Menzel, 2016, p.30).
Judgement: The ability to form valuable opinions and make good decisions (Cambridge Dictionary, 2020).
Leadership: Ability to exert influence on others through behaviour or action (Mumford & Gujar, 2020, p. 33).
Entrepreneurship: The ability to create new businesses, products, services, values and/or a state of mind that thrives on innovations with the potential to improve the lives of many people/customers (Parthasarathy, 2011, p. 461).

### Survey results

The majority of teachers, 49%, said they worked in Europe, followed by 33% in South America. Other continents such as North America, Oceania, Asia, and Africa were also indicated. The countries that were most cited were Brazil and Portugal. Some teachers answered that they teach in more than one country.

**Table 2. Countries indicated by research participants**

Country	Percentage of participants	Country	Percentage of participants
Brazil	30%	United States	2%
Portugal	19%	South Africa	2%
The Netherlands	10%	Australia	1%
United Kingdom	5%	New Zealand	1%
Italy	5%	Czech Republic	1%
Canada	4%	Denmark	1%
México	4%	Ireland	1%
Chile	3%	Switzerland	1%

Turkey	3%	Peru	1%
Belgium	2%	China	1%
Germany	2%	India	1%
Poland	2%	South Korea	1%
Colombia	2%	Singapore	1%

75% said they knew about soft skills, and 25% said they did not realise soft skills. The question that sought to evaluate the average ranking of soft skills asked teachers to estimate each skill's contribution to their teaching subjects. In this question, we used the Likert Scale mentioned above from 1 to 5, as shown in table 3.

**Table 3. Likert Scale Used in the Survey**

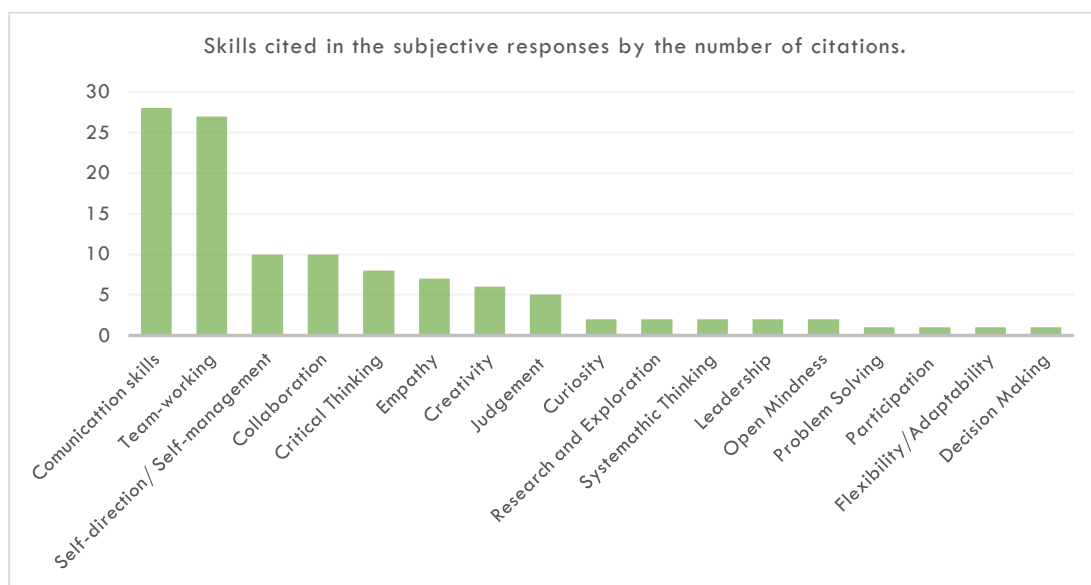
Likert Scale used in the Survey
One = Does not contribute
2 = Contributes little
3 = Sometimes Contributes
4 = Contributes
5 = Contributes a lot

From the statistical analysis done with the SPSS software, the closer the Mean is to 5, the higher the attribute evaluation (shown in table 4).

**Table 4. Ranking of contributions of soft skills in design education**

Skill	N	Min.	Max.	Mean	SD	Variance
Communication Skills	93	2	5	4.66	.667	.446
Critical thinking	93	2	5	4.65	.702	.492
Research and exploration	93	2	5	4.58	.727	.529
Creativity	93	2	5	4.54	.760	.577
Problem Solving	93	1	5	4.52	.816	.665
Curiosity	93	1	5	4.43	.914	.835
Decision Making	93	1	5	4.39	.794	.631
Open-mindedness	93	2	5	4.32	.810	.656
Systemic thinking	93	2	5	4.29	.879	.773
Empathy	93	1	5	4.28	.982	.964
Participation	93	2	5	4.26	.793	.628
Flexibility/adaptability	93	2	5	4.26	.779	.607
Collaboration	93	1	5	4.25	.928	.862
Learning to learn	93	1	5	4.18	1.042	1.086
Teamwork	93	1	5	4.15	.966	.934
Self-direction/ Self-management	93	2	5	4.05	.889	.791
Ethic/compromise	93	1	5	4.02	.944	.891
Judgement	93	1	5	3.69	1.063	1.130
Leadership	93	1	5	3.52	1.028	1.057
Entrepreneurship	92	1	5	3.27	1.178	1.387
Valid N (listwise)	92					

We also asked about the difficulty of evaluating soft skills, and 65% of teachers replied that they have difficulty assessing the learning of soft skills. The last closed question asked if teachers used any methodology that provided opportunities for teaching the skills mentioned in the survey. 80% said they did. An open-ended question finalised the questionnaire and asked the teacher to describe the methodology and/or practice (s)he uses to teach some of the soft skills mentioned in the questionnaire. We received Sixty-seven subjective answers. They were codified by identifying which central competence emerged. Professors explicitly cited some competencies; others appeared in between the discourse. For this analysis, we used the previously definitions to codify the skills.



**Figure 1. Skills cited in the subjective responses**

Teachers' methods prevailed the learner-centred methods, active methods, group activities, self-evaluation/self-knowledge, and peer evaluation. They also cited the design thinking methods and activities focused on real-world problems. In this sense, some answers indicate applying a personality questionnaire and a survey of previous skills and more in-depth knowledge of the students' realities. There was also an indication of the need for non-standardisation of methods, adaptation to the student or class profiles, and individualisation of strategies.

### **What do the results say about the teaching of soft skills in design education?**

The research results show that teachers ranked the soft skills with high rates for design practice. Among the 20 skills, none received an average ranking lower than 3. Only three skills received an average rating lower than 4 (Judging, Leadership and Entrepreneurship).

Regarding the skills that emerge as significant contributors to design courses, cognitive and individual skills (to the detriment of social and collective ones) appeared first and were rated the most important. Communication skills seem to be unanimous in the first place, as they also came first in the previous systematic review. Critical thinking, creativity, problem solving and curiosity appear between second and fifth place. It is essential to mention how some of the less widespread and discussed skills such as curiosity and open-mindedness ranked on average

above more popular and widespread skills such as teamwork, empathy, collaboration, leadership and entrepreneurship.

Despite this, we identified an inconsistency in the teachers' discourse regarding teamwork competence, which appeared in the average ranking in 15th place but emerged in second place in the subjective answers.

The teaching practices identified by teachers as enabling the development of soft skills point to constructivist-based pedagogies, student-centred and active methodologies. Those practices mean, in our interpretation, a teaching approach more connected with reality and with methods that enable engagement, interaction with the group, self-assessments and peer evaluation.

To improve the systematisation of knowledge arising from this research, we propose a classification of competencies based on the literature review. This classification was created from the establishment of 2 sets: Skills performed mostly collectively versus skills performed mostly individually; we call this set collective/individual. The other classification was cognitive/metacognitive skills and interpersonal/social skills. In both groups, we also identified the need to create two sub-groups: The gateway competencies (Kaye & Giulioni, 2013) group and the high-order competencies group. The first group is composed of prior, initial skills necessary to develop more elaborate, complex skills.

Based on these four types of classification, we created a conceptual map to clarify the sets and the relationships identified between the skills in a visual way.

### **Relations between the competencies**

The literature review carried out for the definition of the competencies revealed an interconnection between them. By analysing the delimitations, it was possible to establish links and associate them. The first link resulted from the analysis of the characterisation of curiosity, research and exploration, judgment, decision making, open-mindedness, creativity, flexibility, systematic thinking and critical thinking. Some authors demonstrate the sequential and conditional character of some of these competencies. (van Laar, et al., 2019; Bloom & Krathwohl, 1956). It is possible to establish sets and, from these sets, realise that for the improvement of critical thinking competence, it is essential to have previously grown the other competencies mentioned above because the advance of critical thinking occurs or is made possible by developing previous skills. According to Siegel (2010), critical thinking enjoys a prominent status in contemporary educational goals and ideals and is considered a fundamental ideal and underlying objective of Western education. This status can explain why educators have widely mentioned this competence.

Researchers in the field have also discussed the relationship between creativity and critical thinking. According to Villalba (2011), critical thinking directly relates to creativity and is necessary for creativity to be realised.

*(...) nowadays, it is generally accepted that creative thinking also entails convergent and critical thinking. While divergent thinking involves the generation of ideas, convergent thinking refers to the capacity to provide a*



*single (or few) adequate idea(s). Creativity is usually associated with the capacity to produce something new and adequate. Divergent thinking would be needed to generate ideas, and convergent thinking would be used for choosing good ideas. Critical thinking can be considered as a part of convergent thinking. It involves the evaluation, analysis, synthesis, and interpretation of something to provide a judgment. Critical thinking thus provides the 'why' and 'how' of choosing one idea. In this sense, as creativity, it is always seen as a higher-order skill (Villalba, 2011, p.323).*

It is possible to establish the relationships between flexibility, a necessary competence for creativity, curiosity, and open-mindedness (OM); the latter one is a timely and valuable competence for divergent thinking. According to Lord (2015), from Socrates to contemporary education theorists, OM competence is essential for learning. More recent researchers argue that OM is critical to assessing the mental models of individuals, which are deeply held beliefs or conceptions that can confine them to familiar patterns of thinking and acting. It is also possible to establish the relationship between systematic thinking, creativity, and problem-solving, bearing in mind that systematic thinking is ultimately aimed at understanding problems. "Systemic thinking draws from diverse disciplines to provide a holistic method for dealing with issues in any field. It is scientifically grounded in systems theory and a wide variety of transdisciplinary supporting principles providing a discipline-agnostic approach to address messes" (Gallón, 2019, p.10).

The competence of research and exploration is also preceded by curiosity, defined for Kaye and Giulioni (2013) as a "Gateway Competency". An introductory competence, which induces others. Exploration and research, for example, derive from curiosity (Baxter & Switzky, 2008). The competence of research and the capacity to explore also seem to have this characteristic to lead to other competencies, such as trial, decision making and critical thinking. It isn't easy to separate these competencies objectively because they seem to be deeply intertwined one to the other. We can also establish the relationship between ethics and critical thinking if we think that the construction of ethical thinking involves rational thinking since the competence of Ethics is realised as a construction of a critically reflexive morality (Borstner & Gartner, 2014).

About the cognitive self-regulatory skills, learning to learn, and self-management skills are also related. Self-management involves the learning to learn competence, and both benefit from critical thinking, which is necessary for developing self-regulatory competence.

The competencies that we call Social/Interpersonal also maintain relationships with each other and with cognitive competencies. The need for critical thinking and ethics is unquestionable as "background" competencies for the optimal development of communication, empathy, teamworking, leadership, entrepreneurship, participation and collaboration skills. However, by analysing the definitions of these competencies more closely, it is possible to state that they appear to have greater independence from each other in their condition of practical realisation. This independence does not

mean that the development of one competence does not favour the enhancement of another. Indeed, if the individual develops empathy competence, they will find it easier to grow leadership skills and work in groups. In this sense, it is possible to establish connections between Communication, Empathy, Collaboration, Participation and Team Working Skills. The ability to communicate well and develop listening skills can enhance Empathy skills. Consequently, being more empathetic makes it possible to be more inclined to the processes of collaboration and participation. Being able to communicate, listen, empathise and collaborate makes it possible to perform well in group work.

Finally, the skills that were assessed as less critical for design were leadership and entrepreneurship. These skills also benefit from the competencies mentioned above. It is expected that in the scope of contemporary design, which has a more collaborative character, leadership is a competence that has been assessed as less critical since the characteristic of collaboration is to be more horizontal and less hierarchical. Entrepreneurship also benefits from the competencies mentioned above; a designer with this type of competence can act not only in his own business but also in creating value, products and services for society in a broad sense. This value creation happens through private business or public services and social value, not driven by profit. Likely, the very definition present in the common sense of these competencies influenced this result. Although they came in the last place, the average rating of both was high at 3.54 and 3.46 respectively (out of a total of 5), which indicates an agreement on the contribution of these competencies to design of 70%.

Based on these reflections from the literature review, we create a conceptual map (figure 2) to understand the sets discussed here and some of their primary relationships in a visual way.

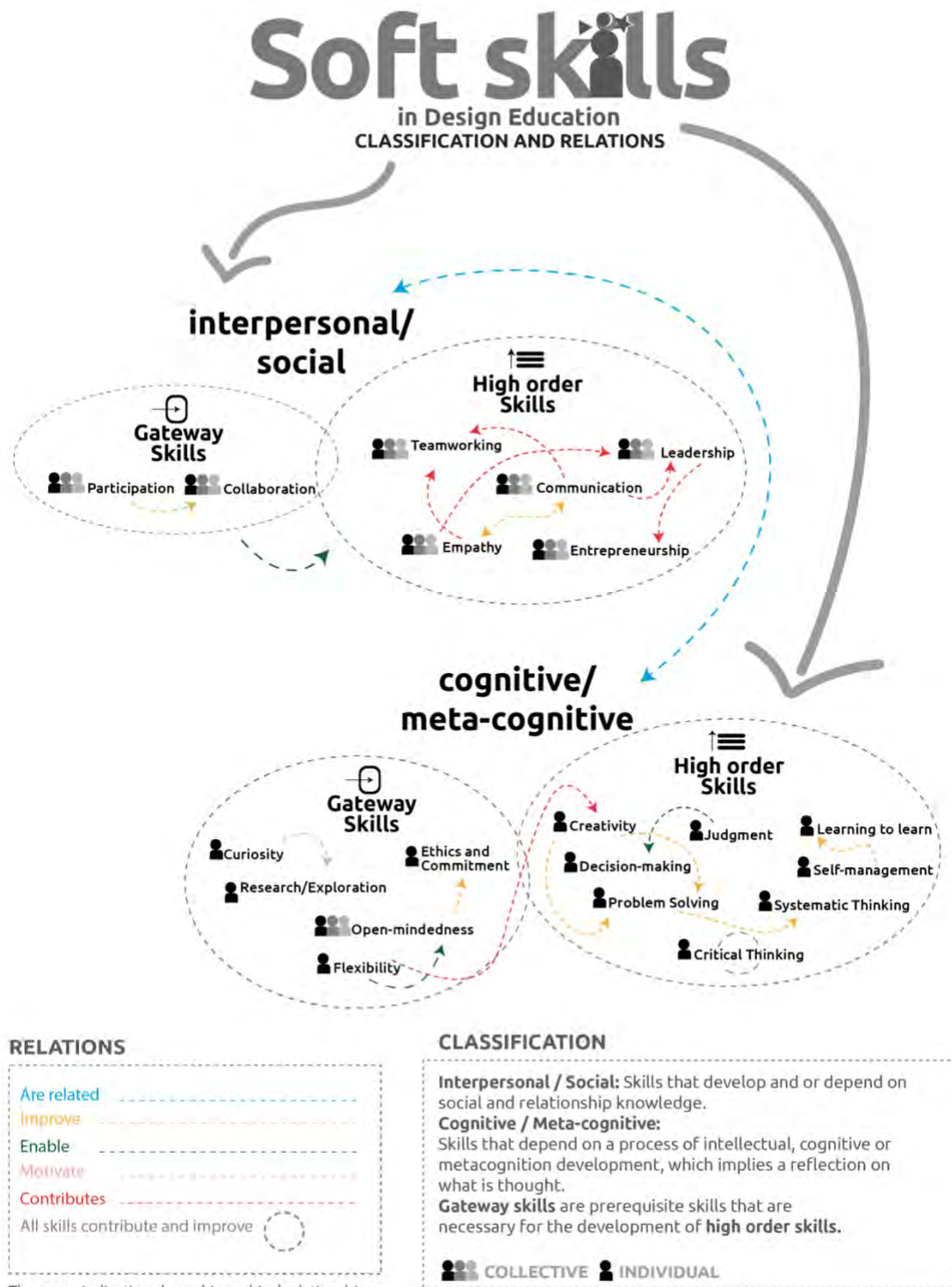


Figure 2. Concept Map: Soft skills in design education

## Outlook

This research showed that the 20 soft skills identified in the systematic review have high importance for teachers in the areas where they work in design. It was possible to determine the relationship and interconnection between the soft skills and to suggest, from the literature review and through the analysis of subjective responses, an interdependence between them.

The proposed classification and the definition of the constructs projected in this article may make it easier for teachers and students to identify the primary soft skills in design education. It is possible to determine which soft skills should be enhanced as initial skills to develop high-performance skills. This classification can be the initial way to indicate which methods can be applied and how to evaluate these skills according to the student's formation level.

It is possible to develop teaching strategies to build the gateways skills in the initial years by creating activities that can gradually involve the students and increasingly require more skills to make them "scale up" the soft skills of the conceptual map.

Problem-based education is an efficient way of teaching soft skills (Crawford et al., 2020) and is already widely developed in many design schools. It can be extended to teach soft skills in a more structured way and make it possible to evaluate them. This teaching approach should take place simultaneously with the development of traditional design skills (hard skills). According to the literature on teaching and learning soft skills, the following conditions must be met to achieve this goal:

- Contextualised teaching (Frascara, 2018)
- Increased contact with complex problems (Ringvold & Digranes, 2017; Azim et al., 2010)
- Active methodologies and a student-centred learning approach; (Leong et al., 2018)
- Integration between areas (interdisciplinarity between course subjects, but necessarily between diverse courses that coexist on campus or in the community); (OECD, 2018)

The study can also be applied to analyse and evaluate students' competencies and establish each student's profile. Thus, potentiating their learning, enabling a more individual and affective pedagogy. It means a pedagogy that looks to students with personal attention, considering their subjectivism and reality.

The use of constructs can be the beginning of a more objective evaluation of these skills within the teaching of design, allowing later the creation of indicators for assessing skills. In the same way, students can carry out a self-evaluation and observe their skills more critically from this map and the constructs.

Future studies should be carried out to verify the perception of these skills in the students and how they learn and enhance these skills. It is also necessary to know how practitioners consider this subject and assess the importance and level of these skills to design students entering the labour market.

Finally, it is interesting to raise the issue of design approaches and the development of these skills. Possibly some methods can enhance and be more complex learning environments than others in design education. The more complex, anchored in real-world problems and involving more relationships between communities and between professionals and different areas, the

more these skills can be developed. Therefore, approaches to design that make it possible to face the complexity of wicked problems, of the turbulent relationships that arise within a designer's actual work, are more conducive to developing these skills.

### **Boundaries of the study**

This study is part of an ongoing PhD research aiming to identify and validate the importance of 20 soft skills for design education. Although we intended to take a global view, we focused on participants from Brazil and Portugal. It was not possible to expand the sample size due to established time limits to the progress of the research, which, if extrapolated, would imply significant delays for the thesis. Moreover, as this is part of a more extensive study, it was impossible to include the students' views of these soft skills in the survey.

Nevertheless, we have already done other studies with students in which we involve students in a co-creation of strategies to teach and learn soft skills in design education (cf. Freitas & Almedra, 2021).

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