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***Mentor Supported Learning Using Authentic Experiences
In A Building Design Office***

by

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Introduction

In Western Australia, the first formal building design training courses were introduced by the department of Technical And Further Education (TAFE) in the late 1960s. Over the ensuing years those courses have undergone many changes to meet the needs of industry, and to embrace new technology such as Computer Aided Design (CAD) technology which has changed the working practices of many building designers. Embracing CAD methods has for many designers meant a move away from hand-skill based design and drawing documentation methods. Changes in work practices made possible by CAD technology have also changed traditional boundaries defined by professional work roles.

Over the relatively short period of about 15 years the usually conservative design and construction industry in Western Australia has undergone major changes in the work roles of building designers, and their use of computer technologies (Baird, 1996). This has necessitated changes in TAFE training courses to reflect the needs of industry and the culture of practice found in many building design offices.

A New Approach to Training Building Designers

Coupled with this technological change has been a pedagogical change at TAFE. There has been a move towards a mentor-based approach to learning some aspects of building design which is the focus of this study. I have sought to determine how students acquire the knowledge and skills used by professional building designers to solve complex design problems in the context of a cognitive apprenticeship learning approach (Brown, Collins, Duguid, 1989; Collins, Brown, Newman, 1989).

The study is examining a group of students working one-on-one with building designers, acting as mentors, to develop a design from a real project brief. The student/mentor collaborations in this study are taking place in the commercial design office of each of the mentors. The students are considered by the mentors to be working as apprentice designers, and are given full access to the design office and all of its resources.

In this situation, the students were seen to gain first hand practical experience of the processes, procedures, and heuristic design strategies used by the mentors' in their everyday culture of practice activities.

The study used a design project incorporating authentic learning experiences, (Kaufman, 1996; Pieters and de Bruijin 1992) developed through real life type situations as grounded in a design project. The mentor task project undertaken by students provided opportunities for problem solving strategies to be embedded in the context of task resolution. This type of situation is considered by many to be the cornerstone of a cognitive apprenticeship learning approach (Brown, et al., 1989; Collins, et al., 1989; Choi, & Hannfin, 1996; Berryman, 1991; Hennesy, 1993; Jarvella, 1995; Duncan, 1996).

The real work, mentor supported approach to learning building design departs from the classroom theory and the abstract exercises traditionally used in TAFE. Student learning guided by expert modelling, including the articulation of the experts thoughts or tricks of the trade (Collins, et al., 1989), is considered likely to make effective use of heuristic strategies that are often tacitly acquired by experts through their experiences in the practice of their discipline. The use of multiple heuristic strategies (Hennessey, 1993) by building design mentors when developing design solutions with students provides for them a vision of the accumulated knowledge and skills used by many experts as tools in their everyday culture of practice (Abbott, 1998). It also assists the students in developing their own problem solving strategies, and metacognitive skills

Building designers, through years of practice, develop their knowledge, skills and abilities beyond the scope of their original formal training. Some of this special knowledge is referred to as tacit knowledge (Collins, et al., 1989). It is the manner in which this knowledge may be communicated to learners in a mentor-supported situation that is a main focus of this study.

The Study Environment

In this study, students worked in a commercial design office with a building designer. For many students it was their first experience of working in a design office situation, of being treated as any other member of staff, and of experiencing some of the working pressures and expectations typical of the design office environment. The design project collaboration provided experiences typical of a design office team based approach to problem solving, and allowed the students to experience first hand the development of a design for a real project. In effect, they worked in the industry for which they were training, but in a monitored environment with the support of their mentor, TAFE staff, and other staff in that design office.

Some studies have been conducted in which a cognitive apprenticeship learning approach has been used in classroom (Hennesy, 1993; Jarvela, 1995) and workshop (Cash, et al., 1997) situations, but not in a commercial design office, as is taking place in this study.

The Study

This study began with a short pilot investigation of a learning situation in which a group of building design students worked on a real design project, off campus, supported by experienced building design mentors and TAFE staff. Findings from the pilot investigation were used to shape this ongoing study, and to develop research questions to explore a design office based, real work experience, approach to learning building design. Of particular interest was how students acquire the knowledge and skills used by expert building designers when solving complex tasks in the context and culture of their everyday design practices.

The real work study reported here is following the progress of twenty students, each working with an expert building designer as their mentor, undertaking the design and presentation of a real work project in a building design office. Data were gathered using:

- Observation of classroom briefing sessions;

- Individual face to face interviews with each of the participating students and mentors;
- Student journals documenting their learning experiences during the project;
- Sketches and drawings produced by the participants;
- Direct observation of design working sessions between the students and their mentors; and
- Video taped work sessions between students and mentors.

A number of key points have emerged from an analysis of the rich body of data gathered so far. Some preliminary findings are presented in the following summary.

Emerging from this Study

Students placed a high value on working with Building Design Association (BDA) experts (mentors) who have specialised knowledge of the building designer industry. Almost all of the students in this study consider that they learnt a great deal by working with a mentor, and that it had greatly changed their outlook, confidence, and approach to building design. Many also felt that they had produced higher standard designs when working with a mentor, and on a real project. The following student comment is typical of many such made throughout the study so far.

S). It's totally changed my attitude towards how I thought about myself. At the start of the semester I just thought the course was boring and I didn't care much about working. After I had done this project I really felt differently about it and inspired, and I wish that I had done it sooner because it would have carried me through in my other work. (Interview #9)

Many students commented that working with a mentor on a live work project provided them with knowledge and skills of value in subject areas outside of the prescribed framework of the design project. Many also expressed the view that this method of learning gave them confidence in their own abilities and this had a very positive spin off effect on their study performance in all subject areas, not just design.

S). I now feel more confident and positive about what I am doing. Before that, (working with the mentor) I would do my designs and I'd think I would wonder if this will work, and I'd think no that's just a shit idea. But now he has broadened my horizons a bit and now I think, hang-on, maybe that might work and I'll try it out (Interview #9).

The influence of expert mentors in developing design awareness in students through their articulation of thoughts and observations during design work sessions and site visits, plays a major role in students' learning building design.

M). Talking and sketching are the communication tools of the trade here, people cannot talk and communicate if their hands are tied. We are always drawing while talking with them, and they need to be able to read your rough sketches. (Interview #1)

S). The first day that I was there working with her she had some appointments on site. I went along with her to some of the jobs that she had designed and she explained to me a lot of things about the way she designs and showed me them in those houses (Interview #18).

Many students commented that they learnt more through their experiences working with a BDA mentor on one real project than they had from doing many classroom based simulated design projects in their course of study.

S). He was great because he let me put up all sorts of ideas and we worked through them - he made me discuss and justify everything that I suggested, just as he did the same by always saying why he did things the way he did. I learnt more from doing that one project than I had all year at TAFE. It gives you such good experience of the real thing, and that for me built my confidence in myself to attempt things that I would not have even thought of at TAFE or been too embarrassed to present in case I got shot down (Interview #13).

The use of hand sketching as a communication tool at all stages of the development of designs, and in the expression of problem solving strategies, was seen as a major factor in transfer of knowledge between mentor and student. Multi-faceted communication skills based on sketching and discussion-centred explanation building were considered by all of the study participants to be an essential element in learning with a mentor.

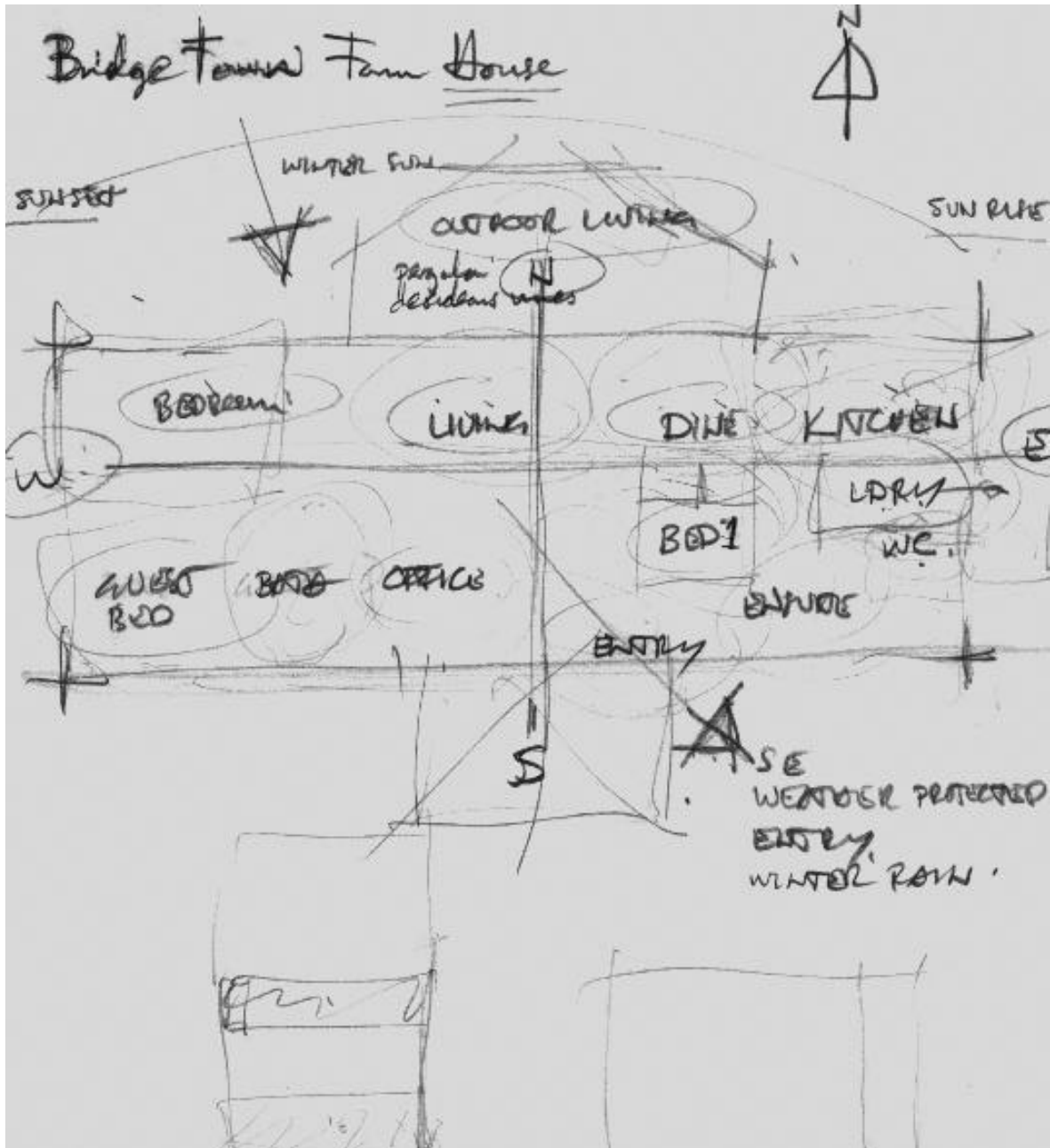
S). He had a lot of different ideas and different ways of putting it across, that was the great thing about it, he has had such a lot of experience he is able to say look I've tried it this way or that way and he gave me examples of where it worked or failed (Interview #13).

In all of the student/mentor working collaborations in this study the use of quick freehand sketching in combination with rich descriptions, provided the detailed explanations of how and why each mentor resolved design problems in the manner they did. The following comment is typical of how any of the mentors approached their work with the students, and an example of the type of sketch used in such exchanges can be seen in Figure 1.

M). When I am working with students what happens is I talk as I draw more, whereas if I were drawing for someone else, like a builder, I might just sketch it out. When you are doing it for a student you need to talk it through so they know the reasons for what you are doing, not just how to do it (Interview #1).

M) I had a little sketch (see Figure 1) which I used to talk him through as to how I would go about doing such a design, and saying why I would do it in that particular way. (Interview #3).

Figure 1 (will print out)



Preliminary design sketch

The use of detailed notes on drawings to describe the design development and to defend the ideas presented was another essential element of the communication between student and mentor (see Figure 2).

S). I wrote down notes on the sketches and the drawings we worked on together. You know, just little things that he talked about as he sketched ideas, or he came up with; things that I wouldn't remember but needed to use later on (Interview #9).

S). Having a list of things to do really helped me see where it was going and even if they (the mentors) were not there I knew from the list we had made what to do next and what I needed to find out to do it (Interview #16).

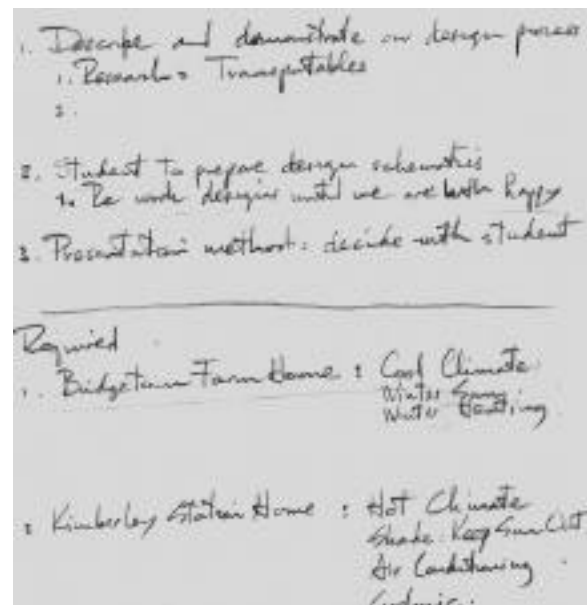


Figure 2

Example of notes made on drawings by mentor when working with student For many students taking part in the everyday operations and culture of practice of the design office provided a rich situation for learning building design. Working as part of a design team required of the participants' collegiality and unity of effort. In some cases this happened through social activities and by the student participating in the day-to-day activities of other staff in their resolution of design tasks. Relationships established in this way were seen by many as playing a major role in developing links with others in the design office, or with persons in associated disciplines whom the student may draw upon for assistance or might later team up on a design project.

M). You need the interaction with others to bounce ideas around and sometimes it is better that students go into a large work environment where they can get ideas from many people rather than just one. That apprenticeship style of learning needs to be in a sharing environment (Interview #4).

One significant aspect of learning with a mentor noted by the study participants was that of seeing and experiencing first hand expert designers resolving design problems.

M). She was right there in the office working alongside the guys as they produced the jobs and I sat her down and got her to go through the drawers and have a good look at how we do it here. She saw it happening from a three-sheet project to a twenty-five-sheet project. We were mostly trying to get her to understand the basics of working through a design brief as we would do it here (Interview #7).

Many students commented that working with a mentor gave them personal insights into how to problem solve in the way that professionals do. It also provided them with an approach to analysing a client brief and applying it to a design, using quick freehand sketching in the expression of a free flow of ideas.

S). Just seeing others in the office working on their projects gave me a different point of view about looking at design. You know you are not so limited to what you can use, I've now got a much broader view of design and know about alternative ways of doing things that you just don't get to see at TAFE. When I first went in there I got a good idea of what their work involved by watching and talking to Sam (sic) and some of the others as they worked on a project that they were trying to get finished. That helped me get into their way of doing things (Interview #16).

The students were required by their mentor to justify their design decisions, but were able to present all their ideas no matter how radical in the safe environment of a supervised collaboration.

S). It was good learning his approach to design, and it was also good that he helped me to develop the design around my own ideas (Interview #8).

S). We sketched all over my drawings together. He worked in pencil using tracing paper over the top so that he could use layer over layer of drawings as he built up different ideas, and we could flick back over what we had done and see how the design had developed (Interview #9).

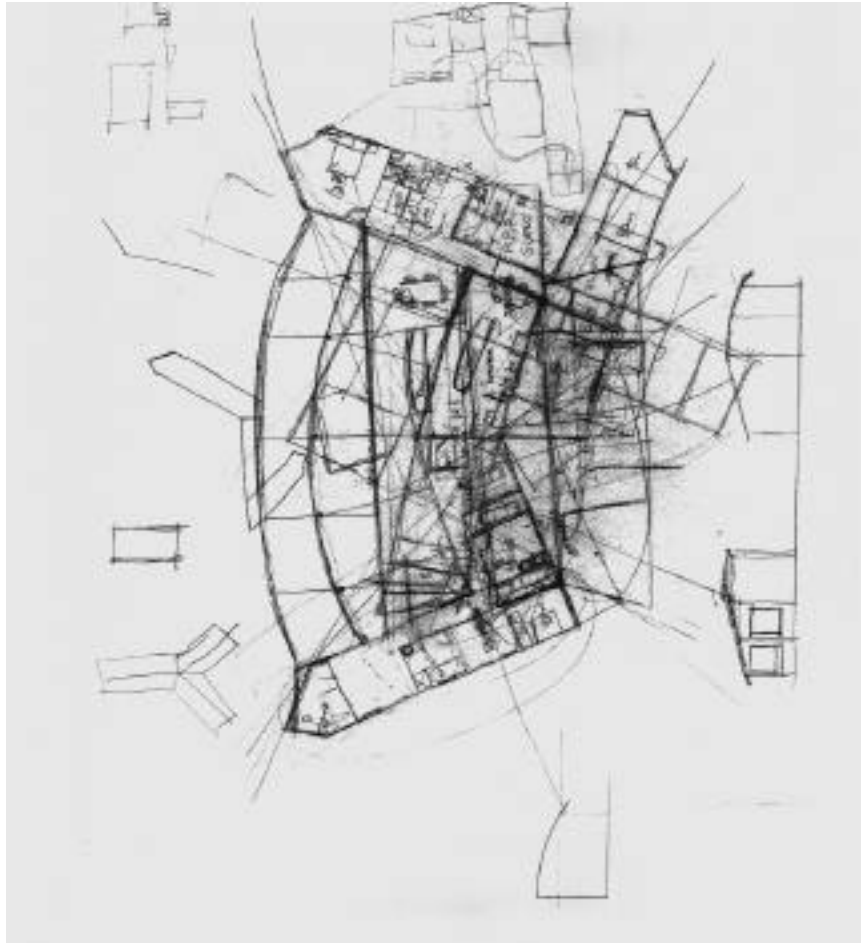


Figure 3
Student sketch showing mentor over-sketching and projection of elevations on right

S). He gave me the advantages and disadvantages of things like room sizes or positions and let me decide on how I might use things, he let me do the design but he guided me when I got bogged down or started doing things that he saw as running off line (Interview #13).

Many students saw this as a non-judgmental setting in which they could explore ideas, even if it meant making errors. This took place under the watchful eye of the mentor who would detect emerging problems in the students work and assist in resolving those problems in collaboration with the student in a supportive manner. This was noted by many of the study participants to encourage creativity, and a mindset open to experimentation.

M). I tell them that they must always be accountable for their designs and to be able to justify why they are doing it in a particular way (Interview #10).

M). She (the student) came back with an end result (design) which she backed that up with sketches where she was able to say look, I've tried this and tried that, but it didn't work so I have come to this result (Interview #5).

S). After we finished this assignment I was all set to go, it gave me a lot more confidence about my own designing ability (Interview #9).

Overlap of modelling and coaching

Throughout this study it was often observed that the line between modelling and coaching was never clearly drawn when it came to mentor/student interactions. During the work sessions the mentors would constantly move from a modelling role to a more interactive coaching role. This was observed as they employed a combination of discussion, articulation of thoughts, and sketching of ideas to communicate heuristic design strategies, procedural knowledge and tacit knowledge needed to resolve the problems emerging from the authentic tasks embedded in the real work project.

S). Listening to his ideas, having him sketch and explain things, that was the most valuable part of communicating with him, that's how we gradually refined the design and worked through all the problems that came out of the brief (Interview #10).

S). She (the mentor) sketched straight on top of my drawings and sketches as well as doing her own butter paper sketches and overlays. Also she talked about why she liked doing things her own way in design, and all the time explained why some things worked and other didn't (Interview #18).

Use of scaffolding in multiple forms

All of the mentors used multiple scaffolding materials from a great diversity of sources, some seemingly quite out of context for a building design setting, to stimulate new ideas and assist the students in their design work.

M). I give them a starting point with some sketches, then let them experiment with the ideas. When they come back with something too outrageous I just slowly pull them back by getting them to show me how they might actually build you might say to them what a great idea but get back to the real world (Interview #1).

M). I gave Mary (sic) a lot of CAD files of entourage and presentation stuff that we use so she could just plug those into her presentation. I said to her, you will find this in almost any CAD based office like ours, it's a resource that the industry uses (Interview #7).

In some instances the mentors used other design office staff to step in and provide a boost to the student when needed. This important aspect of assisting the students was often supported by other design office employees who themselves were recent graduates, and had recent experience of the TAFE culture, and were thus able to empathise with the plight of the student grappling with the design office culture of practice.

S). He was good like that because when I was stuck he would not try to block out my ideas and use his own he would just guide me through and give me little hints and sketches of things to allow me to work it out. He was good at picking up on ideas I presented and talking them through with me, he would point out all the good and bad points that I perhaps hadn't seen and that really helped me to explore a lot more than if I had done it alone (Interview #10).

These comments represent some of the preliminary findings from an ongoing study of a mentor supported cognitive apprenticeship approach to learning. Generally the study has shown that learning in a mentor supported cognitive apprenticeship styled work situation offers many special features unique to the real work situation of the design office. The use of real projects with experienced building designers acting as mentors offers the students insights into the actual working practices of the profession for which they are training. Working with others in the design office solving design problems in the context and culture of practice of a real work situation presents a rich learning experience not readily found in the classroom. Learning to use fast freehand sketching methods in combination with a discipline specific vocabulary when articulating design ideas or defending a concept, or when explaining the reasons for resolving design problems, is seen by this researcher as fundamental to this mode of learning building design.

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Craig Baird started his working life as a Building Designer back when such people were called Architectural Draftsman. After some years in private architectural firms, and two years with the Commonwealth Government, he commenced duties as a Lecturer in Building Design at Leederville College of TAFE (Perth, WA), where he also managed the Computer Aided Design (CAD) Training Centre from which he ran AutoCAD® courses. He has worked with several major Western Australian companies as a CAD trainer and mentor. For a short time he also worked in Melbourne for the international company Autodesk®, as their principal Australian trainer.

Craig has performed duties as a judge and mentor for the Building Designers' Association, and as a State and National judge for Workskills Australia in CAD competitions.

He has developed and implemented two investigative studies concerning CAD use in Building Design in Western Australia. Currently, he is undertaking a PhD study to investigate a training approach for Building Designers based on a mentor supported, Cognitive Apprenticeship-style learning situation, using real work projects in a building design office.

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