Project methods as the vehicle for learning in undergraduate design education: a typology

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Learning through projects is a common feature in practice-based design education. While theory and case-based literature on problem-based learning abounds, the project methods more familiar to design education are rarely defined in practical curriculum development terms. This paper outlines a study of project types in use in a faculty of design. The study identified six project types, four domains and 11 sub-domains related to curriculum design and pedagogical strategies. The resulting propositional typology is presented as a tool for decision-making in project-oriented curriculum design. Also briefly discussed are some significant areas of alignment difficulty found during the study.

Keywords: case study/studies, design education, project-based learning

It has been argued that projects are the traditional method of organising learning in design education (Knoll, 1997; Pearson et al., 1999; Davies and Reid, 2000). Supporting this argument, documentation from practice-based design programs consistently describes project outcomes, regardless of whether studio-oriented or other educational terminology is present. A review of the literature on undergraduate design education also shows that projects are assumed as the structure through which practice-based design education occurs (e.g. Thompson, 2000; Davies, 2002; Swann, 2002; Green, 2005; Blair, 2006). However, the literature on project methods from both design and the broader educational community is relatively undeveloped (Dohn and Wagner, 1999; Thomas, 2000; Helle et al., 2006). Additionally, from the perspective of the day-to-day work of the design academic, the language and examples of educational discourse and management are often far removed from the teaching experience in design. This situation makes it difficult for design educators to utilise and extend educational theory through their own practice. It also limits their ability to take part in the broader educational discussions, to influence policy and develop interdisciplinary curriculum.

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In contrast, detailed theoretical and practical literature on problem-based learning (sometimes described as a subset of project methods) is available to the novice practitioner. In particular, the tutorial processes and student experience have been described in straight-forward terms by a number of authors, particularly Engel (1997). As a result, the practical implementation of problem-based learning and the issues that arise in delivery have been widely articulated and debated (see, for example, Moust et al., 2005). There are also a number of academic development programs available internationally supporting development of problem-based approaches. Those involved in the delivery of problem-based education are able to draw on this discourse in documenting practice, using evidence-based justification, and engaging in wider debate.

One potentially contentious inference to be taken from these difficulties might be that design academics should adopt the language of mainstream educational theory, or of problem-based approaches, in order to take part in the broader educational discussions. However some authors argue that the design learning processes, particularly in terms of creativity, are substantially unique (Caban and Wilson, 2002; Cross, 2004; Jones, 2006). Others suggest that generic educational research has much to offer design education, and that common themes can be found in the principles of experiential and adult learning (Jones, 2006; Lee, 2006). Davies (2002, 2006) argues that empirical studies are needed in the design disciplines to generate such understanding. Davies refers to this as 'subject-level' research, and argues that it is crucial for the development of scholarship in design education, and for engaging design educators in research-based reflection on their teaching practice (Davies, 2002; Davies, 2006). Dohn and Wagner (1999) also suggest that future research in project methods could accomplish a coherent theoretical understanding by examining the underlying educational principles and structural qualities of the project learning process and its variations of use.

The key aims for this study were to explore the nature of the project methods used in design education, to identify differentiating factors in project types, and to produce explanatory models that might provide a starting point in identifying project principles, structures and processes. The findings show six types of project in use, each with specific goals, processes and outcomes. Each was designed by lecturers with particular learning experiences in mind. For the purposes of the study, the alignment of the relationships between desired learning outcomes with delivery processes, student activities, scope and scale of projects and assessment are also of particular practical and theoretical interest. For the design academic this identification of relationships has the potential to provide an avenue for making explicit learning outcome expectations, more closely reflecting on the processes that might hinder or support students and teachers in achieving those expectations, and balancing the

dynamic nature of project curriculum with the need to align aspects of its delivery.

The study was part of a larger qualitative study of practice-based undergraduate design education in a faculty of design. The results of that study were used to generate a typology of project-based approaches to design education that suggests a language that can be shared by design academics and tested as a conceptual framework for the widely differing curriculum practices in design education environments. The language that is at the centre of the typological development draws on the existing educational theory relating to the constructive alignment of learning processes with desired learning outcomes, and the existing literature on project-based learning.

During the development process, two major phases of analysis occurred — empirical and analytical. The empirical work enabled the construction of an initial typology, and the analytical a refinement of the language and alignment of learning outcomes with the associated processes. Identification of misalignments of aspects of curriculum design and implementation were used to clarify and refine the typology over time. The typology should be read as provisional in relation to wider applicability, as it draws from the experiences of one faculty in a particular university. However, the limitations imposed on the research because of this do not diminish its potential to set parameters for further empirical investigations in other institutions.

1 Details of the study

The Faculty of Design is one of six faculties at an Australian Metropolitan University of Technology. At the time of the study, the faculty was home to approximately 1500 undergraduate students (full time equivalent). The faculty has four wholly in-house undergraduate design programs: Communication Design, Multimedia Design, Interior Design, and Industrial Design. In addition, a Product Design Engineering (PDE) program is shared with the Faculty of Engineering. The design programs have a mix of theoretical, technical and design components, but with a strong focus on professional design practice.

Unit and program documents from the first three years of each undergraduate design program, excluding those units delivered by other faculties, were included in the study. In total, 73 discipline-specific and nine shared units of study were reviewed. Based on the findings from an analysis of project types present in the unit documents, a working typology was created. Three units were then purposively selected for observation. The criteria for selection related to differences of project types, variations in the stage of program, number of project methods described, and discipline content. Unit A was a first year communication design subject, delivered by two lecturers taking two different student groups but working to an identical curriculum document and using the same project briefs, resources and teaching plans. This unit was described in

the curriculum documents as being comprised a series of group projects, culminating in an individual project. Unit B was a third year interior design subject, also taught by two lecturers, working to a single curriculum document. However, this unit was designed around a single, complex project to be developed by students individually, within a studio environment. The third unit was a third year interdisciplinary design management subject involving students from all of the design programs and taught by the researcher. This unit comprised two projects with some variation in scale and complexity, both of which were to be undertaken in groups.

All of the observed units were timetabled as 1 h of lectures per week, followed by a 2-h class of up to 30 students. Notes on observations were both chronological records of time-coded activity, and thematic units related to the emerging categories, domains and sub-domains. The two unit convenors from the observed units also took part in post-observation semi-structured interviews designed to clarify educational goals and approaches in relation to observed phenomena. The third unit was reviewed with a graduate student providing additional observational and note-recording to verify the researcher's records and teaching materials. Working drafts of the typology were reviewed with colleagues at pivotal stages in development. This process provided feedback on clarity, coherence and credibility of the emerging explanations, and outcomes were incorporated into the subsequent stages of typology development.

2 *Underpinning concepts*

2.1 *Constructive alignment*

> …students [doing projects] would benefit if curriculum developers and teachers were to invest more in the definition of goals and the congruence between stated goals and the activity students are engaged in. (Helle et al., 2006)

Constructive alignment is Biggs' (1999a) influential model for quality learning in higher education, elaborated on in a number of other publications (Biggs, 1999b; Biggs, 2003; Biggs, 2006). Biggs (2006) asserts that the qualitative measure of a good educational system is that 'all aspects of teaching and assessment are tuned to support high level learning'. Based on elements of systems theory, the terminology refers to two key concepts – 'constructive', the notion that students construct meaning and learning relevant learning activities, and 'alignment', the notion that in order to achieve desired outcomes, all elements of education must be carefully aligned to the desired outcomes (Biggs, 1999a, p. 26).

As a conceptual framework, constructive alignment has had significant influence on contemporary educational theory and practice, and its impact as an

underpinning theoretical framework in much of the literature in learning and teaching is well documented (Davies, 2002; Walsh, 2007). Whilst it is acknowledged that true constructive alignment may be difficult to achieve (Rust, 2002; Engineering Subject Centre, 2006), it is useful as a method of approaching a qualitative measure of the integrity of stated learning objectives with environments, activities, delivery, roles, assessment and tools. Biggs (1999b) describes the process of aligning some of these components within a curricula system as:

- Stating learning objectives in terms of the nature and level of learning outcome required.
- Selecting appropriate learning and teaching activities precisely to the form of learning desired.
- Aligning assessment to both confirm to students the learning required, and to allow judgements to be made about the achievement of the objectives.

In the development of the typology, constructive alignment provided the touchstone for evaluation of the aims, objectives, methods, activities and assessment processes employed. Its primary usefulness in the context of this study was that it offered a means of identifying and articulating the common goals to which they were attuned, and mapping the variations in curriculum delivery throughout each of the observed project units.

2.2 Definitions of project methods

Although a number of authors argue that descriptions of project methods are lacking in both theoretical grounding and practical detail (Dohn and Wagner, 1999; Thomas, 2000; Helle et al., 2006), the underlying educational aims can be traced back to Dewey's (1910) concept of the 'complete act of thought', and Kilpatrick's (1918) emphasis on authenticity and autonomy in learning. However Adderley et al. (1975, p. 1) published perhaps the most thorough account of project methods, including a broad definition that is still in use today:

- They involve the solution of a problem often, though not necessarily, set by the student himself.
- They involve initiative by the student or group of students, and necessitate a variety of educational activities.
- They commonly result in an end product.
- The work often goes on for a considerable length of time though the time span may range from a single afternoon to three years.
- Teaching staff are involved in an advisory, rather than authoritarian, role at any or all of the stages − initiation, conduct and conclusion.

In terms of curriculum design, Morgan (1983) suggests that there are three ways of describing project curriculum design: the project 'exercise', in which students apply previous learning; project 'components', in which the projects

are intended to add something to the educational experience; and project 'orientation', in which projects form the organising feature for the entire curriculum. However, in practice, Morgan's project exercises and components are difficult to distinguish from one another. The distinction between a component and an exercise is particularly difficult to make where projects consolidate previous learning but also add to it. Heitmann (1996) takes a similar approach, but defines only two types of project curriculum: 'project-oriented studies' – projects used to support learning within a program, often culminating in a final capstone project, and; 'project-organised curricula' – entire programs designed with projects as the driving model.

While these categorisations are useful in understanding a level of variation in project methods, they do not provide a sufficiently detailed picture to support decision-making. If I should want to develop a 'project-organised curriculum', what differences are there between projects with different learning outcomes? How would I describe the resource needs and the process to others teaching into the program? Possibly the most illuminating model in this respect is that provided by Gjengedal (2000), who describes three categories arranged hierarchically in relation to autonomy and complexity: basic projects oriented to help students learn project skills; projects as content delivery, and; authentic projects undertaken for external partners. During the current study, however, it was found that these three categories did not sufficiently describe the major variations in project types, nor their necessary focus. A review of literature case studies and program documents, in the first instance, showed three distinct project types clearly differentiated by learning aims, organisation, complexity and level of autonomy granted to the student. These types differed from Gjengedal's categories in that there was no clear differentiation between focus on content and skill delivery. Rather, the levels of each increased in complexity with the scale of the project. In addition, further investigations through observations and interviews found distinctions in each of the types. The resulting definitions, commencing with the domains and sub-domains used for categorisation, are described below.

3 *The typology development*

3.1 *Domains and sub-domains*

Drawing on findings from a review of unit documentation from across the faculty and from observations of unit delivery, a total of four domains and 11 sub-domains were found to account for the major project types in use. These domains and sub-domains form the basic elements of the project types. As such, they also provided the initial means of identifying relationships between aspects of the educational process from initial curriculum development, through classroom practice, to final assessment of student work. Although

presented separately from the discussion of the project types, the two were developed concurrently, and constantly refined as the evidence was sorted and analysed. The final domains and sub-domains were:

1. *Intent*
   a. *Major goals*
      - *Articulated and evident intentions for learning outcomes*
      - *Related to overall aims of the subject*
   b. *Nature of process*
      - *Open or closed-structured, indicating the level of control exerted over the path students would be expected to take*
      - *Open or closed-ended, indicating the level of control exerted over the form and content of the final outcomes*
2. *Delivery*
   a. *Average time*
      - *The length of time typically taken to complete the projects as an indication of complexity, scope or scale*
   b. *Content*
      - *The amount, topics and timing of information formally provided by lecturers*
   c. *Organisation*
      - *Whether projects were primarily carried out by individuals or groups*
      - *The nature of student interaction in and out of class*
   d. *Contact*
      - *The environment and structure of contact between lecturers and students*
      - *Level of organisation of formal activities and discussions*
      - *Level of interaction between students*
   e. *Type of learning resources provided*
3. *Roles*
   a. *Primary tutor role*
   b. *Primary student role*
4. *Assessment*
   a. *Form of assessable items*
   b. *Focus of assessment practice/criteria*

The decisions made with regard to bounding elements and naming domains also reflect some of the explanations of aspects of learning and teaching in the literature. The existing literature on project methods includes descriptions of processes and learning goals (Barron et al., 1998; Chinowsky et al., 2006), learning events and resources – considered broadly as both teaching input and materials (Chujo and Kijima, 2006; Macias-Guarasa et al., 2006), comparative roles and styles of interaction between students and teachers (Blumenfeld et al., 1991; Grow, 1991; Thomas, 2000; Helle et al., 2006), and suggestions for aligning assessment to student activity (Peschges and Reindel, 1999; McGrath,

2003; Langrish and See, 2006). Mazzolini and Buzwell (2006) also refer to the 'open-structured' characteristics of independent projects. The language used to describe the relative characteristics within sub-domains draws heavily on this literature, particularly that of Grow (1991), who describes the interdependencies between student and teacher roles.

The relationships between the domains and sub-domains were also considered important. As the findings were developed the notion of project curriculum as a system of deeply interrelated elements also emerged. Some aspects of those relationships were found to be particularly important. A brief discussion of these is included in Section 4 of this paper.

3.2 *The project types*

The typology evolved as a tentative hierarchy of complexity and autonomy. However, the typology does not represent a definition of projects as they are 'in themselves'. As a working hypothesis it is intended to provide indicative concepts of alignment to specific learning outcomes, circumstances and capabilities.

The typology is expressed in dimensions of project type and domains, and is appended. Below the three initial categories are summarised, and distinctions found during the study are briefly described.

1. *Inquiry methods – commonly used in postgraduate research degrees, featuring significant levels of student autonomy and depth of learning*

Inquiry methods were found to be used in two different ways; in supervision models reminiscent of postgraduate research formats (*independent inquiry method*), and as more formal class or tutorial delivery with somewhat defined outcomes (*independent project method*). The similarities were marked between these two types of learning experience, particularly with regard to the expectations of broad and deep investigation of a topic of personal resonance, and the flexibility of the process as students pursued the projects. However, there were also clear differentiating factors in the modes of delivery, roles and assessment focus.

Independent inquiry methods

Lecturers referred to this project type as open-ended, exploratory, and complex. Learning outcomes commonly cited included sophisticated knowledge and skills, innovative products, critical analysis, the formulation of arguments, and rigorous documentation. Very little structured support was supplied for guiding the students through these projects; rather, supervision meetings (usually individual) were arranged at the discretion of participants on an 'as needed' basis. Even where class contact time was indicated, lecturers often re-arranged the time as consultations.

The level of autonomy given to students in these projects required the lecturer to take the role of a collaborator in working through ideas and steps in the project process, while students were expected to respond by acting as professionals engaging in an entirely autonomous learning process. The emphasis in consultations was articulated as an individualised dialogic process that aimed to elicit student judgment. One of the most significant criteria for this appeared to be that the topic and path to be taken was largely at the discretion of the student. As a result of this autonomous project development process, projects were likely to cover a broad range of processes, topics and outcomes. While academic skills such as critical judgment and theoretical engagement were embedded in discussions about process and assessment, criteria also focused on the sophistication and innovative nature of the final outcomes.

Independent project method

Independent projects centred on themes of investigation leading to artefact development. Although students had control over their process and in most cases, the specific topic they would address, the outcomes were commonly defined within a thematic range of topic possibilities. Within this constraint, students were afforded a great deal of self-direction of process, and significant latitude was also given to the exact form the final outcome might take.

In a major divergence from inquiry methods, classroom delivery was common during the first few weeks of contact, moving into supervision meetings as the project progressed. Although students were largely expected to work independently on project development, lecturers often provided individual and group support in the form of practical information and advice, thematic materials and leads. However, use of these materials was at the students' discretion. Assessment tended to focus primarily on resolution of the project artefact, logical progression and decision-making using appropriate processes for the outcomes. There was significantly less concern with theoretical engagement than that found in the independent inquiry method.

2. *Project methods — identified largely as 'authentic' tasks that students are required to complete largely independently, often extending over several stages of development. Differentiated in the literature as investigative (problem methods) or artefact-driven (project methods)*

Guided project method

This project type is closely related to the classic definition of problem methods. A key factor used to identify problem methods is that the investigative process is emphasised over and above the precise outcomes of student activity (Mills and Treagust, 2003), creating an open-ended learning experience. In addition a structured tutorial process provides a forum for student groups to

demonstrate learning and receive feedback (Engel, 1997). While the design context presented some differences in approach, the process followed a similar path of guided investigation in response to a defined scenario.

Primarily delivered through classroom contact, information provision largely focused on process rather than topic-related knowledge, with a significant proportion of activity directed toward students' articulation of their progress to the larger group. The tutor role was inclined to be that of guide to the process, setting guidelines for methods of investigation and pointing out areas of misunderstanding to prompt further study. This required students to develop their ideas independently, albeit within a predefined process, to develop clear communication skills, and to respond to process-oriented guidance. Assessment, accordingly, tended to focus on the explicit presence of definitive influences and breadth of investigation, and evidence of the required processes having been followed.

Directed project method

There were a significant number of projects that were structured to include lecturer guidance on process that bore a close resemblance to the guided projects. However these projects differed in that the major goal was the application of a provided or defined knowledge base to a structured process.

Class contact included a substantial amount of topic-related content delivery, reflecting the amount of information that needed to be passed to students in order for them to successfully complete the required outcomes. Accordingly, the primary lecturer role was that of expert and instructor, enabling students to master professional practices under supervision. Working in the role of a senior apprentice, students were to follow direction closely but also to manage time and resources independently. Decision-making and action were largely reactive, in that responsiveness to lecturer direction was valued over independence. Following direction and using provided information effectively were, accordingly, considered to be major factors in the evidence sought for assessment, differentiating this category strongly from independent projects, and indicating a lower level of autonomy than found in the guided projects.

3. *Activity methods – includes vocational education models of training, in which students are actively engaged in undertaking tasks that comprise the application of knowledge and/or skills*

In terms of teacher role and level of student independence, activity methods do not fulfil the criteria of project methods as defined by Adderley et al. (1975). However, these methods were included because they are equally directed at learning through completion of processes relevant to the field, and because they were as often described as projects as they were exercises or tasks. They also represent an important section of the continuum from autonomous to dependent learner.

Two modes of activity methods were identified in the design programs, each with distinct expectations of scope, complexity and the resulting assessment.

Project-oriented activity

The major feature of this method was that it was structured as small-scale skill building activities, building to a single artefact outcome. While the steps in each activity were prescribed, a further learning experience was provided in that students practiced, in sequence, the steps involved in putting together a project. These were therefore highly scaffolded projects, rather than discrete tasks.

Reflecting the level of prescription involved, classroom and workshop settings were used to deliver these projects, and much of the activity was carried out in class time. Materials, in the form of samples, workbooks, or background information were generally provided for each stage. In the early parts of this process, the teaching role was that of expert and director, requiring students to follow instruction carefully. However students were usually given some latitude to make relatively minor decisions in the later stages of artefact production. While adherence to the specified steps was the key assessment criteria, there was also discussion of the coherence of the final product that gave some weight to these decisions, and to the overall outcome, in the assessment.

Directed activity method

The goal of activity methods was to provide students with basic skills or knowledge in single units. Classroom delivery, step-by-step guides and directive instruction that controlled all aspects of the process required the student to act as a dependent learner. In most cases, students were completely dependent on following detailed rules and steps in order to successfully complete the tasks.

Although tasks could be quite complex, the approach to this process was to provide simple instruction that could be followed without prior knowledge. Each task was carried out as an end in itself, rather than as part of a larger process. Assessment was also relatively straightforward. Because there was little diversity in outcomes, completion of the required processes as directed was also the criteria for assessment.

4 Discussion

Four significant issues were found with alignment of the types. These were identified as those which presented the greatest response (negative or positive) from lecturers and students. A brief summary of these findings is given below.

4.1 Combining project types

In practice, project types were often used in combination. It was common for structured activities, for example, to be used as development toward

independent study, to provide learning experiences in areas of differing levels of difficulty, or where one topic or skill area had not had substantial coverage in previous units. In one of the observed units, project-oriented activities were used as building blocks for subsequent guided projects. In another, a guided project was followed by a directed project on a different topic. In each case, the shift in project type was given substantial explanation by the lecturer.

However, even with explanations about the scope and type of project, students often expressed some confusion or requested further explanation about how the process would differ from previous experiences. Students expressed similar issues at the beginning of each unit, and in two cases, individual students indicated that their expectations of how a project would proceed were based on previous project experiences. In one case, the entire student group expressed that they were confused at the difference in expectations and language from previous experiences and wished to have information about both the project and the reason for the differences. From the lecturer's perspective, a lack of knowledge about those previous experiences was frustrating both for developing the curriculum for the unit in question, and for understanding students' previous conceptions of the expectations. This appeared to indicate a need for common language, and greater collaboration between lecturers and convenors across the program in defining expectations and outcomes.

4.2 Impact of changes during delivery

At the domain level, during delivery lecturers often changed the nature of one or more sub-domains, including their own style of interaction, in response to perceptions of student capacity, misalignments in the written curriculum, and in response to student requests for more or less guidance. For example, in one project designed for the goals of guided investigation, with students taking on collaborative and reasonably independent roles, a lack of background knowledge and experience working in groups necessitated a need to shift to a less independent model. Most commonly, these adjustments were small – they took place within sessions and were shifts in interaction style and shared understanding, or time limited activities spontaneously arranged to deal with a specific unexpected gap.

However, each minor change to one aspect of delivery also required attention to the possible need for consequent shifts in other aspects of the process. Resources, levels and types of guidance given, the nature of the contact with the group and expectations of outcomes all have to be reviewed for alignment. Within the constraints of a timetabled unit and heavy workloads, this process is a challenging one for lecturers who often worked against the clock to revise materials and plans between sessions.

The most difficult of alignments to manage during delivery appeared to be adjustments to the assessment, which was written into the curriculum documents. Three strategies were noted as means of dealing with an inability to adjust

assessment where curriculum had altered, two of which required some subterfuge in relation to the assessment guidelines: acknowledged adjustments of expectations with some explanatory rationalisation (for example, largely ignoring the criteria and instead looking for underlying evidence to support a grade based on revised expectations), and; unacknowledged adjustments to expectations (sometimes in the form of marking on a curve). The third strategy, which did not require any shift in the assessment guidelines was that of marking to the guide regardless of its appropriateness to the learning experience of students.

4.3 Distance between curriculum development and lecturer roles

There were also indications that some misalignments remained unacknowledged and caused frustration for both lecturers and students throughout a unit. In particular, misalignments of lecturer approach to interactions and the level of independence of the project appeared to be difficult to negotiate and to have a significant impact on both lecturer and student experience. These misalignments of lecturer approach with the written curriculum raised some questions about the distance between curriculum development and the implicit belief systems of lecturers regarding the autonomous nature of creative work, the nature of studio practice, professional practice and the role of the lecturer.

In particular, projects described as independent where lecturers had a directive approach, or conversely directed activities where lecturers preferred to offer only general guidance, appeared to create difficulties with interactions. These difficulties appeared to have a significant effect on the overall learning experience and outcomes. Both lecturers and students expressed the effect as frustration with misunderstandings and slow progress.

However, while lecturers referred to these issues as frustrations, some were more able to identify the issue than others. In one case, although the concept of alignment was presented and the written curriculum was clearly aligned, there was less understanding of the impact of the role taken on by the lecturer. In other cases, the importance of aligning this role was also somewhat undervalued.

5 Conclusion

Although projects are widely agreed to be authentic, complex tasks with some level of independent development, the typology developed as a result of this study describes a spectrum of six project types arranged in a tentative hierarchy of complexity and student autonomy.

Inquiry methods are described as autonomous, highly individualised project experiences. *Independent inquiry* is distinct in its high level of student autonomy, while the *independent project* provides students with a more supported experience while retaining decision-making opportunities. Occupying a middle ground, the *guided project method* is specifically oriented to investigative development that extends student capacity for independent knowledge-building,

while the *directed project method* allows students to practice project development within topic and process guidelines. The two activity methods share some of the process and outcome characteristics of project methods and are also included in the typology. The *project-oriented activity method* is described as a series of tasks that culminate in a single outcome and thus build awareness of the project process, and *directed activity* is included with the qualification that when managed as discrete tasks, the outcomes do not exhibit the complexity generally claimed for project methods.

The study also suggests that lecturers select an overall project type with specific goals in mind, and that components of project delivery can be adjusted to align with these goals. In the dynamic context of project delivery, these alignments require continuous effort beyond the curriculum development stage into delivery and during assessment. The delivery of projects, as with any pedagogical practice, is a dynamic and complex process that involves a huge number of interrelated variables. Seen as a system, each aspect of the curriculum and the process of delivery has an impact on every other aspect, either directly or indirectly. The active nature of projects also increases the complexity of the lecturer's task. Projects, as authentic tasks, open up a range of opportunities for defining, guiding or supporting learning experiences. As the level of independence rises, so does the complexity and variability of those learning experiences in terms of resources and student experience, but also the potential for authenticity and depth.

The complexity and dynamic nature of this process presents a number of challenges for lecturers and for students. Maintaining alignment in a changing environment requires responsiveness and a high level understanding of each aspect of the curriculum and their interrelations, and responsiveness to student input. In this study, particular issues were raised with regard to the alignment across years of project types and language, the need for constant re-evaluation of alignment during delivery, and the potentially difficult adjustment of personal teaching style to align with project expectations.

The picture is demonstrably more complex than presented by existing definitions of project types. However, the picture is not yet complete. During this study, additional dimensions of project methods were identified, including models of professional engagement, modes of group work and inter-disciplinarity. Further contextual research is needed on the ways in which project types may be used in combination, their impact on the learning experience, the spread of project use across levels and types of program, and the exploration of domains and sub-domains as components of a dynamic educational system. Outside of the scope of this study, student motivations and the nature of the broader learning experience in each of the project types have yet to be investigated. Most importantly, given the context of the study, in a single faculty of design, it would be important to extend these findings in other environments with varying educational philosophies and organisational constraints.

Appendix. The project models typology

	Intent	*Delivery*	*Roles*	*Assessment/Outcomes*
Independent inquiry method	*Major goals*: Independent **exploration, definition and development** of a topic in an area defined by the student, aiming to achieve convincing argument. *Nature*: Open-structured and open-ended.	*Average time*: 12 weeks +. *Content*: Little or no provided topic content delivery. *Organisation*: Individualised projects. *Contact*: Individual tutor review discussions, student-directed peer support. *Resources*: None or general/ principles only, student chooses whether to use.	*Tutor*: Supervisor and collaborator in process and field (**collaborator**). *Student*: Professional, **autonomous learner**, self-reflective and self-directed, identifying learning needs and gathering appropriate knowledge, chooses processes.	*Form*: Artefact and/or defence outcome inc. presentation, thesis, product, documentation, oral defence. *Focus*: **Sophistication** − complex decision-making, deep and broad knowledge base, critical analysis, synthesis and formulation of arguments through thorough exploration of a field.
Independent project method	*Major goals*: Independent **investigation and development** related to a broadly prescribed area, culminating in the production of an outcome demonstrating breadth and depth of review. *Nature*: Open-structured, may be open-ended.	*Average time*: 6−12 weeks +. *Content*: Focus on process and context of topic/theme, delivered prior to or during project development. *Organisation*: Individual or group projects as collaborative, cooperative or supportive. *Contact*: Classroom or supervisory, group/individual peer and tutor review discussions, in-class scaffolding activities. *Resources*: Context/topic/process materials may be provided for guidance, students decide whether to use.	*Tutor*: General guide/ supervision as required (**advisor**). *Student*: Junior professional, **self-directed learner**, independent development, identifying learning needs and gathering appropriate knowledge with general support.	*Form*: Artefact and/or supporting material showing process inc. presentation, product, documentation. *Focus*: **Resolution** − decision-making, thorough and consistent development and articulation of a solution using appropriate processes and knowledge for the field.
Guided project method	*Major goals*: **Investigative acquisition of knowledge** and collaborative inquiry in a -defined area making significant use of decision-making, synthesis and argument. *Nature*: Defined iterative structure, but open-ended.	*Average time*: 3−12 weeks. *Content*: Some contextual content provided after issue presentation. *Organisation*: Individual or group projects, cooperative or collaborative.	*Tutor*: Guide/supervisor of process (**guide**). *Student*: Junior professional, **involved learner**, independent and collaborative peer learning and self-reflection, identifying learning needs and	*Form*: Problem definitions and knowledge gained inc. verbal and written or visual presentation of process and knowledge acquisition. *Focus*: **Investigation** − broad knowledge base and formulation of arguments

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Appendix (continued)

	Intent	*Delivery*	*Roles*	*Assessment/Outcomes*
		Contact: Classroom or supervisory, group/individual peer and tutor review discussions. *Resources*: Process materials, general topic materials may be provided, students should consider but may find own.	gathering appropriate knowledge within predefined processes.	through exploration of relevant fields and processes to depth in specific areas.
Directed project method	*Major goals*: **Competent use of knowledge**, processes, decision-making and analysis/synthesis of content under supervision. *Nature*: Minor variation of process/form/topic possible but generally not open-structured nor open-ended.	*Average time*: 2–8 weeks. *Content*: Content focuses on topic and process, delivered prior to or during project development. *Organisation*: Individual or group projects, cooperative or collaborative. *Contact*: Classroom or supervisory, group/individual peer and tutor review discussions, in-class scaffolding activities and instruction. *Resources*: Topic and general process materials and resources provided, students must use as directed by tutor.	*Tutor*: Guide/supervisor and expert on both topic and process (**instructor**). *Student*: Senior apprentice, **reactive learner**, independence is expected in terms of time-management, delivery of expected outcomes and choosing materials within broadly defined topic and processes.	*Form*: Artefact and/or supporting material showing application of prescribed knowledge to process. *Focus*: **Utilisation** – following prescribed processes to achieve a defined form of outcome, articulation of a standard knowledge base, process and rationale.
Project-oriented activity method	*Major goals*: **Skill development** and connecting prescribed processes into a larger outcome. *Nature of process*: Prescribed steps and structures.	*Average time*: 1–4 weeks. *Content*: Content focuses on topic, process is embedded, content/process descriptions delivered throughout. *Organisation*: Individual or cooperative group projects. *Contact*: Classroom setting, structured activities/tasks/topics and work in progress instruction. *Resources*: Functional process and topic-related resources, materials, students follow as directed.	*Tutor*: Expert and general controller of activity (**director**). *Student*: Apprentice, **obedient learner**, some independence in time-management may be expected, some decision-making may be required with regard to project content.	*Form*: Artefact and/or supporting material showing completion of tasks. Demonstration of a series of standard processes. *Focus*: **Adherence** – examination of skill acquisition using provided knowledge and quantitative and/or qualitative product/process outcome.

Directed activity method	*Major goals*: **Skills** and knowledge in narrow field aiming to achieve defined knowledge base and/or develop skills in single topic (internalised but uncritical). *Nature*: Highly prescribed, defined steps and outcomes.	*Average time*: 10 min to 2 weeks. *Content*: Content focuses on topic, process is embedded, content/process descriptions delivered throughout. *Organisation*: Usually individual but may also be small groups. *Contact*: Classroom or resource-based tasks, all students follow same instructions to complete specific distinct activities. *Resources*: Functional process and topic-related resources, materials, students follow exactly as directed.	*Tutor*: Expert and director of activity (**controller**). *Student*: Follower, no independent decision-making or time-management other than completion of basic tasks, **dependent learner**.	*Form*: Completed task. Demonstration of a standard process. *Focus*: **Completion** – examination of quantitative product/process outcome.

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