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Architectural artisanship skills development strategies implemented through architectural design studio projects focused on process

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Abstract

Design education is an integral part of the architectural student's journey. Traditionally, in the undergraduate course, emphasis is placed on the skills development of conceptual sketching, model making, storytelling, and various communications of the concept and design processes. However, these skills are often seen as separate parts and taught as such without always utilising the opportunities to integrate these various aspects and parts into a holistic process. Architectural artisanship is a vital part of design acumen and must be seen as a skill that facilitates the design process rather than a separate entity. For the 2022 Architectural Design III module, Bachelor of Architecture degree third-year of study, at the Tshwane University of Technology, South Africa, the project briefs are conceptualised to emphasise developing the artisanship required for architectural design. This is done through mandatory design process work presentations towards successfully addressing the outcomes of project briefs. Student outputs provide the data analysed to present the findings of this paper. The findings presented indicate a noteworthy improvement in the design process of the students. As a response to various design generators and variables, the architectural process is a nuanced journey with many feedback loops and development stages with multiple design iterations. The final design proposals improved as a result of students' use of process tools such as conceptual drawing, model making, storytelling, and other techniques of communicating the process. This paper presents an outline of these processes and a critical appraisal of what worked more effectively or less effectively. The findings are significant and as such research documented and presented becomes a benchmark for further development of undergraduate design courses for architectural learning sites.

Keywords: Architectural artisanship, design studio, design process, skills development.

Introduction

This paper presents teaching strategies to achieve architectural artisanship skill development in the 2022 Architectural Design III module for the Bachelor of Architecture degree in the third year of study at the Tshwane University of Technology (TUT), South Africa. Data, in the form of a selection of students' submissions for the concept development stage of the projects, is presented, analysed, and discussed as findings.

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What is discussed in this paper is not a new pedagogy but rather a recharter of an old pathway, so that it may be rediscovered and retaught. Since the ascent of computers as a representation tool for the architectural process, teaching has declined of skills such as free-hand drawing, model making, and storytelling (Taraszkiewicz 2021). This paper presents findings on why hand-eye coordination is essential during the conceptual stage of a design process (Ceylan 2020). The paper advocates for a balanced approach between computer-aided and hand drawing, whereby eye-hand coordination drawing and making dominate the design process.

Literature review

Design education is an integral part of the architectural student's journey. Traditionally, in the undergraduate course, emphasis is placed on the development of conceptual sketching, model making, storytelling, and other artisanship skills for communicating the concept and the design process. Architectural artisanship gives rise to design understanding and must be seen as a tool that facilitates the design process rather than a stand-alone proficiency. A student who has developed such skills has a better chance of becoming a design artisan, having mastered techniques for solving architectural problems (Ceylan & Soygenis 2022).

This paper focuses on the concept development stage of the architectural process, which is at the start of the architectural or creative process of a project. The concept development stage of the architectural process is followed by the design development stage and the design resolution stage, as indicated in Figure 1.

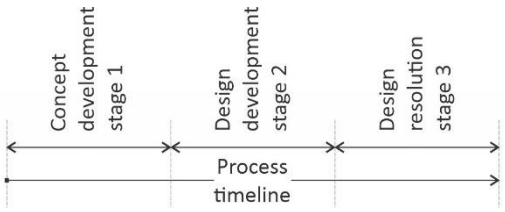

Figure 1: Three stages of the architectural process with a timeline

Figure 2 below shows the following artisanship skills fundamental for students to navigate the architectural design process: conceptual sketching, model making, and storytelling. If these skills are seen and taught as separate modules or units, students often find it difficult to integrate them into a holistic design process.

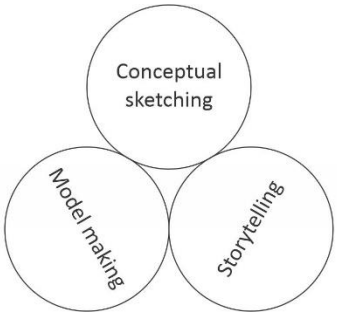

Figure 2: Three artisanship skills: conceptual sketching, model making, and storytelling

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Conceptual sketching

Le Corbusier (Charles-Édouard Jeanneret-Gris 1887 to 1965) famously stated:

> I prefer drawing to talking. Drawing is faster, and leaves less room for lies (Ricci 2023).

Conceptual sketching is the human action of conceiving an idea and formulating it on paper by way of rough free-hand drawing. Such sketching dates back millennia to cave paintings that were used to record and tell stories. Design professionals use conceptual sketching when solving problems and communicating ideas to others. It is the launching point for an iterative design process made easier by the act of roughly and speedily drawing up ideas on paper.

According to Pieters (2023), sketching allows one to communicate or dramatise ideas much faster. Architectural students are taught conceptual sketching in most undergraduate courses in modules such as presentation techniques and design. Sketching is often taught along with model making and storytelling to communicate the architectural design process. This study views conceptual sketching as the principal and antecedent skill in architectural artisanship. Conceptual sketching is a precursor to architectural drawing and architectural draughting, and should not be confused with architectural drawing, as indicated in Figure 3.

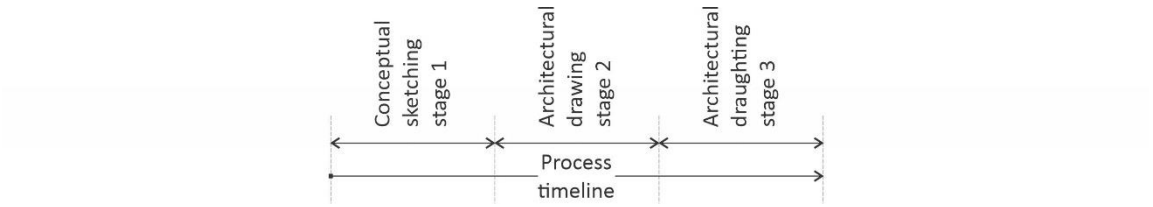

Figure 3: Timeline with three stages of pen and pencil to page, namely sketching, drawing, and draughting

Model making

Model making is the human action of building a smaller-scale, 3D proposal prototype. According to Smith (2007), the architectural scale model is created as a means to design buildings and define built culture. Calvino (1998) argues that a scale model is a mechanism for creating a definition between chaos and design. Thus, the model serves to concretise architectural ideas that would otherwise remain fluid and fragmented in the mind of a designer. A model offers architects an understandable way to develop and define their concepts (Garner 1980).

Model building supports the iterative process (Afify et al. 2021). A process model, known as a maquette, is usually built from cardboard, paper, wood, wire, and various other materials that are quickly assembled by hand using a cutter knife and glue.

Model making plays a crucial role in translating a design idea into something tangible during the design process. For each of the stages shown in Figure 1, there is an appropriate model type, as illustrated in Figure 4 below. Stage 1 is the concept development stage of the architectural process. Models for this stage are most effective if they are quick, rough, handmade, and explorative, as working models that can change and easily evolve. Stage 2 requires design development stage models that are often made to an accurate scale, albeit at a small scale (such as 1:10000 or 1:1000), built more neatly, and especially effective if placed in a similar-scale context model (showing existing project site features such as contours, and existing buildings, among others). In the design resolution stage, Stage 3, a final model or a detailed model is built, this time at a larger scale than Stage 2 models (such as 1:500, 1:100, or even 1:20).

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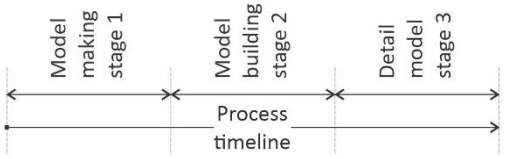

Figure 4: Timeline of the three stages of producing models, namely model making, model building, and detail building

The purpose of an architectural model is to convey, investigate, and represent specific features and aspects of a proposed building design in ways that drawings or even CAD models might not. Its impact lies in the effective, agile, and unlimited exploration of space and form during the early stage of the design process. Models offer a quick and easy potential of communicating an idea through a physical 3D form. Model building allows ideas still forming to reveal themselves for refinement and for further opportunities to be identified, expressed, and developed further through the process of making.

Storytelling

Human beings are storytellers (Boyd 2018), a trait that distinguishes them from other animal species. The earliest known record of storytelling through pictures dates back 44000 years (Aubert et al. 2019) to a cave in Indonesia. In addition to pictures, a story could be told in voice, words, dance, song, video, sketching, animation, writing, painting, drawing, model building, or any other medium.

A story consists of several parts that form a sequence of events. A well-narrated story succeeds in tying the parts together, where one part leads to the next. In any good story, the intrigue, drama, composition, and punchline must be presented confidently, even elegantly (Huang & Grant 2020).

Storytelling applies to the development of a design proposal. A narrative design presentation should unpack the context, objectives, influences, and informants of a project. This exposition can provide a clear understanding of the final resolved design proposal and portray the essence of the design process, communicating both the functional and emotional aspects of the project synchronously.

Iterative process

A design activity is an iterative process with feedback loops and the development of ideas accompanied by refinement. Jonassen (2008) argues that the simultaneous constraint satisfaction and propagation make design an iterative process. Maier and Störrle (2011) present data showing that iteration is the most important characteristic of the design process.

An iterative process “involves repeating a process or set of instructions again and again, each time applying it to the result of the previous stage” (OED 2023). Figure 5 below shows how a design iterative process draws repeatedly on the integration of conceptual sketching, model making, and storytelling. This process consists of proposal presentation, communication, and design review criticism from peers and mentors.

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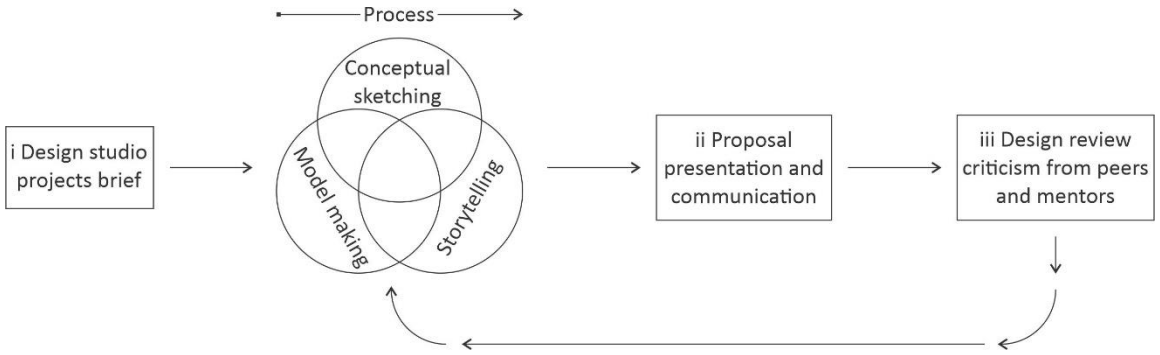

Figure 5: Conceptual sketching, model making, and storytelling integrated within an iterative process

Proposal presentation, communication, and design review

Consistent, constructive criticism from design studio instructors and peers is crucial during the design process to prompt students to refine and develop their design projects. Crucial decisions often result from design studio review discussions. These discussions aim to improve and develop a concept until its fruition as an architectural proposal. During a design process, aspects or issues that need attention often emerge, but students may be too oblivious or complacent to resolve them.

By responding to criticism, students make decisions that may give rise to further iterations of the proposal. Decisions compound or follow one another, and are interrupted by inquiries or criticism of the proposal. Therefore, the ability to effectively present their design process to studio instructors and peers is indispensable for their development and growth.

The students' architectural artisanship must be applied effectively and with agility. They should have the know-how to adjust the speed of design, applying techniques that require minimal effort, as required, to accommodate the changes within a given time constraint of a project. The premise of this paper is that the artisanship of conceptual sketching, model making, and storytelling are three such skills that students can deploy in this instance. These skills are, however, in stark contrast with computer skills that are efficient but lack effectiveness.

Holistic, integrated process

This study addresses a skills development gap resulting when architectural students do not effectively integrate conceptual sketching, model building, and storytelling when designing. One of the contributing factors to the lack of integration is that sometimes, students skip the concept development phase that calls for hand-eye coordination. Instead, they jump straight into computer-aided draughting (CAD). Hands-on learning at the design concept development stage, without or with fewer technology aids, enables a better understanding of key aspects of a visual-spatial project (Chong 2023).

Based on observations in the TUT third-year architecture studio, if students are not encouraged to use conceptual sketching, model building, and storytelling early in the concept development phase of the architectural process, they usually default to relying heavily on CAD. This restricts design exploration, resulting in a lack of and/or poor iteration of proposed solutions. CAD requires time-consuming precision when inputting drawing perimeters, yet it usually yields poorly resolved design solutions.

Layering, through the iterative process, is necessary to deepen and enrich architectural design proposals. Conceptual sketching, model building, and storytelling (with limited computer use during

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various parts of the design process) often lead to more refined and considered design solutions. These skills can be used interchangeably to express developing design ideas when required.

Complexity of design

Architectural design is a complex and multilayered problem-solving process (Silber 2007). Frampton (1995) argues that there are three sources of legitimacy in architecture: *tecton* (the art and science of construction and, according to Porter (2004), the artistic expression of construction); *typos* (referring to type); and *topos* (referring to site). Van Tonder (2022) argues that these three may be further broken down into six sources, namely visual tectonics, technology tectonics, natural typology, cultural typology, and the type of building falling within a linear or a circular economy production and use.

An architectural design process should also consider emerging variables that mitigate climate emergencies, such as climate resilience adaptation, redress of imperialism, system interception, fairness, and regenerative potential. In addition to project briefs, these variables act as design generators, which in turn call for a building programme. Students are expected to process and design for several different considerations and find a balance towards an appropriate proposal. This task is daunting and overwhelming, often resulting in 'designer's block'.

Pieters (2018a; 2018b) outlines the following six steps (Figure 6) to 'get rid of designer's block' in the course of preparing architectural design solutions: 1) define the problem; 2) gather the information; 3) analyse the problem and the information and brainstorm the case; 4) develop solutions; 5) gather criticism and self-evaluate; and 6) improve. These steps are components of an architectural design iteration. This creative process is facilitated by the artistry of conceptual sketching and architectural drawings and these six steps could be considered a guideline for the architectural process (van Tonder & Stander 2022).

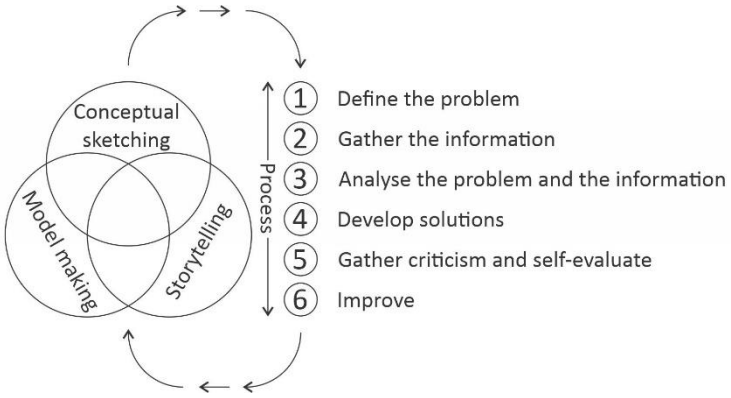

Figure 6: The six-step iterative process

Hand-eye coordination uses free-hand drawing, which is important to unlock creativity and the potential of design thinking. Free-hand drawing, making with hands, and creating a design narrative is discussed in seminal literature by Edwards (1989) and Pallasmaa (2009). Drawing by hand is a pertinent discussion in an age where design professionals increasingly use computer assistance to draw.

Methodology

Skills development strategies in an architectural design studio

The TUT third-year architectural design studio projects used for this study were composed to foster and develop the fundamental skills architects require to perfect their craft. This was achieved by introducing intermediate studio one-to-one presentations (known as 'crits') of the students' design process work. In addition to providing student-based feedback, studio instructors clarified project briefs and deliverables during these crits. The observations and findings of the study may be useful to studio instructors when developing curricula and pedagogies.

Data collection from architectural design studio projects

Some theories highlighted in the literature review section, such as hand-eye coordination, were tested in the design studio through teaching practice. Qualitative improvements were observed in the design products of the students who applied process tools (conceptual sketching, model making, and storytelling). The architectural process in response to various design generators and variables is a nuanced journey with many feedback loops and development phases with multiple design iterations.

An assessment rubric that indicated a breakdown of each process tool was used to allocate marks during the interim crits. No marks were allocated during the concept development stage crits for computer-aided drawings; with the exception of using quick rescaling or collages on Microsoft PowerPoint, or technology-aided presentation techniques such as physical model photographs layered with free-hand concept sketching in Photoshop, among other uses.

Findings and discussion

Case Study 1

Case Study 1 presents observations gathered from a selected student's portfolio submitted for the in-studio sketching exercise. The exercise took place after a tour of the physical project site by all the third-year architecture students.

The following observations were made from work submitted for the **in-studio sketching exercise, as shown in Figures 7(a) to 7(h):**

a) Use of free-hand drawings allowed the student to quickly put down their initial idea relating to the arrangement of space on the project site in relation to the proposed circulation.
b) Free-hand drawings of proposed building sections were effective when resolving spatial layouts, forms, and building programmes.
c) Following the documentation of the site, the design generators and end-user needs were identified, resulting in the first and early building design forms. Free-hand drawings in the form of rough plans and sectional drawings were used to explore building envelope shading devices and overhead planes.
d) Section drawings were used to explore possible relationships or links between the proposed building and a water body (indicated in blue) from various positions on the project site.
e) When analysing a site, documenting and communicating findings using only one graphical representation medium is often difficult. Typically, plans, sections, and perspective drawings depict various aspects of a building or site. This student managed to communicate the context of the project site, representing a sense of the topographical qualities of the site. This communication was achieved through a hand-drawn section drawing incorporating a photograph of the portion of the site where the section line is positioned.

f) Hand-drawn perspective drawings allowed this student to visually express the characteristics of particular parts of the site deemed important for someone viewing the work to notice and understand. Hand-drawn analytical diagrams complemented the images and drawings shown. Images incorporating computer-assisted graphics and hand drawings successfully and documented on the site, whereby photographs were used to give a realistic rendering of the atmosphere of the place.
g) Students were tasked with documenting their site and journey to the site through small drawings. This work shows how the task encouraged students to be reflective and focus on developing a site inventory of elements, issues, and opportunities identified as key to addressing and resolving design problems.
h) The student used the drawings shown here as a reminder about the core design focus of the project. This helped the student frame a design intent through influences seen and experienced during the project site visit and site walk. This free-hand drawing allowed the student to document and express aspects relating to scale, spatial use, and the site vegetation and topography.

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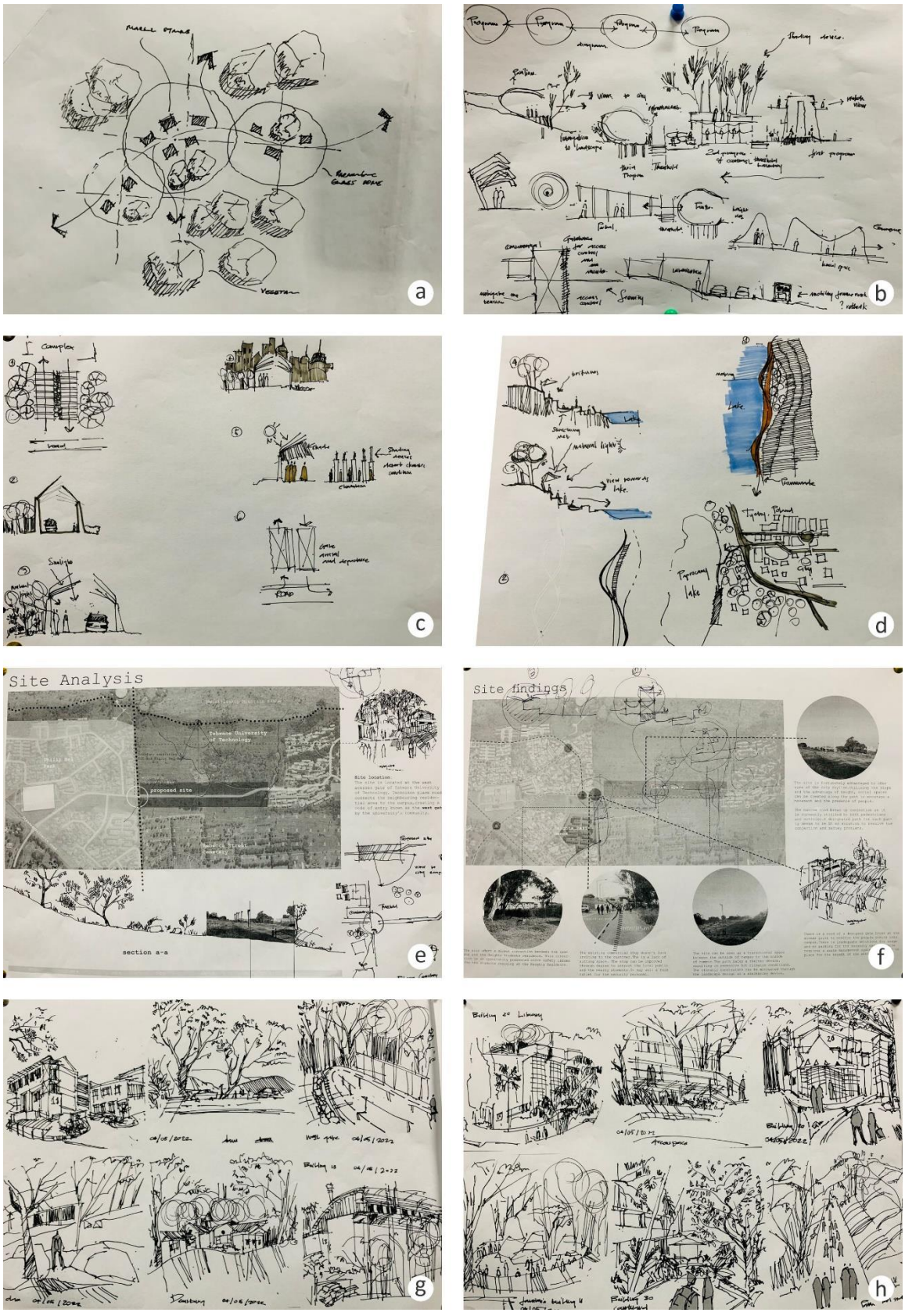

Figure 7: Case Study 1 shows conceptual sketching as the dominant artisanship utilised for the architectural process

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Case Study 2

Case Study 2 presents examples of third-year students' model building for the concept development stage and model use in proposal presentation.

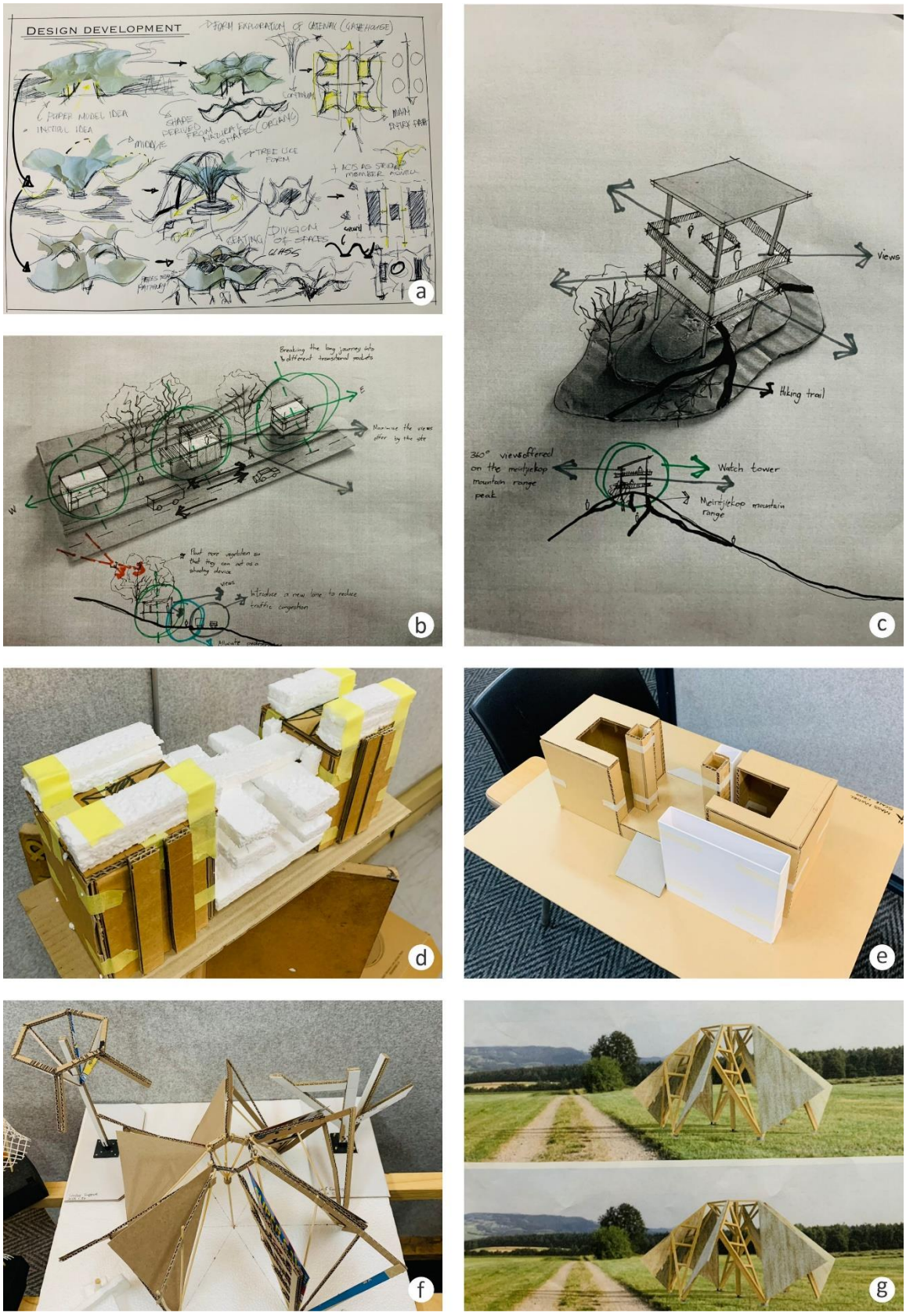

Figure 8: Case Study 2 model making and model use in proposal presentation

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The following observations were made from work submitted for the model-building exercise, as shown in Figure 8 ((a) to (g)):

a) This student used a paper collage to express the organic and curvilinear form of a developing design idea. A conceptual model was then photographed, using the photographs as the base for further design iterations through free-hand drawings of sectional and planal building explorations.
b) This student struggled to use free-hand drawings and, therefore, opted to make a model to probe the building form and another model for interior spaces. Following this, the two models were photographed, and the initial site programme and planning were formulated by overlaying free-hand drawings on the photographs.
c) Other versions of the sectional and 3D design ideas shown in Figure 8(b) were explored. The student made a larger model, responding to the previous two site-development models. This was done to provide more design details and refine the developing building proposal.
d) This design project entailed repurposing and making additions to existing high-rise buildings on the project site. The student used reclaimed cardboard and polystyrene, assembled with masking tape. This was a simple and effective time-saving form of expressing an early design response through 'massing' (sizing, shaping, forming, and relating a proposed building to an existing context).
e) As the design developed (Figure 8(d)), the 'massing' of the building was refined and proposed new additions were indicated in white and existing buildings in brown.
f) This shows a sample of handmade physical models of resolved design proposals required for this project stage, along with details of specific parts of the students' models. The students were asked to do so at a larger scale with the aim of showing refined designs.
g) No CAD renderings were allowed for this stage of the project. Students superimposed their design interventions onto photographs that they had taken of the project site. As shown in this sample, this enabled students to quickly test the success or shortcomings of their design proposals on the project site.

Case Study 3

Case Study 3 presents examples of the students' storytelling. In this paper, the term 'storytelling' refers to effectively communicating the design process towards the final building proposal using graphical representations.

The following observations were made when analysing the submitted storytelling projects in Figure 9:

a) Without an oral presentation, the student used illustrative free-hand drawings to communicate a design approach used to resolve circulation spaces in relation to the various spaces in the building. The perspective drawing shows that the building's entrance and vertical circulation core were related to the façade.
b) The student's use of greenery in the building can be seen in the section and perspective drawings; here, circulation spaces were also considered. Spatial planning, scale, form, shading, vegetation, and circulation were evidently explored through section and perspective drawings.
c) The student explored new additions to an existing high-rise building: the programme of the building was explored using section drawings, as was the relationship between reprogrammed existing spaces and new spaces or circulation on various floor levels, and perspective drawings of selected parts of the building.
d) Here, the student printed images of the existing high-rise buildings and overlaid tracing paper onto the printed images to sketch and superimpose initial design ideas.
e) This student managed to express the intended spatial atmosphere created by the place-making features of the proposed building. This was done by sketching the proposed landscape design,

vegetation, activities, and people to illustrate how the buildings and spaces are intended to be used.

f) In this submission, the student used a photograph of a physical model of the existing building to explore the idea of stacking form when massing the proposed building. This was in the inception stage of the design process. The submitted poster was carefully designed to visually narrate the design idea as a method of storytelling.

g) The student superimposed a CAD 3D view of a design intervention onto a photo of the existing building on the project site. This gives a viewer a sense of how the building is situated within its context, its scaling and proportionality, how it interacts with the street, and the atmosphere created by used building materials.

h) This student's design proposal used additive and subtractive forms. The student was able to construct a photomontage using images of the existing building and computer-aided images of the proposed building. This mixed-media approach to represent an architectural design was done to highlight repurposed parts of the existing building in contrast to those left untouched. This gave a sense of material use and contrast, as well as the scale and proportions of the building forms.

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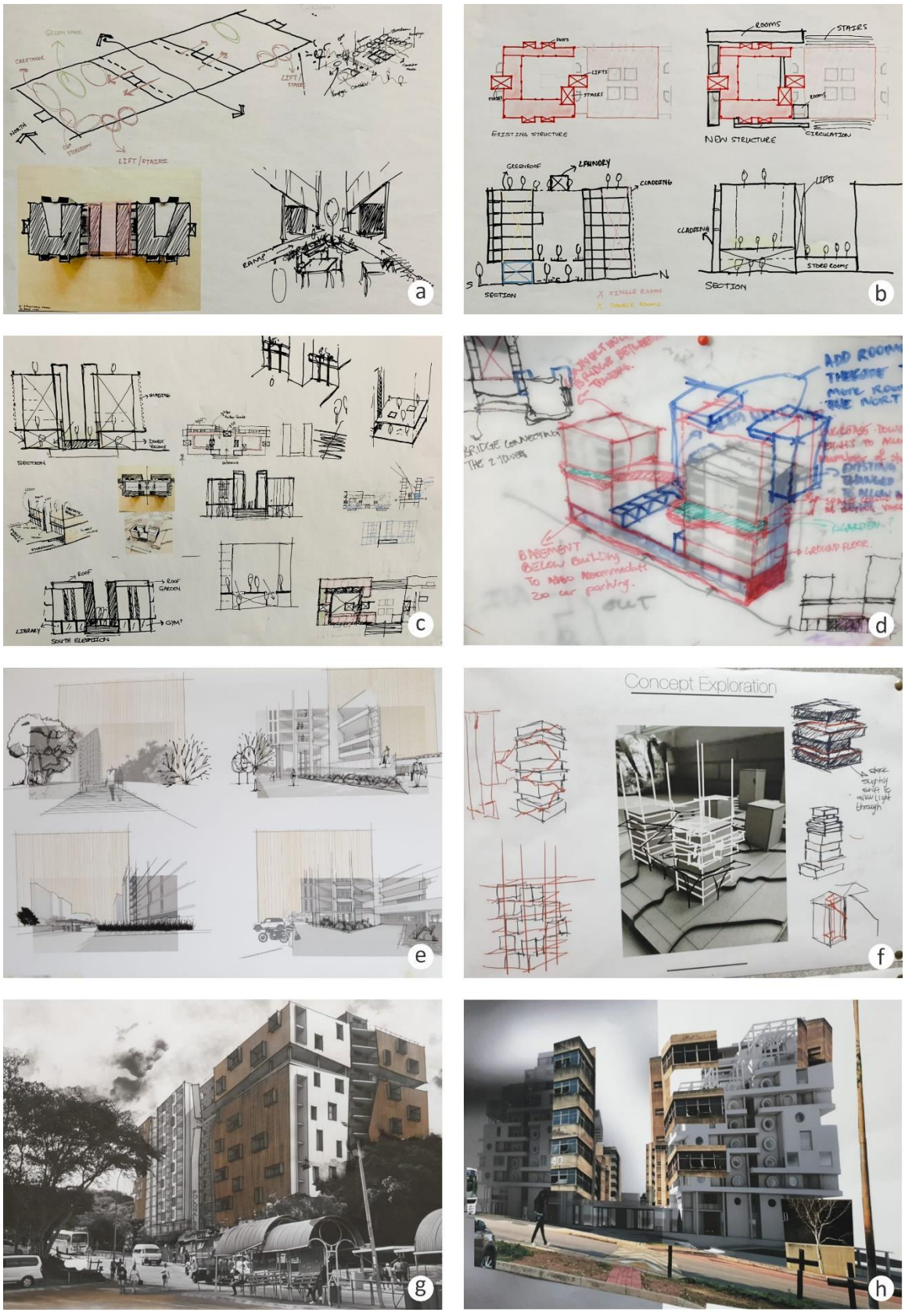

Figure 9: Case Study 3 storytelling and communication of the process towards the final proposal

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Summary of findings

The students' outputs provide the data analysed to present the findings of this paper. The findings as per Case Study 1 (conceptual sketching), Case Study 2 (model building), and Case Study 3 (storytelling), indicate a noteworthy improvement in the design process of the students. As a response to various design generators and variables, the architectural process is a nuanced journey with many feedback loops and developmental stages facilitated through multiple design iterations. The case studies affirm that a student's use of process tools such as conceptual sketching, model making, and storytelling to communicate and receive feedback for design activities resulted in a better final architectural proposal.

Comparison of artisanship of conceptual sketching, model building, and storytelling to the exclusive use of computers

CAD can be a highly efficient tool for productivity but has limitations in the architectural design process. With CAD, many drawings may be produced. However, the design quality of the work may be poor due to a lack of eye-hand coordination iterations, poor design development, and ineffective communication of certain aspects of the design process.

Free-hand drawing is often a more efficient technique that can be used for expressing design poetics and capturing the atmospheric qualities of 'place' as opposed to photographs or CAD images, especially when documenting a site. Hand-eye coordination also uncovers aspects that technology-assisted techniques may overlook as each drawn line begins to relate to the next.

Recommendations

The authors of this paper recommend the inclined use of computers throughout the architectural design process. Firstly, computers assist in information gathering and tasks that save time. Secondly, they can accurately produce 2D and 3D CAD design drawings once the concept is developed to a saturation point. The artisanship of conceptual sketching, model building, and storytelling applied during the iterative process of project development should also be used after the design is finalised, in the detailing and documentation work stage, which relies heavily on the use of CAD.

As shown in Figure 10 below for clarification, the authors do not recommend eliminating CAD and other technology tools in the building design and development process. Students use their smartphones to take site photographs, access information online (Google Earth or Google Maps), or listen to music while they sketch. Microsoft programmes such as PowerPoint can swiftly resize a photo or sketch or superimpose one medium over the other. A smartphone can be used to produce a fly-through or flyover video of a physical model during the early conceptual development stages.

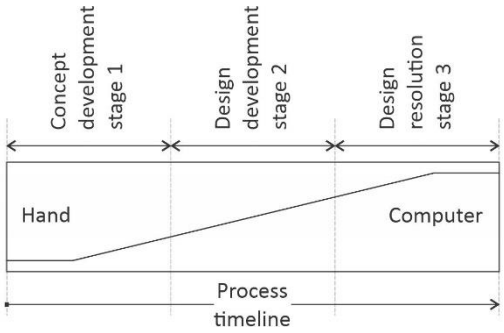

Figure 10: A balanced approach between the computer and the hand during the process timeline of the design studio project

Conclusion

This paper presents an outline of design processes followed by the architecture students and a critical appraisal of what worked more effectively or less effectively. The findings are significant, as the research documented and presented becomes a benchmark for further development of undergraduate design courses for architectural learning sites. Therefore, the paper may contribute to similar existing research by increasing understanding and advancing studio-based teaching methods.

The study also raises pedagogical questions that require further research. For example, a method of measuring the effectiveness of the presented teaching technique requires further research. This future research may comprise establishing key qualitative indicators for judging the success or failure of student design outputs for validating the presented artisanship skills.

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