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An Investigation into the Use of an Atomistic, Hermeneutic, Holistic Approach in Education Relating to the Architectural Design Process

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Abstract**—**Within architectural education, students arrive fore-armed with; their life-experience; knowledge gained from subject-based learning; their brains and more specifically their imaginations. The learning-by-doing that they embark on in studio-based/project-based learning calls for supervision that allows the student to proactively undertake research and experimentation with design solution possibilities. The degree to which this supervision includes direction is subject to debate and differing opinion. It can be argued that if the student is to learn-by-doing, then design decision making within the design process needs to be instigated and owned by the student so that they have the ability to personally reflect on and evaluate those decisions. Within this premise lies the problem that the student's endeavours can become unstructured and unfocused as they work their way into a new and complex activity. A resultant weakness can be that the design activity is compartmented and not holistic or comprehensive, and therefore, the student's reflections are consequently impoverished in terms of providing a positive, informative feedback loop. The construct proffered in this paper is that a supportive 'armature' or 'Heuristic-Framework' can be developed that facilitates a holistic approach and reflective learning. The normal explorations of architectural design comprise: Analysing the site and context, reviewing building precedents, assimilating the briefing information. However, the student can still be compromised by 'not knowing what they need to know'. The long-serving triad 'Firmness, Commodity and Delight' provides a broad-brush framework of considerations to explore and integrate into good design. If this were further atomised in subdivision formed from the disparate aspects of architectural design that need to be considered within the design process, then the student could sieve through the facts more methodically and reflectively in terms of considering their interrelationship conflict and alliances. The words facts and sieve hold the acronym of the aspects that form the Heuristic-Framework: Function, Aesthetics, Context, Tectonics, Spatial, Servicing, Infrastructure, Environmental, Value and Ecological issues. The Heuristic could be used as a Hermeneutic Model with each aspect of design being focused on and considered in abstraction and then considered in its relation to other aspect and the design proposal as a whole. Importantly, the heuristic could be used as a method for gathering information and enhancing the design brief. The more poetic, mysterious, intuitive, unconscious processes should still be able to occur for the student. The Heuristic-Framework should not be seen as comprehensive prescriptive formulaic or inhibiting to the wide exploration of possibilities and solutions within the architectural design process.

Keywords**—**Atomistic, hermeneutic, holistic, approach architectural design studio education.

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I. Introduction / Aims

THIS paper is concerned with First Year Undergraduate Studio-Based Teaching of Architectural Design. Factors intrinsic to Studio-based Learning need to be identified and understood in terms of their impact on the efficacy of the teaching and learning process.

The term Architectural design is intended to cover both undergraduate study in Architecture and undergraduate study in Architectural Technology. Both these undergraduate degrees programs incorporate studio based learning as a central plank to their pedagogy. The process comprises, in the main, students "learning-by-doing" facilitated by a studio tutor's support giving formative feedback on the student's progress

The aim of this paper is to explore issues associated with the Design Studio teaching/learning process and to proffer a 'Heuristic model' that could allow this process to be student-centred whilst providing a clear structure to the student's reflective activity and the tutor's interventions

The intention is to gain feedback from peers on the suggested heuristic model and then to trail the use of this Heuristic model firstly with First Year (Level 4) Architectural Technology Degree students and secondly with level 4 Architecture Degree students to evaluate and assess the efficacy of its use within the teaching and learning process.

Within this paper, key precepts are discussed in terms of their being primary issues that occur in Level 4 teaching and learning. These issues are based on the author's 20 year experience within Studio Based teaching at Sheffield Hallam University (England), and on research undertaken into the nature of the student's experience and learning within Design Studio. These issues are grouped under the heading "Issues Associated with Design Studio Processes" and their implications are communicated as the "summary of Issues Associated with Design Studio Processes"

Borne out of reflections on experiential knowledge and research into the theory bases (discussed as 'issues') a "heuristic model" is formulated for discussion and for trial as a tool for use within Level 4 studio based teaching. The suggested "Atomistic, Hermeneutic, Holistic Approach" is a transmogrification if Vitruvius' Triad 'firmness commodity and delight' into a wider set of 'design domains' that could structure the student's research, explorations, experimentations and design-thinking whereby their 'learning by doing' would incorporate metacognition. The heuristic model could lead a student towards testing an experiment

across a range of design domains and reflecting on the implications on the overall merit/demerit of the experiment. At best, this 'reflection in action' could lead to a future design explorations that were not conceivable before the experiment took place [2].

A primary premise for the development of the heuristic model is that Further Education is primarily 'Transactional' [4], wherein the student should assimilate and synthesise knowledge transferred from the teacher. This being pedagogic in the true sense of the word, whereas Higher Education, (studio based teaching in particular), should be 'Transformational' [4]. That higher order thinking comprising critical thinking and student-led enquiry should form the basis of the student's design experimentations; this being Andragogic learning. If this premise is sound, then the watershed the student will encounter on entering into the higher education system must be ameliorated by explicit support within their learning experience to mitigate against the student's habitual "answer-based" activity falling short of the anticipated "process based activity" in the transition from transactional to transformational teaching

A. Issues Associated with Design Studio Processes

1. Students' Induction into the Design Studio Learning Processes

On application to the undergraduate course, students produce work for scrutiny at an interview which can include art-work or product design work where the student has explored a theme and taken design exploration through to a create a prototype of a utilitarian object such as a portable "paint brush holder" container or a "Parisian design influenced chess-set". The chief assignment aims seem to be combining artistic expression with practical construction-assembly skills. This 'platform' forms a good basis on which to assess the skills, application and potential the student holds; however, the learning process that the students have undergone does not form a robust and comprehensive basis on which to embark on learning Architectural Design skills.

Embarking on their undergraduate studies students are often immersed in and presented with a relatively simple and uncomplicated 'design project' such as a 'cabin' of 'retreat shelter' so that they can enter into this "learning by doing" process

2. From Knowledge Exchange to Experiential Reflective Learning

The 'watershed' that students encounter is that of moving from being strongly directed by a teacher through a prescriptive assignment task of art/craft based activity to a student-centred approach with an assignment that calls for research synthesis and reflective analysis. For example: The design of a "Parisian-style cruet set" does have a set of parameters, opportunities and constraints and objectives such as cultural meaning, practicality, durability and artistic merit but, seemingly, the scope for exploration within these parameters is very broad and the interrogation of these parameters and their successful reconciliation is relatively relaxed. Whereas the design of "a family holiday cabin" has a set of parameters that are essentially more demanding and can leave the students' product design/art approach lacking in terms of developing a robust and comprehensive 'brief' for exploring the design possibilities intrinsic to the cabin, how it functions and why, what it looks like and why, what it is built of and why.

3. Students' Unconscious Incompetence and Tutors' Unconscious Competence

This watershed can present as a 'gulf' between the anticipated learning outcomes of the assignment and the student's established skills-set. This gulf between the student's learning skills and the demands of First Year Design Studio Projects can be further exasperated by the tutors' automated learning or tacit knowledge being hidden from both themselves and (consequently) from the student.

In short, with reference to the "Conscious competence learning Matrix" [5], an unfortunate scenario can develop where the students does not know what they do not know and the tutors do not know what they do know.

At least two unhelpful situations can develop a): The tutors' are not aware of anticipating the students' lack of knowledge and cannot forewarn them of or guide them through the pitfalls that may arise within their experimentations. Or b): the students' fail to recognise the task in terms of its opportunities and or pitfalls

4. Non-Logical Executive Mental Processes versus Technical Rationalism

The phrase 'Technical Rationality' [7] can be defined as: "involving the science based application of solutions from research into generic problems". To add to, (and possible compound), the above issue the architectural design process calls for a wide analysis of interconnecting factors and this analysis does not reside totally in science-based investigation (Technical Rationality), but also resides in mental processes that are derived from and refer to individual human experience of the world as imbued with sociological psychologically and cultural meanings.

Intuitions as to possible design solutions can be borne out of memory, analogy, empathy and imagination, devoid of logical rationalism and sometimes quite unconscious to the designer. The 'environment' for these mercurial mental processes needs to be created within the Design Studio and this is where a guiding framework that could facilitate both logical and intuitive thinking within design experimentation would be of great benefit

5. The Design Process: An Iterative Recursive Model versus a Clinical Linear Model

The exploration of design possibilities can be seen as an investigation into a project when the outcome is not a deductive result of the briefing information. The level of detail of the brief and the range of issues that are explored towards the design solution has a significant impact on the eventual proposal. Discoveries within the research, synthesis and experimentation lead to modifications within aims. A

simplistic model of the design process as postulated as adopted by the (RIBA Plan of Work) comprises a linear, (one-way) developmental progress of 'Strategic Stages' from Preparation of Brief to Concept Design to Developed Design to Technical Design, [6]. However, reflection and analysis at any of the above strategic stages can inform and question assumptions made in any of the earlier stages.

Schön puts forward the hypothesis that the architectural design process is more accurately and appropriately modelled as a conversation between the designer and the experiment, wherein "Reflection-in-Action" [2], an immediate and ongoing process comprising experimentation that can inform one or more of the Strategic Stages. In short, engaged experimentation can inform not only the problem-solving but also problem-setting activity

6. The Hermeneutic Circle of Reflection-In-Action Informing Problem-Setting and Problem-Solving

Originating from the Greek word 'hermeneus' - an interpreter the word has been extended within philosophical use to describe the process of analysis and interpretation, wherein the interpreter cannot be seen as separate from the process. The process is essentially 'transactional', the experiment impact on the experimenter and possible future experiments.

The ability of the designer to recognise design possibilities and to alter the parameters of their enquiry as 'reflections in action' creates the environment where the context and experimentation can modify the initial precepts and original aims within of the design process.

The model is therefore much more fluid and changeable throughout its stages. The exploration of design possibilities then can be seen as an investigation into a project when the outcome is not a deductive result of the briefing information. The level of detail of the brief and the range of issues that are explored towards the design solution has a significant impact on the eventual proposal. Discoveries within the research synthesis and experimentation lead to modifications within aims.

The opportunity for deductive technical rationality to occur in parallel with inductive non-logical intuitive thought processes is created if the experimentation allows for the reflective conversation with experimentations to inform the overall "shape" of the project. Unintended outcomes of experimentation can enlighten the designer in terms of solutions that could not be anticipated at the outset of the design process.

II. Summary of Issues Associated with Design Studio Processes

To summarise then on issues relating to First Year Design Studio teaching and learning:

a) Students are not familiar with student-centred project-driven unstructured processes that require the students to initiate research and analysing reflectively.
b) This lack of experience and skill can occur as an "unknown unknowns" to the student, compounded by the tutors "unknown knowns"
c) The design process involves deductive scientific thinking associated with intuitive reflexive thinking to arrive at viable and elegant solution
d) The design process calls for experimentation by the student and analytical reflection on this experimentation with a conscious understanding of how possibilities informing the direction of on-going design processes

A. An Atomistic, Hermeneutic, Holistic Approach to the Design Process

1. Lost in Transylvania

How can Design Studio be 'delivered' to the student as a student-centred activity that does not 'set the student up to fail'? Certainly 'learning by doing' involves making mistakes and finding the learning within this experience, hopefully, towards a further 'learning by doing' that considered how the mistake could be avoided. But the students have no overall "map" in this process. Without an overview or a "framework" to refer to the risk of being disoriented within the experimentations is great and the tendency for students to hold firm to any seeming solution like a shipwrecked sailor might to flotsam, is significant.

A useful way of facilitating the students' learning would be to provide a comprehensive framework that allowed the student to become aware of where they are in the overall process and to navigate within its 'geography' so that they can evaluate their findings against a more holistic understanding of the overall process.

2. Forms of Experimentation

Experimentation can take three forms essentially: Exploratory, Move Testing and Hypothesis Testing [2]. These can be described in terms of questions that are preceded by the phrases: "What if…", "I wonder if…", and "I think that if…" The first is unstructured blind experimentation the second incorporates thinking that whilst inchoate may hold the seed of design solutions, half recognised and not fully formed – an intuition if you will and the third comprises deductive or inductive thinking holding assumptions that requires testing to become potential robust design solutions

There is no implicit superiority or inferiority in these levels of experimentation. Sometimes viable and elegant solutions can be derived by accident within experimentation but the key element is the designers' ability to recognise these potential solutions as 'Visual Imaginings' [1]. If the student is to learn-by-doing, as a student-led activity there lies within this, the problem that the student's endeavours may become unstructured and unfocused as they work their way into a new and complex activity.

3. Design Domains, Vitruvius' Triad

Architects and Architectural Technologists carry out design thinking in Design Domains within which they are considering aspects of the design within a certain focus, prioritising their thinking within a contained 'field of consideration'. This is a necessary methodology when considering complex issues and

the need to simplify decision-making so that it is achievable is a function of the human cognitive processes.

The Vitruvian triad: "Venustas, Utilitas & Firmitas" forms a foundation for atomising aspects of the architectural design process. The Triad has been reinterpreted in the late 17th century as: 'Delight, Commodity and Firmness'. A more contemporary interpretation of these three Design Domains could be: 'Aesthetics, Function and Construction'. What are the aesthetic aspirations the functional aspirations and the constructional aspirations of the Design Project? Design decisions and explorations can be evaluated in terms of their merits and demerits in respect of one, two or all three of the triad's aspects and alteration to a design in any one aspect can directly alter reflective evaluations of the design in the remaining two aspects.

4. Drilling down into Design Domains

Problem-setting is essential aspect of working towards successful design solutions [2]. The ability to define the design project in terms of problems that require solving is not a defeatist negative activity in this respect; on the contrary, it is a crucial catalyst in the problem solving process. Problem setting is a way of defining the requirements of the project and creating an 'armature' around which design solutions can be formed.

Building on this premise, creating a more refined, detailed and universal design domains that can generally be applied to the architectural design process forms a useful 'template' against which students can frame orientate and frame their experimentations. One useful aspect is that design solutions can be checked against a wide range of design domains and some degree of holistic design can be arrived at. Another useful aspect of having more detailed, specific design domains is that experimentation in one domain can be immediately checked against other in a more structured and explicit (and recordable) program of 'reflection-in-action' [2], throughout the design process.

5. FACTS-SIEVE a Heuristic for Problem-Setting, Experimentation and Holistic Design

To help student "sieve through the facts" of a design project, 10 Design Domains can be created. 'Facts-Sieve' is an acronym of: Function; Aesthetics; Context; Tectonics; Spatial; Servicing; Infrastructure; Environmental; Value and Ecological issues.

The project could be refined and defined using the 10 domains, for example: The Functional aspects of a project such as its internal uses, accommodation, relationship to external views, sunlight, daylight etc., could be grouped researched, analysed, synthesised and experimented with as one design domain. Aesthetic aspirations, aims precedents, meaning intentions, could be similarly explored.

Eventually, 'problem-setting' can be established as a basis to carry out research and experimentations for all 10 aspects of the project and experimentation and reflection in action can occur moving across the full range of domains.

The FACTS-SIEVE heuristic could be used as a method for gathering information and enhancing the design brief in terms of Problem-Setting within the 10 domains. This comprehensive problem setting could be used as a framework against which students could focus their research and their experimentations.

Finally, as the design process continues as a recursive activity, the FACTS SIEVE 'Heuristic Catalyst' [3], although structured, would not preclude poetic, mysterious, intuitive, unconscious mental processes, these could occur alongside logical conscious scientific thinking.

III. Summary

a) The students may well benefit from a map describing the geography of the design process to support their 'journey' supporting their metacognition.
b) Design domains are a useful method for the selective management of information allowing students to focus and contextualise their experimentations.
c) The FACTS SIEVE Atomistic Design Domains could focus problem-setting, experimentations and analytical reflection within the design process.
d) The FACTS SIEVE Atomistic Design Domains could help students to evaluate their experiments across design domains and drive towards robust holistic design solutions.

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