Chapter # 21

DEVELOPING TRANSVERSAL SKILLS THROUGH CREATIVE TEAM BUILDING IN ENGINEERING EDUCATION

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ABSTRACT
Integrating pedagogical innovations and inclusive approaches in university education supports a shift from passive instruction to active, cooperative learning and the development of transversal skills – particularly collaboration and critical problem-solving – demanded by contemporary engineering and architectural practice. This article presents an experiential team-building intervention implemented in a first-year Building Drawing course at Politecnico di Torino, designed to enhance peer interaction and cooperative decision-making between students from heterogeneous backgrounds. The experiential activity proposes a creative challenge in the field of modular architecture by using the 3D-printed basic element proposed by the architect Walter Gropius. The intervention was evaluated through a questionnaire combined with qualitative classroom observations to capture perceived learning experience and group dynamics. This experience shows how innovative teaching methodologies can strengthen relational and collaborative behaviours and, in parallel, increase student motivation, preparing learners to manage group dynamics and suggesting that inclusive, design-based team building can effectively support the development of transversal skills in AEC education.

Keywords: creative design experience, 3D printing, active learning, student engagement, higher education, transversal skills.

1. INTRODUCTION

In recent years, team-building activities have emerged as effective tools for improving group dynamics and transversal skills in educational contexts, including university programs. In the field of building engineering, where multidisciplinary collaboration is a fundamental requirement for professional practice, the ability to work in teams is as crucial as technical expertise. However, traditional university courses tend to favour an individualistic approach to learning, overlooking the potential of cooperative methodologies in enhancing both student engagement and their preparation for the workforce. Within this context, the present study describes a team-building activity designed for first-year Building Engineering students to develop transversal skills and promote a more cooperative learning process. This gap is particularly relevant in first-year courses, where cohorts are often heterogeneous and students have limited prior experience of academic teamwork. Accordingly, this study is guided by two research questions: (RQ1) To what extent can a creative, design-based team-building exercise embedded in a first-year Building Drawing course facilitate peer interaction and initial interpersonal acquaintance within a heterogeneous cohort? (RQ2) How do students perceive their engagement and motivation during the exercise, and which transversal skills do they report activating while collaborating? Consistently with these questions, the study aims to document and examine – through in-class qualitative observations and a post-activity questionnaire – how a hands-on collaborative intervention shapes early group dynamics and students' perceived engagement and collaborative skill use in a first-year Building Engineering setting.

The scientific literature suggests that integrating team-building experiences into higher education can improve academic performance, foster a sense of group belonging, and enhance communication skills (Oakley et al., 2004). Recent studies indicate that approaches such as cooperative learning (Johnson & Johnson, 2017) and problem-based learning (PBL) (Hmelo-Silver, 2004) promote active learning and collaborative problem-solving for complex issues (Gutierrez-Berraondo et al., 2025), thereby strengthening teamwork management skills. Literature syntheses further show that the benefits of PBL tend to emerge more clearly in competence-oriented assessments than in short knowledge-focused tests (Strobel & van Barneveld, 2009). Within this framework, research emphasizes that the effectiveness of such activities depends critically on the instructor's role, which progressively shifts from a "transmitter" of content to a designer of processes and active learning experiences aimed at maximizing student engagement (Johnson & Johnson, 2017). For cooperative learning to be truly effective, it requires explicit design conditions, rather than assuming that simple "group work" is inherently collaborative. In engineering education, multiple experiences show that practical exercises and collaborative project challenges increase students' motivation and engagement and may foster deeper learning approaches, although outcomes depend on the quality of scaffolding and on constructive alignment between learning objectives and assessment (Du et al., 2019; Francis et al., 2025). According to evidence-based principles, this relationship is consistent with the idea that motivation directs students' study behaviours in higher education. Motivation is also strengthened when an activity integrates learning, social, and affective goals, as often occurs in group-based projects (Ambrose et al., 2010; Gauthier, 2013). In parallel, empirical evidence indicates that transversal skills are associated with improved academic outcomes and lower dropout rates, and that project-based practices may contribute to performance also through their role in developing such competences (Guerra-Macías & Tobón, 2025).

Considering these premises, the impact of team-building activities in engineering education can be interpreted across three complementary dimensions. At the formative level, such activities encourage students to connect theoretical concepts with practical applications, fostering critical thinking and creativity in addressing complex problems while supporting flexible knowledge construction and self-directed learning (Hmelo-Silver, 2004). At the social level, they enhance communication skills, promote inclusivity by valuing diverse backgrounds, and strengthen conflict-management abilities, fostering empathy and cooperation – especially when teamwork competences are taught explicitly and supported by fair and transparent assessment practices (Johnson & Johnson, 2017; Francis et al., 2025). It is also important to note that classroom climate and communication patterns can be perceived by students along a continuum from supportive to unsupportive environments, with implications for motivation, learning, and performance: a negative climate may hinder learning, whereas a positive climate can energize it (Ambrose et al., 2010). At the professional level, when these activities are embedded within the curriculum, they simulate conditions close to real-world practice – where engineers collaborate across disciplines – thereby reinforcing soft skills such as leadership, adaptability, and organizational capacity; in this regard, Orih et al. (2024) recommend mixed-methods evaluation and continuous-improvement logics to capture the complexity of socially embedded training interventions. More broadly, as social and emotional processes are particularly salient during the university years, the design of learning environments that can recognize and address students' socio-emotional challenges is consistent with a student-centred perspective oriented towards "teaching students, not just content" (Ambrose et al., 2010).

The remainder of the paper is organized as follows: Section 2 delineates the educational context; Section 3 presents the methodological framework, detailing the design, implementation, and evaluation procedures; Section 4 reports the results; Section 5 outlines directions for future research; and the concluding section synthesizes the main findings and implications.

2. EDUCATIONAL CONTEXT

The team-building approach was experienced in the Building Drawing course at Politecnico di Torino, which lays the methodological foundations of Drawing as a communication language for engineers. As the first core course of the Building Engineering Bachelor's program, it brings together students who had previously been distributed according to different criteria, creating a cohort characterized by diverse educational and cognitive backgrounds. In this context, the experiential activity was designed to establish a collaborative learning environment and foster mutual acquaintance among students. These aspects are considered essential both for the practical group-based tasks that are central to the course and for building interpersonal relationships that are instrumental for subsequent teaching experiences. Sixty-five students from a variety of educational pathways – including high schools, technical institutes, and surveyor schools – participated in the activity.

This experience is integrated within a broader pedagogical teaching strategy adopted in the course that combines multiple teaching approaches to support the formation of competent and reflective engineers. Innovative learning experiences such as this are part of an articulated action plan (Ugliotti, Aschieri, & Osello, 2023; Ugliotti, & Zucco, 2023) with four principal objectives: (i) Providing diversified learning tools and strategies to facilitate the restructuring and elaboration of knowledge, enabling students to form cognitive connections and stimulate critical thinking. (ii) Encouraging students to experiment with mental strategies for developing personal interpretations of theoretical concepts presented in class, thereby constructing individualized understandings or mental models. (iii) Promoting experiential learning through “learning by doing”, allowing students to test, manipulate, and apply concepts in tangible, often collaborative contexts. (iv) Enhancing students’ self-efficacy and self-assessment skills, giving them opportunities to reflect on personal performance and learning outcomes.

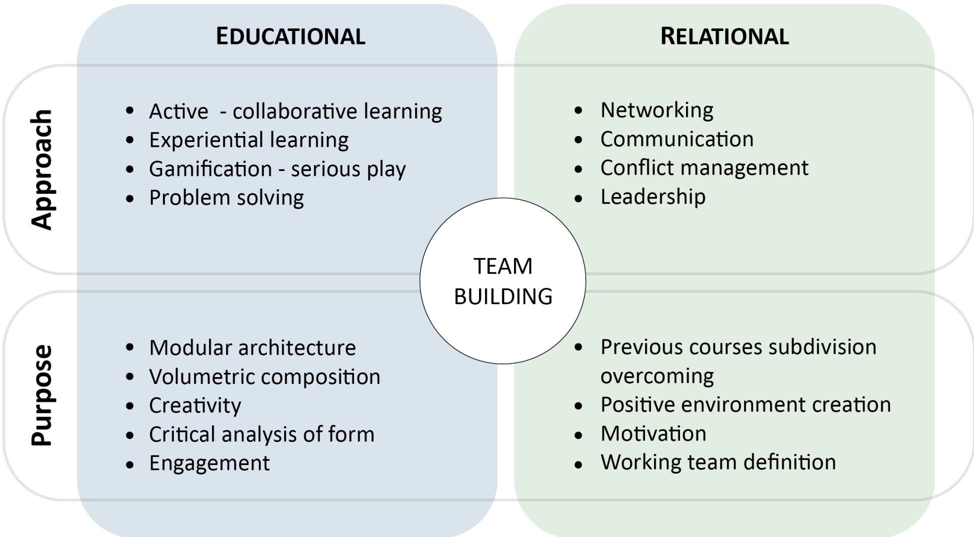
By situating the team-building activity within this framework, the course not only emphasizes technical competencies but also creates a methodological bridge between theoretical instruction, hands-on practice, and relational development. This approach reflects a broader trend in engineering education, where integrating active, collaborative, and reflective learning strategies is recognized as essential for fostering both disciplinary knowledge and transversal skills.

3. METHODS

The concept of modular architecture had been previously introduced to the students alongside the case study selected for the course: the Masters Houses of the Bauhaus in Dessau, designed by the architect Walter Gropius and built in 1925. This case represents not only an architectural milestone but also a pedagogical example of how form, function, and rationality can converge in design through modular systems.

Building on this premise, the participatory activity proposes a creative challenge in the field of modular architecture, which entails the definition of volumetric forms using the basic modules proposed by Gropius (Seelow, 2018). The use of modularity as a conceptual and operative framework enabled the design of a dynamic team-building activity that was both directly connected to the disciplinary content of the course and pedagogically aligned with the broader objectives of engineering education. The activity was conceived with the dual purpose of consolidating disciplinary learning and enhancing relational skills, as summarized in Figure 1.

Figure 1.
Methodological approach.



From a pedagogical perspective, the adoption of active approaches within the course (Ugliotti, Aschieri, & Osello, 2023) was aimed at directly involving students in the learning process, stimulating their participation, reflection, and collaboration. Techniques such as collaborative and experiential learning, gamification and serious play, and problem-solving were integrated into the experience to create a fertile synergy between theory and practice. In this framework, modular architecture served as a "didactic catalyst," transforming abstract concepts into manipulable forms that could be tested, assembled, and reinterpreted. This strategy facilitated the simultaneous development of disciplinary skills – such as graphic representation, spatial reasoning, and compositional analysis – and transversal competencies, including critical thinking, adaptability, and cooperative problem-solving.

Engaging in active learning experiences (Prince, 2004) compels students to confront design challenges in real time, sharpening their capacity for creativity while encouraging them to think through iteration, experimentation, and negotiation. In this case, the activity stimulated critical analysis of form and structure, creativity in volumetric composition, and a deeper reflection on expressive and constructive methodologies associated with modular systems. By situating the exercise within the historical and cultural framework of Bauhaus principles, students were also encouraged to link past architectural theories with contemporary design practice, thus broadening the cultural and intellectual dimension of the learning process.

The relational outcomes of the activity proved equally significant. Working in groups to reconfigure modular elements stimulated communication and networking skills, revealed natural tendencies toward leadership, and required conflict management strategies. Such dynamics highlight how technical knowledge and social competencies are interdependent in engineering education. The creation of a positive environment, reinforced by shared motivation and collective responsibility, contributed to the formation of cohesive and functional workgroups. In this sense, the team-building experience assumed a central role in the educational journey, acting as a transversal component capable of integrating pedagogical goals with relational needs.

The activity involved three main phases: an initial design phase, where the teaching team conceived and planned the activity; a practical execution phase, involving the assembly and manipulation of modular elements; and a final evaluation phase, in which results were critically discussed and assessed (Figure 2).

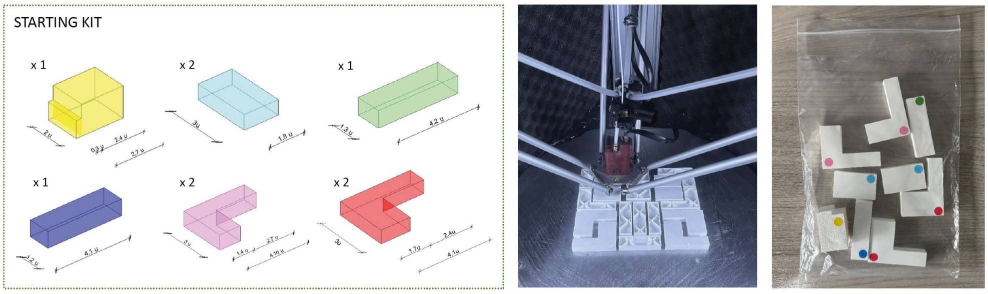
Figure 2.
Activity phases.

3.1. Design of the Activity

The preparatory phase of the activity entailed the digitalization of Walter Gropius's 1922 *Baukasten im Großen* modular forms, which were modelled in 3D using Autodesk Revit software. Once modelled, the digital objects were exported into the slicing software Ultimaker Cura, where they were optimized for 3D printing. At this stage, particular attention was devoted to scaling: the modules had to be sufficiently large to ensure ease of handling and visibility during group work, while at the same time avoiding excessive bulk that could hinder manipulation or transport. This process allowed the definition of a balance between functionality and practicality, ensuring that the printed modules would serve as effective pedagogical tools and could be easily reused in different settings. The final kit, consisting of nine modules, was printed in 40 identical sets, guaranteeing that each group could work under the same conditions. In parallel with the technical preparation, an external pilot simulation was conducted with volunteer students not enrolled in the Building Drawing course. This step was planned a priori as a dress rehearsal to test the feasibility and workability of the activity protocol and data-collection instruments, and to refine key implementation variables before running the intervention with the target cohort (Lenzner et al., 2024). This choice ensured that the participants would approach the task without prior conditioning and allowed the teaching team to observe spontaneous action. The simulation proved crucial in calibrating the timing of each phase, in defining the number of participants per group, and in adjusting the sequence of regroupings to maintain the possibility of dynamic collaboration. Moreover, the test offered the opportunity to design the data collection form more effectively: the requests were refined based on the feedback collected during the simulation. Interestingly, the pilot participants also contributed with critical and proactive suggestions that enriched the structure of the activity. For example, they proposed the idea of naming each composition, introducing an additional expressive dimension that would later become an integral part of the documentation phase. This element revealed the potential of the activity not only to stimulate creativity through form-making, but also to stimulate dialogue and idea-sharing among students. The process of naming the compositions prompted them to collectively interpret the generated forms, establishing connections with structural and architectural concepts.

The design and preparation of the activity required considerable time and resources from the teaching team. In particular, the processes of 3D modelling, printing, prototyping, and the pilot simulation demanded meticulous planning and continuous coordination to ensure that both the physical modules and the overall structure of the activity would meet the pedagogical objectives.

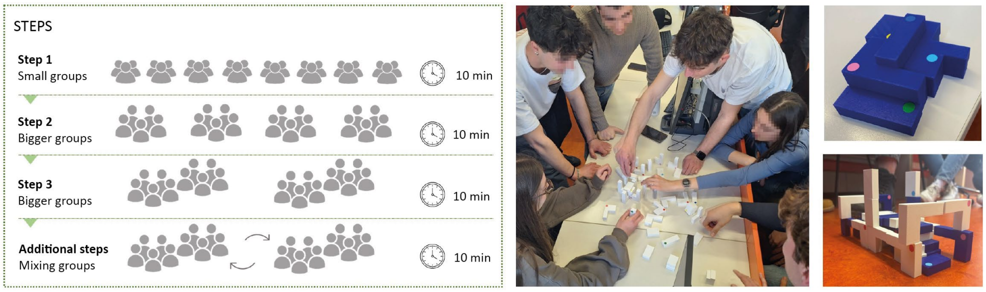
Figure 3.
Design phase.



3.2. Execution of the Activity

The team-building activity was conducted during regular class hours, within a lecture hall equipped with aligned rows of desks placed side by side. Students had been informed in advance that they would be taking part in a team-building session, yet the specific nature of the task remained undisclosed to preserve the element of surprise and spontaneity. The instructions of the activity were presented through slides projected in the classroom and remained visible throughout the exercise, ensuring that students could easily refer to the information while working. The activity unfolded in a series of progressive stages. Initially, groups of two or three students formed according to physical proximity. Each small group received a starter kit of modular elements contained in a transparent plastic envelope and was asked to assemble free compositions using the modules provided. No constraint was imposed on the use of all available elements nor on the number of compositions, leaving room for diverse creative strategies. As the process advanced, groups were gradually merged, doubling the number of participants and pieces available, thereby stimulating new interactions and increasing the complexity of the design tasks. In later phases, reorganizations followed a different logic: groups were reshuffled independently of seating arrangement and without increasing the number of individuals, with the main objective of facilitating interactions among as many students as possible. Each construction phase lasted approximately ten minutes. At the end of every step, students documented their work by completing a form recording the name of participants, the number and type of modules employed, the chosen name for the composition, and a photographic record of the model. This systematic documentation provided the basis for subsequent analysis of both relational and formal outputs.

Figure 4.
Execution phase.



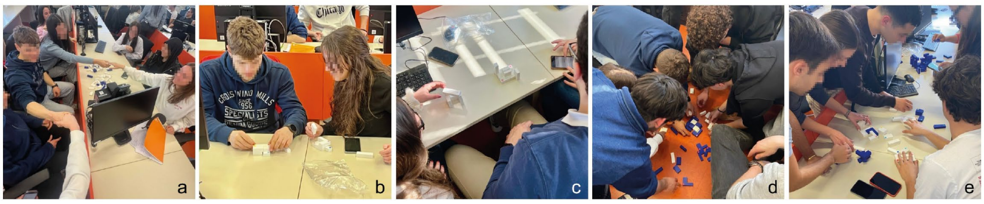
3.3. Evaluation of the Activity

During the activity, the teacher and collaborators paid special attention to qualitative observations of the dynamics among the students and the effectiveness of the planned task. Moreover, a structured questionnaire was administered to all participating students at the end of the session. The instrument was designed to collect both quantitative and qualitative feedback, with the purpose of assessing the pedagogical effectiveness and relational impact of the activity. The questionnaire was articulated into five sections. The first explored students' perceptions of the objectives and benefits of the activity, assessing to what extent the activity was able to promote teamwork and facilitate interpersonal acquaintance. A second section was dedicated to engagement and participation, measuring personal involvement and motivation, the skills applied, and the quality of each student's contribution within the group. The third part addressed organization and dynamics, focusing on the clarity of the instructions received, the adequacy of the time allocated, and the effectiveness of the group structure in supporting collaboration. Attention was also given to the interest in the proposed theme, in order to understand whether the conceptual reference to modular architecture stimulated curiosity and sustained attention throughout the activity. Finally, a section on future experiences investigated the students' willingness to take part in similar initiatives again, while also collecting suggestions for improvement concerning the format, duration, and integration of such activities into the course. The questionnaire combined closed-ended questions, using rating scales to allow measurable comparisons, with open-ended prompts that enabled students to provide personal reflections and suggestions. The systematically collected data served as the basis for subsequent analyses of relational dynamics and educational implications.

4. RESULTS

The team-building experience revealed several relational dynamics with important pedagogical and social implications. During the activity, the teacher and her collaborators observed that, each time a new group was formed, participants overcame interpersonal barriers through a spontaneous self-introduction phase (Figure 5.a), fostering a climate of openness and reciprocity. From the very first phase, devoted to small group formation, different approaches to problem solving emerged. Most participants adopted active collaboration (Figure 5.b), while in some cases a more individualistic approach was observed (Figure 5.c), in which each member focused independently on his or her own construction, emphasizing personal operational styles. In later stages, and thus with larger groups, the relational approach took on even more diverse forms. Some groups adopted parallel methods that facilitated a synergistic and equitable distribution of tasks (Figure 5.d), while others experimented with sequential strategies (Figure 5.e) in which one segment of the group devoted itself to constructing the form and another to prototyping the composition. The latter dynamic is symptomatic of a spontaneous predisposition to effective coordination. Just in a few isolated cases, a lack of engagement by some participants was observed, highlighting the need to implement motivational and inclusive strategies, as well as to create an environment more conducive to collaborative activities, in order to encourage active participation and the development of optimal group dynamics.

Figure 5.
Main relational dynamics observed.

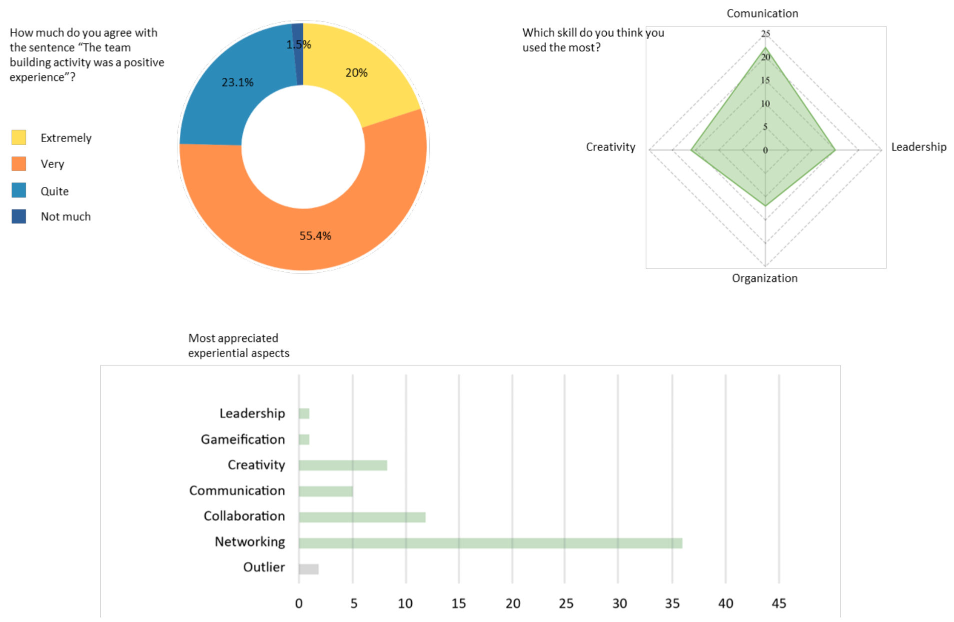


The post-activity questionnaire highlighted additional experiential and relational dynamics. Responses regarding perceived objectives and benefits indicate an overall very favourable evaluation: about three quarters rated the experience as “very” or “extremely” positive, and almost all respondents provided a positive assessment when including the “fairly” option.

Consistently, the great majority reported feeling engaged and stated that the activity helped them meet new classmates, although the presence of a small number of negative responses suggests that the effect was not fully uniform and calls for attention to the inclusion of more peripheral participants. In terms of engagement and participation, the opportunity to express one’s ideas was rated highly (approximately 97% positive responses), yet with a non-negligible concentration on “fairly,” pointing to room for improvement in balanced turn-taking and more symmetric participation within groups. In parallel, the most frequently mobilized competences were communication (about 34%) and creativity (about 25%), followed by leadership (about 23%) and organizational skills (about 19%), outlining a profile consistent with a task based on negotiation, coordination, and shared decision-making. With respect to organization and dynamics, the instructional design appears robust: the instructions were perceived as clear almost unanimously, while the overall duration was considered adequate by most respondents (about 92%) but insufficient by a minority (about 8%), indicating that timing is a sensitive variable to refine, particularly during regrouping and realignment phases. Regarding interest in the proposed theme, the activity triggered a design-oriented reading aligned with the course: about 94% reported interpreting the configurations as "buildings" while assembling them; however, the increase in curiosity toward modular architecture was less uniform (about 83% positive, about 17% reporting little or no increase), suggesting that for part of the cohort the link between hands-on composition and the conceptual framework could benefit from more explicit debriefing and shared interpretive prompts. Finally, in relation to future experiences and open-ended feedback, almost all respondents considered it effective to place team-building at the beginning of a course (about 99%), and a large majority would like to repeat similar activities in other courses (about 89%), indicating high acceptability and perceived transferability; open-ended responses further confirm that networking was the most appreciated aspect (followed by collaboration and creativity) and that suggested improvements mainly concerned time, group organization, and space/layout, highlighting that key levers lie in implementation conditions rather than in the theme itself.

In addition, communication and creativity emerged as the most frequently utilized soft skills, proving to be essential for effective teamwork and problem-solving (Figure 6).

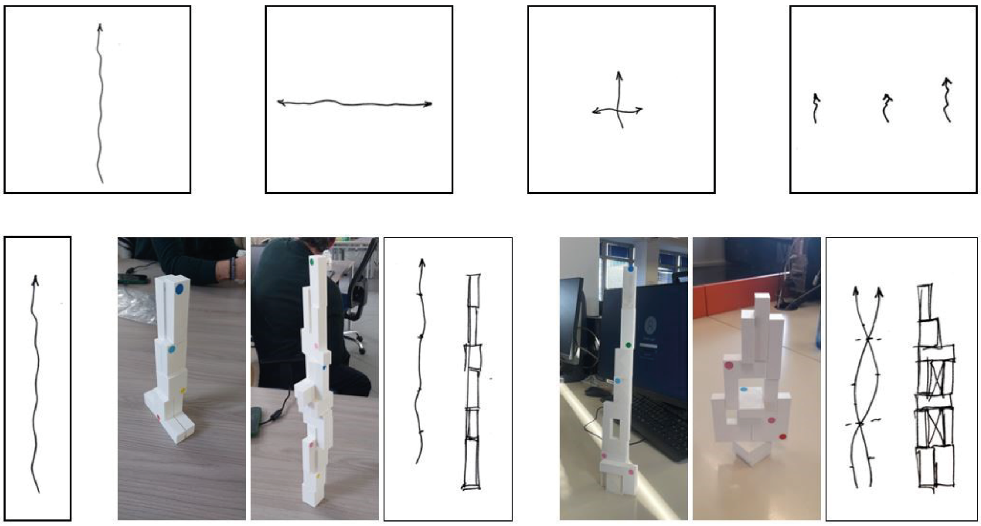
Figure 6.
Form results evaluation.



Overall, these operational strategies contributed significantly to the development of key relational competencies and soft skills, including communication, networking, conflict management, and leadership. Such skills are indispensable for fostering cohesive and efficient teams in educational contexts, while simultaneously providing valuable preparation for the future Building Engineer.

Beyond the relational and collaborative dynamics observed, an additional outcome of the activity concerned the creative composition of forms using the modular kits. For first-year Building Engineering students, this represented an initial, hands-on encounter with the notion of design, enabling them to explore spatial organization, structural thinking, and compositional strategies in a tangible and collaborative setting. The artefacts produced by each group were systematically documented through the data-collection forms and photographic records, allowing an initial identification of recurring compositional logics and emerging design tendencies (Figure 7). Importantly, this documentation did not serve only an analytical purpose: it was subsequently shared and discussed with the students, becoming the starting point for a guided debriefing and a structured pedagogical pathway. Through the collective review of the results and the observed strategies, the activity was used to explicitly introduce and consolidate core disciplinary notions – such as modularity, spatial reasoning, and the relationship between structure and form – by connecting students' self-produced artefacts to the theoretical concepts addressed in the course. In this way, form-making functioned not only as practice, but as a scaffolding device that helped bridge experiential exploration and conceptual formalization, laying the groundwork for more advanced architectural and engineering reasoning in subsequent courses.

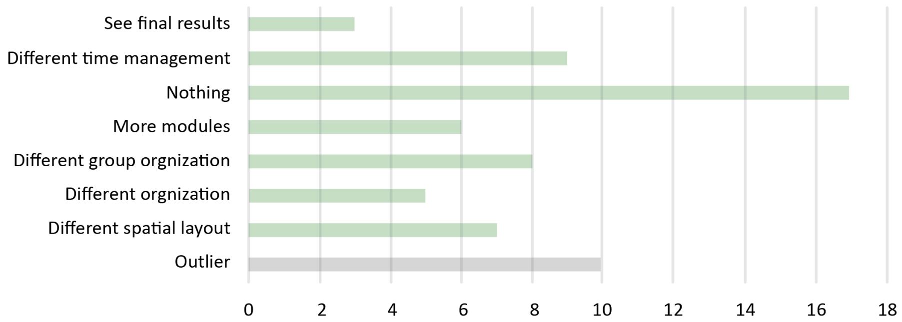
Figure 7.
Design tendencies observed.



5. FUTURE RESEARCH DIRECTIONS

The present pilot experience demonstrates the potential of team-building activities based on modular composition to foster both relational and creative skills in first-year Building Engineering students. Given the positive outcomes observed in terms of engagement, collaboration, and interpersonal interaction, this approach could be replicated and adapted in other educational contexts. During the evaluation phase, additional proposals and suggestions for future implementations of the activity were collected, as summarized in Figure 8.

Figure 8.
Suggestions for future team-building activities from the questionnaire.



Future implementations could systematically test variations in the number of participants, the duration of each phase, and the size of working groups in order to identify an optimal balance between intensity of interaction and manageability of coordination. In particular, these parameters should be treated as interdependent variables: larger groups may increase diversity of ideas but also raise negotiation costs, while shorter timings can sustain focus but may limit deeper cooperation. Additionally, alternative arrangements for group formation and phase sequencing could be explored together with classroom layouts that move beyond the traditional "frontal" setup – typically characterized by aligned desk rows facing the lecturer – and instead support collaborative exchange. Configurations such as well-spaced round or square tables, flexible islands of desks, or modular stations that allow groups to face each other and circulate between work areas may reduce physical barriers, facilitate eye contact and dialogue, and ultimately strengthen collaboration and peer interaction. Moreover, while the current activity focused on modular architecture as a didactic medium, similar strategies could be designed around other subject-specific themes relevant to the course of study, offering students a "soft" introduction to disciplinary concepts through hands-on, collaborative, and creative exercises. For instance, a structural form-finding tabletop challenge could engage student teams in building small-scale structures using simple elements (e.g., sticks, rubber bands, clips, and weights) with the goal of maximizing height, span, or load-bearing capacity. Beyond introducing core principles such as intuitive statics, triangulation, constraints, and structural behaviour, this format would also activate key transversal competencies – such as distributed leadership, collaborative problem-solving, and conflict management – as groups negotiate design choices under time and resource limitations. Further research will investigate how such interventions can be refined and tailored to maximize educational, relational, and cognitive outcomes.

6. CONCLUSION

This study documented and analysed, from a pedagogical perspective, a creative team-building activity designed to support the development of transversal skills and to foster interaction among students with heterogeneous backgrounds within a first-year Building Drawing course. The creative challenge, situated in the context of modular architecture, involved the use of building modules inspired by Gropius' designs, modelled and 3D printed, offering participants the opportunity to reinterpret architectural space in a personal way. In addition, it enabled students to explore the compositional, graphic, and spatial principles that constitute its theoretical and practical underpinnings.

In response to (RQ1), the collected evidence suggests that the exercise effectively facilitated peer interaction and the initiation of mutual acquaintance within the cohort. Classroom observations showed that, at each regrouping stage, students tended to overcome initial barriers through spontaneous self-introductions and rapid negotiations, progressively activating coordination dynamics (including parallel and sequential working arrangements). These qualitative insights are consistent with questionnaire data, which indicate a highly perceived usefulness of the experience both for meeting new classmates and for positioning team-building activities effectively at the beginning of the course. Although the intervention is student-centred, the literature also invites consideration of the instructor's role, which emerges as decisive: no longer a mere transmitter of content, but a designer of structured learning experiences aimed at sustaining participation and maximizing active student engagement. In this sense, the activity can be interpreted as a cooperative learning device: regrouping and the need to reach operational agreements required continuous use of communication skills and the progressive construction of peer collaboration practices.

In response to (RQ2), questionnaire results indicate high levels of engagement and a widespread perception of participation, together with the activation of specific transversal skills during collaboration. Students mainly reported mobilizing communication and creativity, followed by leadership and organizational skills, outlining a profile consistent with a task grounded in comparison, coordination, and shared decision-making. While not a PBL pathway in the strict sense, the exercise incorporates a problem-based logic: heterogeneous groups address an open-ended task and negotiate solutions through cycles of trial, discussion, and reorganization, activating collaborative problem solving and transversal skills within an active learning context. At the same time, response distributions indicate that the quality of the experience also depends on implementation conditions such as timing, regrouping phases, and the balancing of participation.

Beyond these relational and organizational aspects, the experience also highlighted the potential of experiential activities to act as "gateways" to theoretical knowledge. By engaging directly with modular elements, students were able to internalize architectural principles – such as modularity, repetition, and scalability – not only as abstract notions but as concrete design strategies tested in practice. This embodied approach resonates with constructivist theories of learning, according to which knowledge is consolidated through the continuous interplay between action, reflection, and conceptualization. In this way, the activity bridged the gap between theory and practice, enabling heterogeneous groups of students to access disciplinary content through multiple cognitive channels – visual, spatial, and kinaesthetic – thereby reinforcing inclusivity.

Overall, this pedagogical model, potentially replicable across educational settings, contributes to the discourse on educational innovation by showing how advanced technological tools and interdisciplinary approaches can foster academic and relational competences on solid, critical, and collaborative foundations, break the monotony of passive listening, and promote broad, conscious participation. However, the outcomes should be interpreted as observational and perceptual evidence (in-class observations and post-activity self-reports), rather than as causal or pre-post measures of competence improvement. The study further suggests that active and experiential learning can enrich the assimilation of theoretical knowledge, preparing students to face the dual challenge of mastering disciplinary content while cultivating the social and collaborative skills essential for contemporary professional practice.

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KEY TERMS & DEFINITIONS

Transversal skills: capabilities not tied to a single discipline and applicable across multiple contexts, encompassing effective communication, collaboration, critical thinking, creativity, leadership, and organizational abilities. These skills underpin interpersonal interaction, conflict management, and shared decision-making processes.

Active learning: a pedagogical approach that requires learners to engage actively through participation, reflection, and interaction. It promotes deeper cognitive processing by integrating practical tasks, cooperative activities, and problem-oriented strategies.

Team building: a structured set of activities designed to strengthen communication, trust, cooperation, and cohesion within a group. It supports the development of effective interpersonal relationships and facilitates productive collaborative dynamics.

Modular architecture: a design framework based on repeatable and combinable units that enable the generation of flexible spatial configurations. It provides a foundation for examining compositional principles, constructive logic, and standardization processes.

Collaborative problem-solving: a collective problem-resolution process in which individuals contribute ideas, assess alternatives jointly, and coordinate their actions to achieve a shared objective.

3D printing: an additive manufacturing technology that produces three-dimensional objects through the progressive layering of material derived from a digital model. It allows rapid prototyping, geometric experimentation, and the fabrication of complex forms.

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