

Cross-discipline Collaboration and Innovation in the Design Studio: Drawing on the Bath Model

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Abstract

As information expands and comprehension becomes more complex, so the need increases to develop focused areas of knowledge and skill acquisition. However, as the number of specialty areas increases so the languages that define each separate knowledge base become increasingly remote. Hence, concepts and viewpoints that were once considered part of a whole become detached. This phenomenon is typical of the development of tertiary education, especially within professional oriented courses, where

disciplines and sub-disciplines have grown further apart and the ability to communicate has become increasingly fragmented.

One individual and visionary who was well acquainted with the shortcomings of the piecemeal development between the disciplines was Professor Sir Edmond Happold, the leader of the prestigious group known as Structures 3 at Ove Arup and Partners, who were responsible for making happen some of the landmark buildings of their time, including Sydney Opera House and the Pompidou Centre, and the founding professor of the Bath school of Architecture and Civil Engineering in 1975. While still having a profound respect for the knowledge bases of the different professions within the building and construction industry, Professor Happold was also well aware of the extraordinary synergies in design and innovation which could come about when the disciplines of Architecture and Civil Engineering were brought together at the outset of the design process.

This paper discusses the rationale behind Professor Happold's cross-discipline model of education and reflects on the method, execution and pedagogical worth of the joint studio-based projects which formed a core aspect of the third year program at the School of Architecture and Civil Engineering at the Bath University.

Introduction

Although the combination of different discipline bases within the same school or department is not unique, many utilize joint-teaching simply as a means of rationalising student cohorts, and do not take full advantage of the hybrid opportunities that arise from actively pursuing cross-discipline course work. One individual and visionary who was well acquainted with the shortcomings of the piecemeal development between the disciplines and their teaching was Sir Edmond Happold. Happold was in 1975 appointed professor at the School of Architecture and Civil Engineering at Bath University. As well as professor at Bath, he was also leader of 'Structures 3' at Ove Arup and Partners, a group of talented designers and structural engineers who were responsible for making happen some of the landmark buildings of their time, including the Sydney Opera House and the Pompidou Centre.

This paper discusses the rationale behind Professor Happold's cross-discipline model of education and reflects on the method, execution and pedagogical worth of the joint studio-based projects at the core of third and fourth year teaching at the School of Architecture and Civil Engineering at Bath University.

Current context

As information expands and comprehension becomes more complex, so the need increases to develop focused areas of knowledge and skill acquisition. However, as the number of specialty areas increases so the language that defines and illuminates each separate knowledge base becomes distanced from its neighboring fields and epistemology. Hence, concepts and viewpoints that were once considered part of a whole have become divorced. This phenomenon is typical in the development of tertiary education, especially within professional oriented courses in Australia and worldwide, where the teaching of increasingly demarcated disciplines and sub-disciplines has become fragmented.

While there exists a large body of research on the benefits of cross discipline education, with significant advances in the field being developed in the United States,¹ the majority of the knowledge base is concentrated within the secondary education sector. One of the reasons for this is that higher education, traditionally driven by a research imperative, places progressive demands to specialize on its student cohort in order to keep abreast of an ever expanding knowledge base. This demand has been exacerbated by the progressive shedding to other professional bodies of subject material that was once central to the education of the architect. Yet while the streamlining of many course structures continues, the Building and Construction Industries action agenda, which calls for *'single source solutions'*, is essentially challenging schools to engage with cross-discipline learning.

"As public and private sector clients increasingly seek 'single source solutions', there is a need for the various sectors of the industry to cooperate as a seamless provider of design, finance, construction and maintenance services".²

Denise Caruso and Diana Rhoten write further on the topic, *"while cross-disciplinarity is universally acclaimed in principle, it is also equally apparent that there may be problems with its actual practice,"³* and furthermore that,

"It is most fascinating to watch the march to institutional acceptance of the hybrid disciplines, such as the cognitive sciences. When they were still considered interdisciplinary, their practitioners were dancing on the razor's edge of illegitimacy. But when they yielded sufficient individual achievement ... they then became accepted 'disciplines' in their own right."⁴

Although interdisciplinary education has been a topic of discussion since the 1970's,⁵ it has only very recently been earmarked as a national focus area in Australia. The catalyst for this was the publishing in May of 2003 of an investigation into *'Emerging Issues for Cross-Discipline Research'* by the Higher Education division of the Department of Education Science and Training (DEST).⁶ The study was commissioned to,

"investigate emerging issues with respect to cross-disciplinary research and the possible implications for higher education research of an increase in this activity. The current attention directed at cross-disciplinary research arises from a widespread

recognition that important societal questions can no longer be adequately addressed within a single discipline, and, in fact, demand multidisciplinary and interdisciplinary conceptualization and subsequent research solutions.⁷ In addition, it is quite clear from a cursory examination of advances in many fields such as the life sciences that it is the activity at the interfaces of disciplines that is of crucial importance to these advances.⁸

If higher education is to embrace this call for cross-disciplinary research and learning by both the DEST and the Building and Construction Industries action agenda, then we may need to rethink how significant components of our course structures will be altered to accommodate such change. One exemplary example of a restructuring which has produced a very successful and eclectic school is the Bath Model.

The Bath Model

While still having a profound respect for the knowledge bases of the different professions within the building and construction industry, Professor Happold was also well aware of the extraordinary synergies in design and innovation which could come about when the disciplines of Architecture and Civil Engineering were brought together at the outset of the design process. With a team of six colleagues, including his collaborator at 'Structures 3', Dr Chris Williams,⁹ Ted stretched out the traditional six-semester (or nine-term) structure from three to four years, creating what is now referred to as a 'thin sandwich' program. Incorporating significant internship components into the course during the third term of the second, third and fourth years of the first degree, enabled the school to mesh successfully professional practice with its academic research and teaching.

The School currently runs two core professional programs. The first is a six years (five years equivalent) architecture program, divided into a Bachelor of Science in General Architectural Studies of four years (Part 1 of the three-part RIBA professional qualification) followed by a Master of Architecture of an additional two years (RIBA Part 2). The second is a four year civil engineering degree which students are able to upgrade to a Master of Engineering by undertaking a fifth year of graduate study.

While both streams also offer graduate research programs at M Phil and Ph D levels, it is interesting to note that the school has never actively sought to develop a double-degree in architecture and engineering. The reasons for this are twofold. Firstly, while recognising the benefits of cross-discipline and collaborative working, the school also recognises the importance of ensuring that their students continue to maintain a strong and coherent depth of knowledge that is core to their respective discipline bases. Secondly, the fundamental aim of the staff was not to produce individual graduates who could merely perform in both roles, but was to inspire and cultivate an empathetic language of collaboration and ideation shared between the two disciplines - a language with which graduates could subsequently enlighten interaction and inspire innovation at the interface of architectural and engineering practice.

Collaborative Working

While both programs have separate course structures that address the requirements of the various accrediting professional bodies, they have components within each of the four undergraduate years where both student groups combine in a studio environment to engage in joint project work. Moreover, engineering and architecture begin their programs in a common first semester. This shared semester not only has the effect of moulding the student body into a coherent group, but also allows individual students to switch courses before settling into a specific discipline base.

Joint project work is initiated in the second year, and rapidly expanded in the third year to occupy a five-week block of the program. This is further expanded in year four to a competition based fourteen-week project in the first semester, known as the Basil Spence Award (which has been running since 1978). Regarded by staff and students alike as the fulcrum of the joint school program, the Basil Spence project is intended to

“develop creative, collaborative working techniques; explore the impact of engineering, both structurally and environmentally, on the form and functioning of the building; and acquaint students with the characteristic strengths and weaknesses of a particular material, together with its environmental profile.”¹⁰

Both the third and fourth year joint projects, *“essentially bring together Architecture and Engineering students in a way that simulates the best of real life design projects, introducing to each discipline what the other can contribute creatively in the production of the built environment.”*¹¹

The unit chairs of both architecture and civil engineering programs negotiate the project brief. Students are divided into collaborative teams of two or three consisting of at least one architecture student and one engineering student, and are subsequently tutored at the same time as a single cohort by a pair of supervisors comprising one architect and one engineer. Teams are formed at the outset of the project, and they work together on the brief from concept, through schematic design, to design development. They then submit a single ‘seamless’ joint submission that is subsequently presented to and assessed by a four member jury, comprising of an external engineer and an external architect and an internal pair of examiners from the two discipline programs.

Benefits Gained

There seems little doubt that cross-discipline working is only successful as long as the tutors working on the project have an assured empathy allowing them to work collaboratively with other discipline members. This implies a willingness to blend and contribute their respective knowledge bases, and demands a clear understanding of the coordination of the studio. While piecemeal working amongst the student groups at Bath rarely surfaces within what is a highly energetic and motivated environment, when it does its effect stifles all facets of a project submission. Ideas are often underdeveloped, concepts are narrow, resolution is poor and inconsistent, and both visual and verbal presentations reflect in their incoherence the lack of cohesion in the group.

For effective brainstorming to proceed, students must readily accept probably the most important criterion – this being that all ideas deposited and developed within the group become the property of the group rather than of an individual. This principle breaks down leadership and property claims, which can often lead to fractures within the project. Student groups are rarely permitted to have more than three members - a team size that seems to optimise breadth and depth of knowledge acquisition; design

exploration and resolution; and the thoroughness, execution and delivery of a presentation. Cross-discipline collaborative working was, at least at Bath, often able to achieve these targets faster and more complete than individual students working on year-four projects of a similar scale and complexity. Indeed, the Basil Spence Award roll of honour often contained the names of students who had previously never excelled. Perhaps more pointedly, cross-discipline design at Bath appears to counter the difficulties of collaborative projects that Ruedi¹² and Howes¹³ have underlined, instead enhancing dramatically the development of ideas and accentuating learning and understanding through experience. One could speculate that these findings may even have implications for the pedagogy of teaching outside of schools of architecture. For the Bath model demonstrates quite clearly that for many educators turning to group learning (often as a solution to ever increasing student to staff ratio's), cross-disciplinary collaboration may provide an impetus for innovation (what we might even quite pertinently call 'outside-of-the-box' thinking) often lacking in conventional single-discipline project work.

Conclusion

We are continually being made aware of the short-comings of over-specialization and a perceived lack of innovators able to bridge the language and knowledge barriers between different disciplines. The apparent rise in the number of consultants offering increasingly specialist services would seem to indicate that this awareness has prompted little change. Unless multi-disciplinary schools are prepared to implement programs such as the Bath model, which provides serious weighting to collaborative and cross-discipline work, then we may need to rely on double-degree courses in our architecture schools to carry the breadth and diversity of a cross-discipline skill base which the construction industry is calling for. However, while the double-degree graduate in Australia may hold the key to spanning discipline delineation, their understanding and implementation of an empathetic language of collaboration and innovation is being hindered by course structure and content. For universities seem content merely, in the hope that they will attain the right mix in the caldron, to reassemble double-degrees from units compiled for different programs rather than assembling them afresh - from the ground up as it were. The mix must occur in team project collaboration rather than merely, as it stands in some schools, in shared lecture units. Moreover, while the development of the APAI grant scheme is

proving to be a very sound funding structure - indeed in many instances it has facilitated a large range of new links between industry, the community and academia - the DEST's call for cross-disciplinary research initiatives could prove even more difficult to cultivate if the Australian Research Council (ARC) is reluctant to revise its policy on the coordination, administration and funding point-allocation of multi APAI cross-discipline grant applications.

Notes and References

¹ See, for instance, Sanz-Menendez, Bordons, and Zulueta, "Interdisciplinarity as a Multidimensional Concept", *Research Evaluation*, 10 (1), 2000, pp47-58.

² Building Construction Industries Action Agenda & Key Initiatives 1998.

³ Grigg, Johnston, Milsom, *Emerging Issues for Cross-discipline Research, Conceptual and Empirical Dimensions*, Higher Education Group, Department of Education, Science and Training, May 2003, p.1.

⁴ Caruso, Rhoten, *Lead, Follow Get out of the Way: Side Stepping the Barriers to Effective Practice of Interdisciplinarity*. The Hybrid Vigor Institute, <http://hybridvigor.org>, April 2002.

⁵ Grigg et al, *Emerging Issues for Cross-discipline Research, Conceptual and Empirical Dimensions*, p.1.

⁶ Grigg et al, *Emerging Issues for Cross-discipline Research, Conceptual and Empirical Dimensions*, p.3.

⁷ Royal Society, 1996; OECD, 1998, 2000; Gibbons, et al, 1994; Johnston, 1998.

⁸ http://www.dest.gov.au/highered/respubs/conc_emp_dimensions/cross_disc.pdf.

⁹ Who had also worked closely with the German Engineer Frei Otto, and who has since been responsible for developing hallmark research on the application of bone structures to building form.

¹⁰ School of Architecture and Civil Engineering, University of Bath,
Course Description <http://www.bath.ac.uk>.

¹¹ School of Architecture and Civil Engineering, University of Bath,
Course Description <http://www.bath.ac.uk>.

¹² K Ruedi, "Habits and habitats: interdisciplinary collaboration in a community architecture studio", in *Changing Architectural Education: Towards a new professionalism*, D Nicol & S Pilling (Editors), Spon Press, London, 2000, pp 119-127.

¹³ J Howes, "Is working together working?" in D Nicol & Pilling, pp 128-136.