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ENHANCING STUDENT LEARNING THROUGH EXPERIMENTAL RESEARCH: TRADITIONAL METHODS OF CONSTRUCTING HALF-TIMBERED WALLS

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Purpose: The main aim of the experiment was to introduce architecture students to the practical science of construction techniques used in historic timber buildings. It represented a return to the original concept of architectural education based on the master–apprentice model.
Design/methodology/approach: This article presents an evaluation of the teaching process during a student workshop that enriched the education of future architects. The goal was to provide hands-on experience with timber-framed wall construction techniques and conservation methods for historic buildings.
Findings: Participants developed practical skills, increased their environmental awareness, and strengthened their competencies in teamwork and international cooperation. The teaching process was assessed based on student engagement, the effectiveness of team collaboration, problem-solving abilities, and the quality of group interaction. The use of both quantitative and qualitative methods enabled a better understanding of the workshops' impact on students' readiness for professional practice, supporting the optimisation of future learning initiatives.
Practical implications: The workshops demonstrated their practical value through measurable conservation outcomes while also preparing students to meet the challenges of sustainable architectural practice. The initiative had broader social benefits, fostering cultural ties between Poland, Germany, and the Czech Republic, and promoting the preservation of unique regional architectural heritage.
Social implications: The project raised awareness of cultural heritage and sustainability in architecture. It encouraged international exchange and may inspire more institutions to include traditional techniques in education and policy.
Originality/value: This article is addressed to architecture educators and students. Returning to traditional teaching methods, such as the master–apprentice model, can be seen as an innovative approach in today's educational landscape. In an era dominated by digital tools and remote learning, opportunities for direct, hands-on experience are increasingly rare. Yet it is precisely this kind of embodied, relational learning that responds to current educational challenges. It encourages deeper engagement, develops practical and social skills, and restores a human dimension to the learning process.
Keywords: heritage conservation, practical education, ancient building techniques.
Category of the paper: viewpoint and case study.

1. Introduction

The preservation of architectural heritage is of paramount importance for maintaining the cultural and historical identity of communities. Historic buildings function as material manifestations of past eras, serving as repositories of intangible cultural knowledge. This knowledge encompasses traditional construction techniques, aesthetic values, and social customs, which collectively contribute to the shaping of local and regional identities (Ashworth, 2011; Jokilehto, 2006). As Graham, Ashworth, and Tunbridge (2000) emphasize, heritage encompasses not only the physical fabric of buildings, but also the meanings and values attributed to them by successive generations.

The half-timbered wall system, utilised throughout Europe since the Middle Ages, exemplifies both technical ingenuity and ecological sustainability. Wooden frameworks were infilled with natural, locally sourced materials such as straw-reinforced clay, hand-moulded earth blocks, or lightweight fibres – enabling rapid, low-impact construction often carried out with community involvement. Regionally specific techniques like *Lehmstaken* and *Lehmwickel* were traditionally transmitted through apprenticeships but are now at risk due to urbanisation and educational shifts. These practices reflect a duality of craft-based knowledge and environmental adaptation rooted in vernacular architecture (Houben, Guillaud, 1994; Holmes, Rowan, 2021; ICOMOS, 2013).

The preservation of such heritage necessitates both technical conservation and cultural continuity, a fact that is especially evident in regions such as Upper Lusatia, which is located on the Polish-German-Czech border. In this region, vernacular forms such as *Umgebinde* houses have survived to the present day. These hybrid wooden-log structures have attracted interdisciplinary interest and are the focus of both community-led and institutional conservation efforts (Rdzawska, 2007; Trocka-Leszczyńska, Rdzawska, 2009).

In recent years, international student workshops have emerged as a response to the dual challenge of conservation and education. These initiatives combine historical research, field-based instruction, and hands-on construction, immersing students in authentic heritage contexts. They create a unique learning environment where experiential education and cultural exchange intersect, allowing architecture students to engage directly with endangered building techniques (Tzonis, 2014).

The central research question guiding this study is: how do international, hands-on workshops in traditional timber-frame construction impact architecture students' technical skills, ecological awareness, and intercultural competencies?

The primary aim is to assess the educational effectiveness of such workshops by examining how direct engagement with historical building methods contributes to broader goals in architectural education – particularly in the areas of sustainability and heritage preservation.

Accordingly, this paper evaluates two international workshops held in Seifhennersdorf, Germany, in 2022 and 2024. Drawing on observational data, student reflections, and post-workshop survey responses, the study explores how experiential learning supports the development of competencies related to heritage conservation, ecological thinking, teamwork, and cross-border collaboration in the context of vernacular architecture.

2. Methodology

This study employs a mixed-methods research design to evaluate the educational effectiveness of two international student workshops focused on the conservation of timber-framed buildings. The workshops were held in Seifhennersdorf, Germany, in August 2022 and July 2024, as part of an academic collaboration between the Silesian University of Technology (Poland) and HTWK Leipzig (Germany). Participants included architecture students from both institutions, supervised by faculty members specializing in heritage conservation.

The pedagogical foundation of the workshops draws on principles of experiential learning, which emphasize the role of direct experience in developing knowledge, skills, and attitudes (Kolb, 1984). This approach is increasingly recognized as effective in architectural education, particularly when addressing complex, real-world challenges (Tzonis, 2014). By engaging students in authentic conservation activities, the workshops created conditions for learning through action, reflection, and problem-solving.

The structure of the workshops integrated three established instructional models:

- Action Learning, where students tackled real restoration tasks in groups and learned through doing.
- Problem-Based Learning, which encouraged them to collaboratively devise solutions to construction-related challenges.
- Case Study analysis, focused on the architectural and historical significance of the Umgebinde house typology.

Such a blended approach has proven effective in design and technical disciplines for cultivating creativity, cooperation, and critical thinking (Barrows, 1996; Ibrahim et al., 2021). The workshops further extended this model by emphasizing manual skill development, sustainable building practices, and intercultural teamwork in a hands-on setting.

To assess the workshops' impact, the study utilized three complementary data collection methods:

- participant observation, conducted by the instructors throughout the activities,
- informal student reflections, collected during and after the workshops,
- an anonymous post-workshop evaluation survey, completed by all participants.

This triangulation of data sources follows established educational research practices (Creswell, Plano Clark, 2011), providing both breadth and depth in evaluating learning outcomes and enhancing the reliability of the findings. The survey combined closed and open-ended questions across five categories: organizational quality, teaching methods, teamwork and atmosphere, working conditions and safety, and perceived educational value.

The evaluation framework was designed to be learner-centered, reflecting the growing emphasis in higher education on student voice and agency in the assessment process (Boud, Falchikov, 2007). This comprehensive methodology enables a nuanced understanding of how participation in heritage-focused workshops supports the development of technical, social, and cultural competencies among architecture students.

3. Workshop Process

The international workshops conducted in Seifhennersdorf in 2022 and 2024 were structured into three main phases: contextual analysis, design development, and practical implementation. This division reflects established approaches to project-based learning and participatory design in architectural education (Salama, 2015; Schön, 1983), enabling students to gradually build understanding through observation, ideation, and hands-on practice.

To support the practical exercises, Figure 1 shows the key structural elements of a traditional half-timbered wall. These include the timber framework, typical infill techniques like *Lehmstaken* and *Lehmwickel*, and the use of natural insulation. Understanding these elements was essential before moving on to the construction tasks.

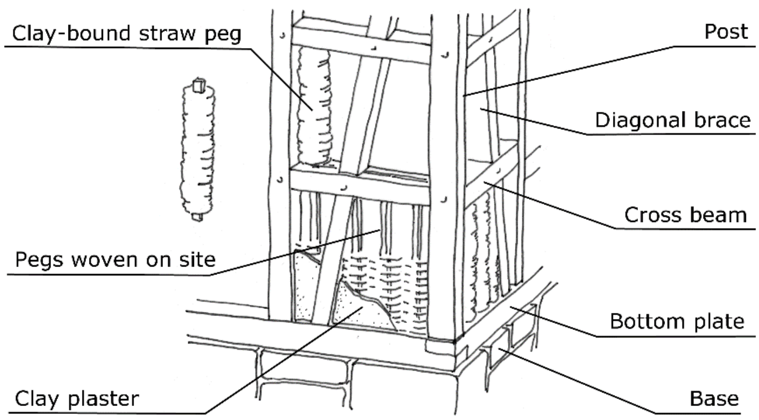

Figure 1. Structural elements of a traditional half-timbered wall, including straw-clay infill, timber frame joints, and various techniques of field filling such as *Lehmstaken* and *Lehmwickel*.

Source: Gerlic, 2024.

3.1. Phase I – Site research and analysis

The initial phase focused on understanding the historical, environmental, and social context of the *Umgebinde* houses located in Upper Lusatia. Students participated in guided tours of preserved buildings, museum sites, and contemporary restorations. A lecture on construction principles and the cultural significance of hybrid wooden-log systems provided theoretical grounding. Through site visits and collaborative reflection, students developed critical insights into spatial constraints, materials, and adaptive reuse potentials—an approach aligned with place-based learning strategies (Gruenewald, 2003).

3.2. Phase II – Concept development and design exploration

In the second phase, students formed interdisciplinary and international teams to create conceptual proposals. Sketching, diagramming, model-making, and perspective drawing were used to explore functional and aesthetic strategies for preserving authenticity while incorporating new uses. The iterative process emphasized sustainability and participatory design, consistent with experiential learning models (Kolb, 1984) and socio-constructivist pedagogy in design education (Tzonis, 2014).

Working in culturally diverse teams facilitated peer-to-peer learning and challenged students to negotiate differences in communication, methods, and expectations—a crucial competency in today's globalized professional environment (Dannels, 2002).

3.3. Phase III – On-site construction and material experimentation

The final and most immersive phase involved active engagement in a supervised yet student-driven setting, with traditional construction techniques. Under expert supervision, students rotated through a sequence of hands-on tasks, including:

- Preparation of natural materials: mixing straw and clay, selecting aggregates, shaping clay-straw blocks.
- Frame work: identifying structural nodes, marking joinery, stabilizing wooden elements.
- *Lehmstaken*: inserting straw-coated wooden rods into grooves or notches in the timber frame.
- *Lehmwickel*: preparing bundled straw soaked in clay, woven and pressed into the frame.
- Manual plastering with earth-based renders.
- Application of natural insulation (e.g. wood wool).

Rotating between tasks enhanced cross-functional learning, fostered peer support, and ensured comprehensive engagement with all aspects of traditional construction. This method resonates with "learning by doing" models and the studio-based tradition in architectural pedagogy (Cuff, 1991), while also emphasizing embodied learning—particularly relevant when working with tactile, heavy, and variable natural materials (Orr, Phoenix, 2010).

By participating in the full spectrum of activities, students developed technical proficiency, ecological awareness, and a holistic understanding of conservation challenges. This integration of theoretical knowledge and physical engagement illustrates the strength of field-based learning environments in developing professional competencies (Ibrahim et al., 2021).

4. Results

The results of the workshops were analyzed based on direct observations, student reflections, and an anonymous post-workshop evaluation survey. This multifaceted assessment provided a comprehensive picture of both the educational outcomes and the experiential quality of the workshops.

4.1. Educational outcomes and student performance

Throughout the workshops, students demonstrated increasing levels of engagement, technical curiosity, and adaptability. The opportunity to work with natural materials such as clay, straw, and timber in real construction conditions significantly enhanced their understanding of material behavior and traditional construction logic. Most students entered the workshop with little or no hands-on experience in building crafts, yet quickly adapted to the physical demands and developed practical competencies.

As observed by instructors, students exhibited steady improvement in manual skills, spatial reasoning, and confidence in tool use. The rotation of tasks and collaboration across small teams fostered peer-to-peer learning, allowing more experienced participants to support others. Furthermore, exposure to environmental challenges (e.g., handling wet clay, working in variable weather) built resilience and problem-solving abilities, often under informal time constraints.

These observations confirm previous research on the effectiveness of experiential, tactile learning in design education, particularly in contexts that demand adaptability and manual skill development (Kolb, 1984; Cuff, 1991).

4.2. Instructor reflections

The teaching team noted that the workshop format enabled a unique type of pedagogical interaction, distinct from traditional classroom settings. Students asked more practical, context-driven questions and showed initiative in seeking clarification. Working in international teams introduced linguistic and cultural dynamics, which, although occasionally challenging, encouraged students to develop communication strategies and leadership in small group settings.

The balance between freedom and structure proved effective. While students were encouraged to improvise and experiment, safety protocols and performance expectations were clearly communicated. Many participants expressed motivation that exceeded initial expectations – particularly when they began to see the tangible outcomes of their work.

This kind of hands-on engagement aligns with Schön's (1983) idea of the "reflective practitioner", where students learn by reacting to immediate situations and refining their actions through feedback.

Figure 2. Students weaving straw and clay infill between timber elements using the *Lehmwickel* technique.
(Photo: E. Rdzawska-Augustin, 2022)

Figure 3. Straw-clay blocks formed and dried on site before being placed into timber frames.
(Photo: K. Gerlic, 2024)

Figure 4. Students rotating between construction tasks: mixing clay, preparing the timber frame, and applying plaster.
(Photo: E. Rdzawska-Augustin, 2022)

Figure 5. International student groups collaborating on-site, exchanging knowledge and supporting each other across language and skill differences.
(Photo: K. Gerlic, 2022)

4.3. Survey results

The evaluation survey, completed by all participants, revealed consistently high satisfaction across all categories:

- Workshop organization received the highest ratings. Students praised the clarity of pre-departure information, accommodation logistics, and the overall schedule. The introductory lecture and site visits (e.g., to Zgorzelec) were seen as valuable additions. A minor suggestion concerned the student union's involvement, unrelated to the core organization.
- Teaching methods and content were also rated very highly. Students highlighted the professionalism, clarity, and approachability of instructors. Practical tasks, particularly those involving clay and tool work, were described as the most memorable and beneficial. Some suggested shortening the theoretical component slightly in favor of more group interaction or physical modeling.
- Teamwork and atmosphere were evaluated as extremely positive. Despite minor language barriers, students enjoyed working in international groups. They recommended simple improvements to group cohesion, such as name badges or shared meals. Small, mixed teams (3-5 people) were preferred.
- Working conditions and safety were described as excellent. Students appreciated the availability of tools and materials, adherence to safety instructions, and the proximity of accommodation to the workshop site. Participants felt safe throughout the workshop.
- Knowledge and applicability were assessed as very high. Students emphasized the practical relevance and inspirational nature of the knowledge gained. Many expressed a desire to participate in future workshops and proposed expanding the program to include other heritage techniques such as stonework or community engagement with local residents.

Students' positive feedback regarding teamwork, atmosphere, and task rotation aligns with the findings of Dannels (2002), who emphasizes the role of communication and group structure in fostering design studio effectiveness.

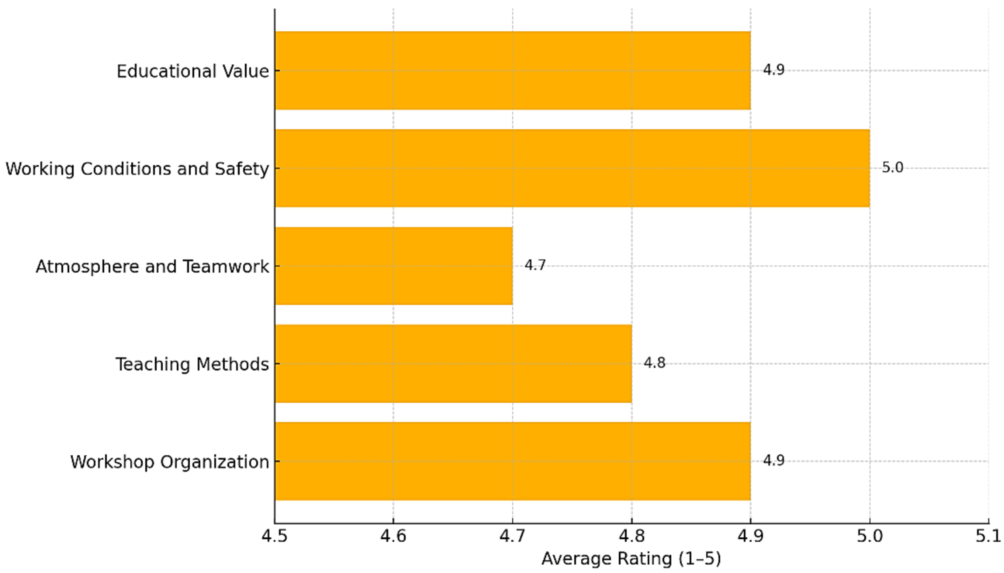

Figure 6. Summary of student evaluations across key workshop categories.

Source: Post-workshop evaluation survey, 2024.

5. Discussion

The findings of this study confirm the high educational value of practical, field-based learning in architectural education. The integration of manual work, historical context, and interdisciplinary collaboration within a real construction setting created a rich and engaging learning environment that extended far beyond the capabilities of traditional studio or classroom instruction.

5.1. Experiential learning as a foundation for architectural education

Experiential learning, grounded in direct engagement with materials, tools, and real architectural problems, fosters a deeper understanding of construction systems, building traditions, and spatial logic. Unlike theoretical instruction, hands-on workshops allow students to "think with their hands," as Schön (1983) described it, by testing ideas in physical form and adapting intuitively to emerging challenges.

In the context of traditional timber construction, this method proved particularly effective: students developed an embodied understanding of weight, texture, resistance, and the time-intensive nature of manual processes – experiences rarely accessible in modern curricula. The presence of unpredictability (e.g. weather, material inconsistency, fatigue) contributed to a realistic approximation of professional practice, where adaptation and improvisation are crucial.

Unlike design courses focused on software and virtual modeling, these workshops reconnected students with the physical reality of construction. As Webster (2008) notes, architectural education often marginalizes manual labor in favor of abstract representation. In this sense, the workshops addressed a systemic gap by foregrounding craft, collaboration, and full-body engagement with architecture.

5.2. Student competencies: technical, social, cultural

In addition to acquiring construction-related skills (material mixing, tool handling, structural assembly), students improved their teamwork abilities, communication strategies, and intercultural sensitivity. Working in small, international groups required them to coordinate across language barriers, negotiate design decisions collaboratively, and adapt to different working styles. These competencies are crucial for future architects expected to operate in interdisciplinary, multicultural, and often transnational professional environments (Dannels, 2002; Ibrahim et al., 2021).

Importantly, many students expressed increased confidence not only in using tools or performing tasks, but also in taking initiative, solving problems creatively, and supporting their peers. The social dynamics within each group were often self-regulated, demonstrating high levels of responsibility and mutual respect—especially noteworthy given the physical demands and novelty of the work.

Moreover, the exposure to vernacular heritage enhanced students' cultural awareness and ecological thinking. Understanding how historical buildings responded to environmental and social conditions strengthened their appreciation of sustainable design principles rooted in local traditions. This echoes current calls for a more place-based, culturally sensitive approach to sustainability in architecture (Gruenewald, 2003; ICOMOS, 2013).

5.3. The impact of the international setting

The cross-border nature of the workshops added an important layer of complexity and value. Working alongside peers from different academic, linguistic, and cultural backgrounds helped students develop soft skills such as adaptability, empathy, and openness to alternative perspectives.

The workshops also became informal spaces for cultural exchange. This aligns with the goals articulated in international charters on heritage and education, including the Faro Convention (Council of Europe, 2005) and UNESCO's World Heritage Education Programme, which emphasize youth participation and international collaboration in safeguarding cultural heritage. The workshops demonstrate how these values can be operationalized in a tangible, site-based learning format.

Furthermore, many students reported that the multicultural environment was one of the most memorable aspects of the workshop. The daily negotiations of language, humor, customs, and expectations turned the construction site into a microcosm of intercultural interaction – one that mirrors the complexity of contemporary architectural practice in Europe and beyond.

5.4. Recommendations for future practice

The workshops proved to be a valuable educational experience, and we believe this model could be successfully developed further. Suggested improvements include:

- opening the workshops to a wider group of students, for example through cross-faculty recruitment,
- introducing new themes, such as stone masonry, window restoration, or lime plastering,
- involving local communities more directly, including craftspeople, residents, and cultural institutions,
- sharing the results of the workshops, for example through open-access reports, photo documentation, or short instructional videos.

To make these workshops a regular part of architectural education, they could be formally included in study programs. This might take the form of:

- elective courses with ECTS credits based on participation,
- certificates or digital badges confirming the acquisition of specific skills,

- interdisciplinary courses offered jointly with other departments,
- final-year projects connected to the topics explored in the workshops.

Such integration would give the workshops more academic weight and make it easier to secure support and funding.

It’s worth noting that the workshops involved a relatively small and self-selected group of students. This means the results may not fully reflect a wider student population. Still, the outcomes suggest that combining theory with physical work brings clear benefits. Students developed confidence with tools and materials, but also improved their teamwork and cultural awareness – things often harder to teach in traditional settings.

In the future, similar projects could cover other heritage crafts or work more closely with communities. It would also be interesting to follow up with participants and see how this experience influences their choices in internships or professional paths.

6. Conclusions

This study has demonstrated that experiential, site-based workshops focused on traditional building techniques can serve as highly effective educational tools in architectural training. The workshops conducted in Seifhennersdorf in 2022 and 2024 achieved multiple interconnected goals: they strengthened students’ technical and manual skills, fostered teamwork and intercultural cooperation, and deepened awareness of heritage values and ecological principles.

By immersing students in the full process of heritage construction – from analysis and design to hands-on execution – these workshops created a learning environment that combined physical experience with intellectual reflection. The integration of cultural context, historical typologies, and manual techniques offered students a holistic perspective on architecture as both a technical discipline and a cultural practice.

The practical implications of these findings are twofold and highly relevant for both education and conservation practice. First, in the context of architectural education, such workshops provide a compelling alternative or supplement to studio-based learning. They equip students with real-world competencies: not only in handling materials and tools, but also in navigating group dynamics, intercultural exchange, and the unpredictability of construction conditions. Second, from a conservation perspective, engaging future architects in heritage practices at an early stage fosters greater appreciation for vernacular techniques and the ethics of preservation, potentially shaping their future career paths and priorities.

However, one of the main challenges in developing this model further is the lack of funding. A possible solution is to offer such workshops as optional courses for students who are interested. This way, universities could use their resources more effectively while still giving more students the chance to take part in hands-on heritage education.

The workshop model presented here is both replicable and adaptable. It can be successfully implemented in various educational settings – including architecture, civil engineering, cultural heritage studies, and vocational training. The key to its success lies in balancing freedom and structure, integrating theory with action, and grounding learning in local cultural and material contexts.

To realize its full potential, we recommend continued institutional support, strategic partnerships with heritage organizations, and the development of long-term frameworks for workshop-based learning. With such support, field-based heritage education can evolve into a standard, impactful component of sustainable architectural education across Europe and beyond.

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