The integration of real-life scenarios in architectural technology pedagogy.

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BUILDINGS FIT FOR CLIMATE CHANGE

ICAT 2025
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TAHAR KOUIDER
ANTONIO GALIANO GARRIGÓS

CONFERENCE PROCEEDINGS
11th International Congress on Architectural Technology
15-17 May 2025 University of Alicante - SPAIN

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THE INTEGRATION OF REAL-LIFE SCENARIOS IN ARCHITECTURAL TECHNOLOGY PEDAGOGY

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Abstract. This paper explores the impact of integrating real-world experiences, such as publishing work for exhibition, into the pedagogical framework of architectural technology education. By engaging students in projects that require them to publish and present their work publicly, the learning process extends beyond traditional academic exercises to include practical skills in communication, collaboration, and critical thinking. This approach fosters the development of metaskills such as problem-solving, creativity, and adaptability, which are essential for professional success in the rapidly evolving field of architectural technology. The study focuses on how these experiences can enhance student learning by combining technical knowledge with a deeper understanding of historical context, building conservation, and digital and artistic applications in architecture. By researching the history of a neighbourhood or area, students gain insights into the cultural and architectural significance of spaces. This blend of historical and technological perspectives enriches their education, encouraging a holistic understanding of the built environment.
Moreover, public exhibition of student work promotes confidence, accountability, and professionalism, as students engage with both academic and non-academic audiences. The findings of this paper suggest that the incorporation of such experiences not only enhances pedagogical outcomes but also prepares students for the challenges of the construction industry, while equipping them with the skills necessary to lead in areas like building conservation and the application of digital skills in architectural technology.

Keywords: Exhibition; Building Conservation; Exhibition; Metas kills.

1. Introduction

The purpose of vocational learning in courses such as Architectural Technology is to embed real scenarios and experiences into the learning. This could be through collaborative teamworking, independent study and leadership, but it is difficult to teach in vocational learning the need to socially engage with external stakeholders and the public. The project-orientated, ‘constructivist’ (Lea, 2015) approach has many benefits however. Currently, it is the quintessential ‘project based’ contextual learner as advocated by Vygotsky (Lea, 2015) and the innovative teaching methods in design education, such as Kolb's (1984) experiential learning theory or Schön’s (1983) reflective practitioner model, which align well with project-based and constructivist learning (Lea, 2015). The intent of this activity in pedagogic terms was to develop metaskills, through leadership and independent learning but also to develop a better link and understanding of built heritage and place through this independence. Therefore, the intent of this study was to illustrate the potential and interest of a key area of Aberdeen with the students leading an exhibition of the main street in Aberdeen, Union Street. Through this it was emphasized that the

students would lead the exhibition, the content and the display of the materials produced.

To define what an Architectural Technologist is, Wienand (2013), Emmett (2009) and Silver & MacLean (2013) all note that Architectural Technology encompasses all aspects of technology. Wienand (2013) also adds that the discipline of Architectural Technology overlaps with many other disciplines and the opportunity is there to 'borrow' theoretical models of teaching. Wienand adds that it is important to establish Architectural Technology as a design profession with technical expertise. This is something that is not necessarily backed by Barrett (2011), who favours more focus of the technological background, rather than design focus, of the Architectural Technologist but even here, Barrett emphasises the need to deliver the design rather than the building. Emmett (2009) somewhat straddles both to say that technical design should be considered equally with the conceptual design phase – and it is this phase where an Architectural Technologist can deliver. There is merit in each of these views, but fundamentally you cannot deliver a design without fundamentally understanding the material and structural detail that is required behind it. This idea has driven changes to studio pedagogy – and was the foundation in creating a project-driven course. It is with this technological focus that places the students methodologically best placed to tackle complex problems such as sustainability within project-based scenarios. This emphasis on technology and how it should be taught, however, lends itself to other skills – which is what this paper will discuss.

2. Methodology

The methodological approach was for the students to independently lead the development of the project brief and method themselves, in developing a public exhibition. A methodological approach where stakeholders develop the brief and method themselves **(Participatory Action Research (PAR)).** In PAR, participants actively collaborate to identify problems, define objectives, and develop strategies to address challenges. The researcher primarily observes, facilitates, and supports the process rather than imposing external frameworks.

This approach is particularly valuable in contexts requiring empowerment and co-creation, as it fosters stakeholder ownership and contextual relevance. PAR is iterative, allowing stakeholders to reflect, adapt methods, and overcome challenges collaboratively as they arise.

Participatory Action Research (PAR) has been effectively utilized in research for several decades (Chevalier, 2019), with examples demonstrating its capability to engage stakeholders collaboratively in addressing complex challenges. It has been successfully used in the context of buildings and mental health and within schools, for example, so it is relevant around the context of construction and pedagogy (albeit not directly).

The paper illustrates the potential to the adoption of PAR's in pedagogy in fostering stakeholder-led problem-solving, critical for addressing complex challenges like built heritage and design related issues. Built heritage and its study on historic buildings has a somewhat dominant bourgeois-led view (arguably) to its study which is difficult to inspire through pedagogy with a different societal point of view and interest (from the tutor). The adoption of PAR as a pedagogy counters this

and represents a ‘counterhegemonic approach’ to knowledge production (Kindon, Pain & Kesby, 2007).

3. Setting the scene

The participants were outlined a task to produce an exhibition by the Academic Stakeholder – who operated as co-ordinator and facilitator but did not ‘teach’. The exhibition entailed producing visual imagery of the built heritage (in this case Union Street, Aberdeen – examples in figure 1 following). The project had a public stakeholder (client: The City Council, Our Union Street, JM Architects) and was co-ordinated through independent and private stakeholder design practice, Makmono. The framework for the task was set, (e.g. when meetings take place, frequency, feedback to client, etc) and team meetings to set the exhibition requirements were set from the beginning – all actionable by the students (participants).

The majority of the students were familiar with Aberdeen, but few actively engage with its architecture by looking up and appreciating the intent or design of its buildings. To address this gap, the participants were introduced to the exhibition project with clearly defined boundaries and expectations and tasked with a review of the heritage of Union St. They were tasked with reporting progress regularly to private and academic stakeholders, emphasizing a professional process. Importantly, the project was designed to be student-led and not assessed, with the exhibition scheduled for after their semester’s formal evaluations. Of the 12 students involved, half were consistent in participating in group meetings and providing feedback.

The methodology centred on Participatory Action Research (PAR), ensuring the academic stakeholders facilitated student requests rather than directing the project. Consequently, critical sessions, resourcing, and overall direction were largely dictated by the participants themselves. Recording the progress and response by academic stakeholders was observational and transactional when appropriate, with meetings involving stakeholders even when not mandatory.

A dedicated digital office was set up using Microsoft Teams to streamline communication and collaboration organised by the participants but administrated by the academic stakeholder. This platform supported file sharing, discussions, and project updates, creating an accessible and organized workspace. The exhibition setup was carried out collaboratively by the participants and Makmono, with academic stakeholders playing an advisory role. The partnership with Makmono included discussions to align feedback and feedforward, ensuring the process remained a true reflection of student initiative and creative direction. This approach empowered students to take ownership while fostering a supportive framework for learning and collaboration.

When the participants strayed from this approach, which given the various available file sharing techniques now ubiquitous in learning and collaboration, it did become difficult to maintain an observational status towards the date of the Exhibition. By then, most of the relevant data was collated, however.

The exhibition took place in a public exhibition space (city centre shopping centre) before being exhibited publically at Union Terrace Gardens. Estimated footfall has been estimated around 3,000 people but likely to be higher. The exhibition was widely publicised – publication itself was a participant led activity.

4. Context to Aberdeen and Built Heritage

Aberdeen, commonly referred to as the "Granite City," represents a significant case study in the architectural and cultural history of Scotland. Its built heritage reflects the city's historical evolution as a centre of commerce, education, and industry. The enduring architectural legacy of Aberdeen underscores the importance of materiality, regional traditions, and the intersection of historical and contemporary influences in shaping urban identity.

The prominence of locally quarried granite in Aberdeen's architecture is central to its current distinctive character. Before this the city followed (materially) much the same trajectory of all the medieval cities in Scotland. The pervasive use of granite exemplifies the role of local materials in constructing regional identities and gives the city it's unique vernacular moniker and style – similar to the vernacular development of many masonry cities in the Scotland (Edge and Pearson, 2001) (Brunskill noting this in much of his writing). The silvery-grey hue and remarkable durability of Aberdeen's granite lend an aesthetic and functional quality to many of the city's iconic structures. Notable examples include Marischal College, Union Terrace Gardens, and the granite terraces of Rosemount, which collectively highlight the technical skill of 19th-century stonemasons and the city's historical prominence as a centre for granite craftsmanship. The intricate carvings and structural ingenuity evident in these buildings underscore the interplay between material resources and architectural expression. The architectural critic Jonathan Meades reflected this and indeed noted the exemplary style of the city in relation to its economic successes.

The medieval and early modern architectural heritage of Aberdeen further enriches its cultural landscape. The city's historic core, encompassing sites such as the Mercat Cross and St. Nicholas Kirk, reflects the enduring influence of Scotland's burghal traditions. Brogden (2016) is particularly pertinent here, emphasizing the role of such landmarks in fostering communal identity and historical continuity. The industrial era catalysed significant changes to Aberdeen's urban form, as the expansion of its harbour and the introduction of rail infrastructure redefined the city's spatial organization. This period saw the emergence of new architectural typologies, including Victorian warehouses and tenement housing, which accommodated the demands of a growing population and an evolving economy. These developments align with broader industrial trends across Scotland, wherein architectural design and function converged to address industrial and urban imperatives.

In recent decades, Aberdeen's built heritage has confronted challenges posed by urban redevelopment and economic transitions, particularly the decline of traditional industries and the rise of North Sea oil exploration. Despite these pressures, key areas such as the Castlegate have retained their historical integrity. Brogden (2016) emphasis on community participation in heritage management is especially relevant, as public engagement has played a crucial role in the conservation of landmarks like the Music Hall and Rubislaw Quarry.

Aberdeen's architectural legacy is not static; it continues to evolve. The integration of contemporary architectural interventions, such as the modern extension of the Aberdeen Art Gallery, illustrates the city's ability to harmonize innovative design with its historical fabric. This approach aligns with Brunskill's perspective that the coexistence of vernacular and modern styles enriches the built

environment (Brunskill, 1983). Aberdeen's built heritage is a complex and dynamic tapestry of materials, styles, and histories. It serves as both a repository of historical significance and a platform for architectural innovation, offering valuable insights into the interplay between tradition and modernity in shaping urban identities.

4.1 UNION STREET

Union Street is the "spine" of Aberdeen and is one of Europe's most iconic thoroughfares and a vital component of its built heritage. Conceived in the late 18th century during a period of significant urban expansion and modernisation, Union Street exemplifies the interplay between functionality, aesthetics, and urban planning. Its construction, led by prominent architects such as Archibald Simpson and John Smith, reflected Enlightenment ideals of rationality and order in urban design.

Union Street's architectural character is dominated by the use of locally quarried granite, underscoring the city's identity as the "Granite City." The uniformity and durability of granite imbue Union Street's buildings with a sense of permanence and cohesion. Iconic structures, including the Town and County Bank building and the Music Hall, not only reflect Aberdeen's economic prosperity during the 19th century but also demonstrate the versatility and refinement of granite as a medium.

Brogden (2016) and Smith (1989) amongst many other authors on Aberdeen heritage emphasize the importance of Union Street as both a functional and symbolic axis within the city. Designed to accommodate increased traffic and connect the city centre with its western peripheries, the street served as a critical artery for trade and communication. Its elevated construction, involving extensive engineering feats to span natural valleys, highlights the ambition of Aberdeen's civic leaders during this transformative era.

However, Union Street's heritage faces challenges, including the impact of modern urban pressures and economic shifts. The decline of retail activity and the rise of car dependency have altered its social and functional dynamics. Conservation efforts now focus on balancing the street's historical significance with its adaptation to contemporary urban needs. The stakeholders in this pedagogics activity rarely visited Union Street beyond the need to travel through it as does much of the population of the city with the street seeing declining footfall for decades. Recent interventions, such as the new Market, aim to stall this trend but post-COVID economic decline and shopping trends ensure that much of the city centre and Union Street specifically has very little prominence or protection currently.

The stakeholders were responsible for the entirety of the project, they led team meetings and they co-ordinated the framework for the exhibition – with the aid of Makmono regarding the location, time, audience of the event itself. The stakeholders were 12 in total, but there was a core group of 5-7 that participated in the meetings regularly and pushed for the completion of the project beyond the curriculum timetable. From a methodological point of view, the research was conducted through observation and being involved in the formation of meetings and at the conclusion of the event. The following benefits and challenges were observed:

5. Outcome

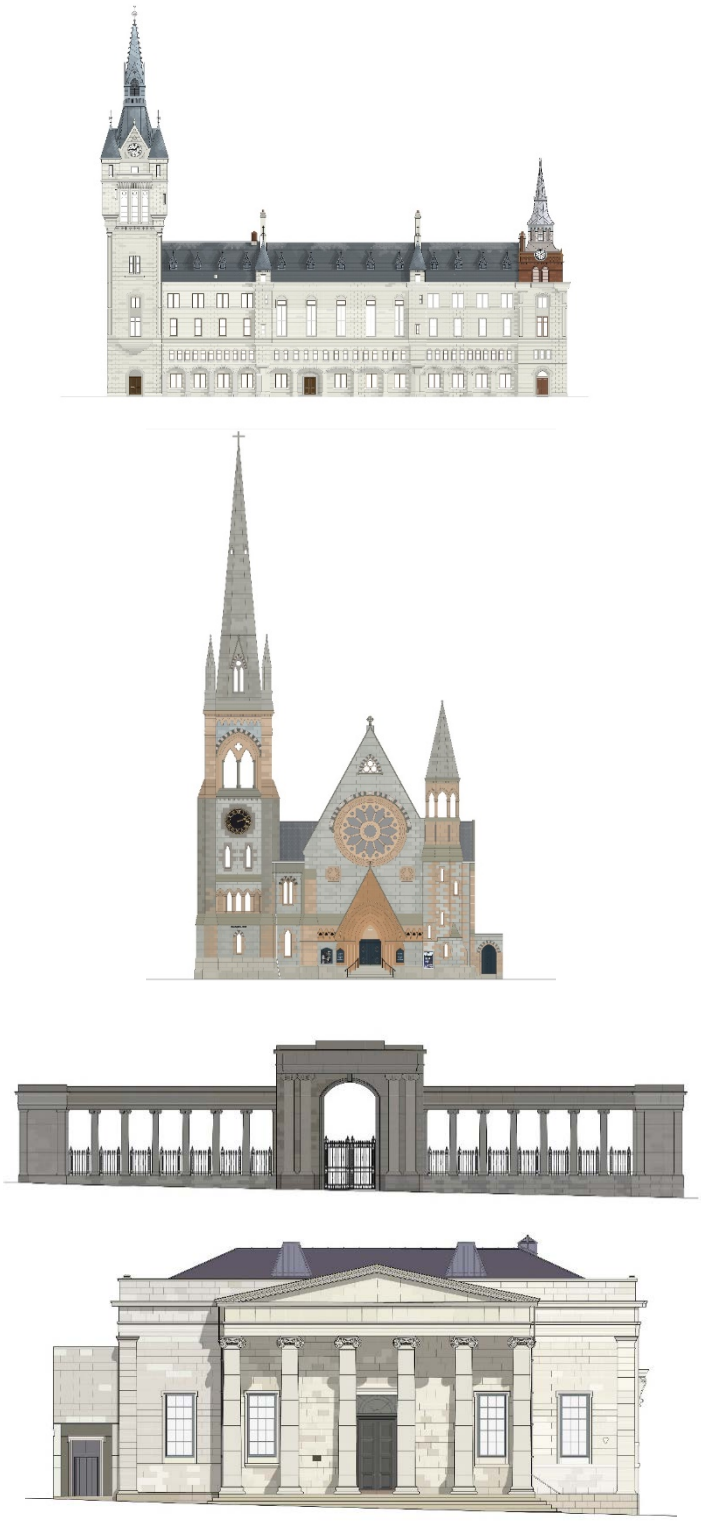

Figure 1: Development of stakeholder Exhibition, from Top to Bottom: Town Hall, Gilcomston Church, Greyfriars Colonnade, Music Hall. All Grade A listed buildings.

5.1 BENEFITS OF PARTICIPATORY ACTION RESEARCH (PAR) IN PEDAGOGY

Enhanced Engagement and Ownership by involving students in co-developing their learning objectives and methods, PAR encourages active participation and ownership of the learning process. This aligns with Vygotsky's constructivist principles, emphasizing learning as a socially mediated activity within a meaningful context (Vygotsky, 1978). In architectural technology, this can lead to students engaging deeply with complex issues like built heritage (which would be otherwise unfashionable) and innovative and creative solutions for sustainability and circular economy integration, particularly around social sustainability.

Contextual and Real-World Problem-Solving in PAR's iterative cycle of action and reflection allows students to address authentic challenges, applying theoretical knowledge to practical situations. This approach nurtures critical thinking and adaptability, essential for professional practice (Kingdon et al., 2007). Moreover, the dynamic interplay of action and reflection fosters the development of metaskills such as self-awareness, resilience, and effective communication (Lea, 2015). By engaging with complex, real-world scenarios, students refine their ability to navigate uncertainty, collaborate with diverse stakeholders, and synthesize interdisciplinary perspectives. These behavioural competencies not only enhance academic performance but also prepare learners to meet the evolving demands of their professional environments and improve employability (Nicol and Pilling, 2000). Indeed, Nicol and Pilling (2000) state that many graduates in the architectural field do not go onto professions directly related to Architecture but these skills make the participants ‘adaptable, flexible and versatile’ and thus more robust to the vagaries of change prevalent in our industry.

Collaboration and Multidisciplinary Learning through stakeholder engagement, PAR exposes students to diverse perspectives and disciplines, fostering collaborative and systems-thinking skills critical in architectural technology and design (Lea, 2015). The participatory nature of this approach emphasizes interdependence, teamwork, encouraging students to navigate group dynamics, resolve conflicts, and build consensus effectively (Rusbult and Van Lange, 2008). By working alongside peers, professionals, and community members, students developed a deeper appreciation for the value of collective intelligence and the interdependence of roles within complex projects. This collaborative process not only enhances their ability to address multifaceted challenges but also equips them with essential interpersonal and leadership skills required in professional practice in an ever changing industry and climate (Antonini, *et al*, 2021).

The process helps students build technical, managerial, and communication skills as they navigate real-world project constraints and stakeholder dynamics, preparing them for industry demands.

5.2 POTENTIAL CHALLENGES OF PARTICIPATORY ACTION RESEARCH (PAR) IN PEDAGOGY

Inevitably there were challenges in the adoption of this approach to learning. Observational points specific to this project were noted. The whole process, in setting out the remit and framework for the exhibition is a time-intensive process. PAR's iterative nature can require significant time for planning, action, and

reflection, potentially conflicting with semester-based academic structures. Additionally, there is a need for a Facilitation as effective PAR requires skilled facilitators to guide the process without dominating, a role that may demand training for educators. This was handled by Makmono, yet similarly the process was new for them. The reiteration of the process (as it is an iterative process) will ensure that these two challenges can be better addressed through a better understanding of the project, scope and framework.

Balancing Academic and Practical Outcomes where students may struggle to align academic requirements with practical project goals, especially when external stakeholders are involved. This was partially predicted, and assessment was removed – however, given the teamwork involved and not all fully participated some students may feel undervalued through the whole process if not assessed. In this instance it proved to be deliverable, but in future it is worth remembering that assessment could also be part of the PAR process itself.

PAR often requires resources like stakeholder access, funding, and technology, which may be limited in educational settings. The resourcing and set-up need to be right for it to operate smoothly, which was not a problem for the students, but it was for Makmono (in the sense of getting their points across coherently in a manner that the stakeholders understood). This was certainly a maturity issues on behalf of the stakeholders involved. Emphasis on resource allocation and appropriate routes of communication needs to be in place before the activity begins.

Collaboration was mentioned as a benefit, and indeed collaboration was mostly positive with a core member of stakeholders present and participating throughout, but this was not without equity. This was also a small cohort, and moving forward with this pedagogic approach the intent would be to have the process and framework in place for a larger group of stakeholders, that are multi-disciplinary and not only Architectural Technology, Architecture and Surveying skills sets, but also the potential for interior design, computational design and/or occupational therapists (to name a few) involved. The issues already highlighted in communication and resourcing therefore, it is hypothesized, make the challenge of adopting a multi-disciplinary approach exponentially more difficult.

5.3 PRIVATE STAKEHOLDER FEEDBACK

This is a reflection on the lessons learned from the "Showcasing: Union Street" project. The project offered a valuable opportunity for students to engage with professional practice while producing an impactful and celebratory exhibition. While the experience was broadly successful and fulfilling for participants, several areas for improvement were identified to enhance future iterations of the project.

A key challenge encountered during the project was the participants unfamiliarity with essential software, particularly Photoshop, and related graphic terminology. Students frequently required additional time to complete their work, often restarting due to technical issues or knowledge gaps. Furthermore, they were unfamiliar with strategies for managing and producing certain file types, necessitating significant time to address these problems. Another common issue was a reliance on guesswork rather than consulting accurate reference materials, leading to inconsistent outputs.

To address these challenges, future modules will embed dedicated software workshops and practical demonstrations to build proficiency in tools such as Photoshop. Incorporating photogrammetry into the curriculum would provide

students with an accurate reference source for their drawings, improving precision and efficiency. Additionally, scheduling regular studio time with external stakeholders would allow students to refine their software skills and receive real-time support, ensuring more consistent and high-quality work. This can be fed back to pedagogic learning across the curriculum.

The project also revealed challenges related to management and structural coherence. Students often used different templates, line weights, and colours, resulting in feedback that frequently focused on achieving uniformity. Moreover, the timeline of the programme extended beyond the semester, causing conflicts in communication and scheduling. Participation levels varied, with some students missing deadlines or submitting incomplete work due to the self-managed nature of the project. Feedback was occasionally misunderstood or ignored, further exacerbating these issues. This was an important lesson for the academic tutors who want to enhance collaboration and co-design philosophies into the course – yet participants at various levels of technological advancement (whatever the technology used is) has hindered the collaborative aspect of this real-scenario project. The scenario is realistic in the sense that in practice different members of a design team may be at various technological levels and unable to collaborate (e.g. BIM orientated projects).

To improve management and structure, future projects should ensure that the production phase occurs entirely within the semester to avoid scheduling conflicts. While the exhibition itself can take place afterward, confining production to the semester would streamline the process. Provisioning dedicated studio blocks, where students can focus on final drawings and receive tutoring, would enhance productivity and ensure consistent outputs. Embedding external or private practice resource throughout the semester would further support participants by teaching skills and helping to manage deliverables effectively. Observationally, participants responded more quickly through the private stakeholder providing skills development than what would happen via academic support.

It was important for the participants to ‘buy into’ the ethos and foster a sense of pride in their work – this can be gained through recognition beyond the university setting. This would also contribute to a broader legacy for the project, reinforcing its impact. The resourcing and financial support can also foster pride and engagement if this was feasible.

In summary, the "Showcasing: Union Street" project was a rewarding endeavour that offered students valuable real-world experience. By addressing the outlined challenges future iterations can further strengthen this initiative, culminating in a exhibition that benefits both students and the wider community.

6. Discussion

Constructivist Benefits in PAR-Driven Pedagogy are evident in this approach for those that were fully engaged in it. Vygotsky's emphasis on the Zone of Proximal Development (ZPD) supports the integration of PAR by highlighting the value of collaboration and scaffolding. Students learn effectively when working on tasks slightly beyond their independent capabilities, aided by peers, tutors, or stakeholders. This collaborative, constructivist approach ensures that learning is both meaningful and directly applicable to real-world challenges.

This integration of constructivist and PAR methodologies provides a robust framework for architectural technology education, equipping students with both conceptual understanding and practical expertise. The outcomes of the *Showcasing: Union Street* project highlighted its overall success in engaging students and producing high-quality work, bolstered by the collaborative and celebratory elements of the exhibition. However, several challenges emerged, suggesting areas for improvement in future iterations of the simulated practice module.

Students faced significant hurdles related to software proficiency and workflow management, including unfamiliarity with visual imagery software, graphic terminology, and strategies for file production. These gaps often resulted in inefficiencies, such as repeated tasks and reliance on guesswork. Proposed changes moving forward include integrate practical software workshops (e.g., Photoshop and photogrammetry) into the curriculum. Schedule studio sessions with technical experts, such as Makmono, for hands-on skill enhancement and troubleshooting.

Inconsistencies in design templates and production standards created additional work, while the project's extended timeline caused communication conflicts and participation issues as noted previously. A self-managed approach to deadlines led to missed submissions and misunderstood feedback.

Proposed Changes to the format are to confine production to the semester to maintain alignment with schedules; conduct exhibitions post-semester if needed. Allocate dedicated studio blocks for production and feedback with continuous support from staff. Explore sponsorship opportunities to fund exhibitions and incentivize participation, emphasizing external visibility for student work. These changes aim to streamline the process, enhance student capabilities, and amplify the project's impact.

7. Conclusion

This study underscores the transformative potential of adopting Participatory Action Research (PAR) in architectural technology education. By integrating constructivist principles and experiential learning methodologies, students engaged with real-world challenges, such as the complexities of Aberdeen's built heritage and Union Street's significance. The iterative and collaborative nature of PAR fostered critical metaskills, including leadership, adaptability, and systems thinking, while promoting stakeholder engagement and contextual understanding. Despite challenges in balancing academic and practical outcomes, the project highlighted the value of empowering students to co-create knowledge and solutions. Moving forward, refining the framework and expanding multidisciplinary involvement will enhance the approach's efficacy and scalability.

Looking ahead, the adoption of Participatory Action Research (PAR) in similar collaborative, multidisciplinary projects hold significant potential. Expanding this approach to include diverse disciplines—such as interior design, computational modelling, and urban planning—can enhance innovation and inclusivity. Structured frameworks, improved resource allocation, and targeted skill development will ensure broader applicability and sustained impact in education and looking beyond built heritage.

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