

Transport planning education in urban planning schools in Australia

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Abstract

In the next four decades, seventy per cent of the world's population will become urban, demanding improved mobility and better accessibility. Yet current transport planning practice at both international and domestic level has not been able to keep pace with the challenges posed by rapid urbanization, increased globalization and internationalization. Diversifying requirements of the transport planning industry and practice is further stressing universities to equip students not only with the tools of the trade to be able to connect ideas with action but also to have a deeper and more practical understanding of transport issues and challenges to result in reflective practice. In Australia, transport planning courses in academic institutions are increasingly progressing from being taught as a purely technical to a multi-disciplinary, practice-based discipline. Through an evidence-based scoping framework, this article examines the extent to which transportation planning curriculum design in various Australian planning programs addresses the needs of industry whilst also ensuring that students are able to develop appreciation of planning theories. The framework serves as a template to initially scope the capacity and capability of university-level transport planning education in Australian urban planning schools in addressing the emerging needs of the transport planning profession and to investigate the extent to which programs meet emerging needs of the industry. While results indicate a progression towards non-traditional multidisciplinary curriculum design, there are still areas that require significant improvement. The intent of this study is to assess the extent to which future planners can be equipped with the necessary skills to plan for transport effectively and the capabilities required to lead the next generation of transport planning practice.

1. Introduction

In the next four decades, seventy per cent of the world's population becomes urban (World Bank, 2009). The expected demand for better mobility and increased accessibility places pressure on the current practice of transport planning, both locally and at the international front, to be able to keep pace with the challenges associated with rapid population growth, urbanization, and globalization. Diversifying requirements of the transport planning industry and practice (Sussman 1995; Zuylen 2000) is further stressing that universities better equip transport planning students not only with the tools of the trade (Handy et al. 2002) to be able to connect ideas with action (Baum 1997; Ozawa, 1999; Seltzer and Ozawa 2002) but also to have a more practical and deeper understanding of the complexity of transport issues and challenges (Zuylen 2000; Ramsden 2003) so as to result in reflective practice (Schon 1983). Transport professionals in practice, however, lament on the skills-gap of new graduates when they enter the workplace (Handy et al. 2002). These students still have to undertake extensive training for specific skills that would make them more workplace-ready (Handy et al. 2002). Given the need to be more industry-relevant, academic institutions are now faced

with the challenge of ensuring that 'transport planning' courses address the widening gap between what is being taught in class and what is required in professional practice.

Also, being able to effectively link theory to practice is claimed to better prepare students to the rigours of professional practice (Ozawa and Seltzer 1999, 2002; Baum 1997; Friedmann 1995). Given that transport planning is a practice-based course, it therefore becomes imperative for transport planners to be taught and be able to acquire sufficient knowledge and understanding of planning theory (Khisty 1988). In addition, they also need to obtain the necessary knowledge and skills required of planners, in general (Ozawa and Seltzer 1999), and transport planners, in particular (Handy et al 2002). Current planning students, therefore, expect to be given ample opportunity to practice planning (Handy et al. 2002). However, Baum (1997) states that most planning (and even engineering) programs, where transportation courses typically sit, provide limited opportunities to be able to do so (Handy et al. 2002).

The paper investigates transport planning education in Australia. Through an evidence-based scoping framework, it explores the extent to which the transportation planning curriculum address the theory to practice nexus.

The paper is arranged in the following manner: Chapter 2 summarizes the literature review; Chapter 3 discusses the methodological design; Chapter 4 explores the results and discussions derived from the scoping exercise of different offering of transport planning courses in Australia, design of a transport planning course curriculum and the results of an perception interview/survey of transport planning students, markers and tutors at the University of Queensland; and the paper concludes in Chapter 5, with an overall summary, conclusion and further studies.

The study significantly contributes to the identification of measures to enhance transport education of future planners to be able for them to plan for transport effectively and be able to lead the next generation of transport planning practice.

2. Transport planning education: a review

This literature review aims to provide an overview on transport planning education at the university level and discuss the changing needs and challenges of transport planning practice and its impact on transport pedagogy; and identify gaps in literature between transport planning education and practice.

2.1 Transport education: linking theory and practice

The call to improve 'transport planning education' has been a constant agenda for academic institutions. This is in response to the changing needs of the profession and industry (Rupenthal 1998; Kaspar 1982). For example, Kaspar (1982) discussed the need for continuing professional education for managerial staff in transport companies in Switzerland while just a decade ago, Handy et al. (2002) found a mismatch between what is being taught in schools and the needs of the profession in the US.

Transport planning is usually a practice-based course. It generally sits under an urban and regional planning or an engineering program although, in some instances, it is also being offered in other non-planning/non-engineering disciplines such as 'tourism', 'business' or 'public policy'. As with most practice-based courses/programs, being able to effectively link theory to practice is claimed to better prepare students to the rigours of professional practice. As with most practice-based courses/programs, being able to effectively link theory to practice is claimed to better prepare students to the rigours of professional practice (Ozawa and Seltzer 1999; Baum 1997). While urban and regional planning students would expect to be given ample opportunity to practice planning, most planning programs provide limited opportunities to do so (Baum 1997). For example, only 19 out of 87 degree granting programs surveyed in the United States required internship while only 11 out of 33 required

work experience (Frankland, 1988). This lack of immersion of graduate students in real planning situations furthers the divide between concept/idea and action. In most instances, students study rational theoretical models and processes expecting this to be the model used in the workplace but only finding out later that what they are expected to do in the workplace contrasts with what they were prepared to do when they were in the university, therefore, further frustrating them (Baum 1997). Students, at the end of their degree, still have a vague understanding on how planning theories relate to practice (Friedmann 2008; Krizek and Levinson 2005).

Furthermore, in courses where students have the opportunity to undertake a project in a conventional studio setting, while they deal with a specific planning issue they are still taught in the “learning-by-doing” tradition, a mode, claimed by Baum (1997) to be an extension of the transmission model, where students are still considered as “empty vessels” waiting to be filled. The emphasis is often on the mastery of generic skills (Arefi and Triantafillou 2005) rather than being able to translate planning theory into practice (Friedmann 1995; Friedmann 2008). According to Baum (1997), this bias in planning education towards training for traditional academic disciplines and away from planning practice was brought about by educators who are foremost academicians rather than practitioners, and are being rewarded in being so. Although these educators, who come from diverse traditional disciplines, bring to the planning discipline their own theories and concepts which are then translated into planning language and discourse (Friedmann 2008), the planning curriculum is still designed in such a way that “academic and practice coexist as separate cultures” (Baum 1997). However, there has developed in recent decades a more aligned and integrated curriculum (Biggs, 1991) with the adoption of non-traditional methods of learning and teaching, and emphasis on different ways to engage students to motivate deeper approach to learning (Ramsden 2003).

The design and development of the transport planning curriculum has largely depended on the influence, innovation and changes in the general field of urban and regional planning (PIA, 2010). It has, however, advanced from being taught as a purely technical subject area, where the concern was to calculate and design roadway capacity, to becoming a multidisciplinary subdiscipline (van Zuylen 2000) generally addressing issues of health, equity and sustainability (Handy et al. 2002). In the 1960s and 70s, the rational-theoretical planning model significantly influenced the field of [transport] planning (Ozawa and Seltzer 1999; Friedmann 1995) which led to the delivery of a technically-oriented transport planning course curriculum. With the introduction of communicative practice in the 1980s and 90s (which was a response to Lindblom’s disjointed incrementalism, Davidoff’s advocacy planning, and Alan Altshuler’s critique of comprehensive planning, among others), [transport] planning pedagogy was reviewed and revised to be able to capture its thrust towards policy-orientation and to be able to facilitate communications in a critical manner (Friedmann 2008; Ozawa and Seltzer, 1999), further reflecting the changing facets of the [transport] planning profession and subsequently incorporating these changing objectives into the curriculum (Handy et al. 2002).

Current urban and regional planning graduates are trained and typically complete the program as generalists (Friedmann 2008). Thus, they often have limited understanding of the core planning theories and how these relate to practice. However, practitioners also require specialist training and skills so as to perform more effectively in their jobs (Arefi and Triantafillou 2005). Sussman (1995) argued that the ‘new transport professional’ must have skills that are both broad to better understand the bigger picture as well as deep, implying that a planner must also be an expert in at least one subdiscipline across the ‘planning practice’ spectrum. Alongside a broad set of knowledge and skills, for example, they also need to acquire specific technical skills such as proficiency in Geographic Information System (GIS) (Handy et al. 2002). Additionally, van Zuylen (2000) emphasized that planning’s multidisciplinary (van Zuylen 2000) is one of its selling points to future students, however, Krizek and Levinson (2005) contend that limited literature exists that explore across

its various specializations. Orlick (1993), through interviews with professional planners, found a need to enhance planner's communication skills (e.g. working well with colleagues, working with the general public, and understanding the needs of the client), a requirement further validated in a study by Handy et al. (2002). Similar to other practice-oriented discipline, the diversifying requirements of the planning practice demand that academic institutions provide the students with adequate knowledge and skills so as to link ideas to action (Freeland 2009). However, given that only a limited number of courses can be accommodated in a broader program, and only limited hours can be allocated to cover the broad and multidisciplinary field of planning, these programs must decide on which courses to include. Within each course educators must then choose from amongst a diverse set of important topics what they should teach. The inevitable exclusion of many concepts and topics results in critical gaps in the curriculum, which may potentially reduce the effectiveness of courses and of the overall program. In the long run, this may eventually affect negatively on the planning practice and to the wider community as well. Conversely, attempting to 'teach everything' in a shallow and superficial manner precludes students from being able to achieve deep learning (Krizek and Levinson 2005: 313). A balance must be sought.

2.2 Experiential learning to bridge theory and practice

Experiential learning promises to be a potential strategy in linking theory to practice (Freeland 2009; Friedmann 1995; Friedmann, 2008) as learners who are highly engaged in the learning activities would be more likely to use learned theories in their professional practice. Some experiential-based instructional approaches that provide students the opportunity to experience practice in a workplace setting include: work-based learning through practicum (Kotval 2003) and internships (Baum 1997; Nocks 2002), learning by doing through studios (Arefi and Triantafillou 2005), problem-based learning where students solve real-world issues (Gaber 2007), paired teacher lecturing of practitioner and academician (Hudson 2005) and service learning education (Norris-Tirell and Roakes 2000). For example, internships provide an opportunity for students to undertake actual practice but informality and lack of structure may leave them without adequate feedback from and reporting to faculty members (Baum 1997). On the other hand, undertaking a practicum allows students to experience urban planning issues, assists in students' confidence and knowledge building, and provides community service (Kotval 2003; Norris-Tirrell and Roakes 2000), however, to ensure that it is a student learning-focused activity, this should be implemented alongside client's active participation in work scoping, mentoring on an "as need" basis and must ensure that timely feedback is provided. Studios can also provide students with a real world planning context (Arefi and Triantafillou 2005) in teaching a planning studio, Arefi and Triantafillou (2005) emphasize the importance of transcending the tangible to include less tangible aspects, thus, moving from conventional teaching approaches to non-traditional ways, becoming co-investigator, towards experiential and reflective techniques of understanding. In problem-based learning (PBL) students use "triggers" from the problem case or scenario to define their own learning objectives. Subsequently they do independent, self-directed study before returning to the group to discuss and refine their acquired knowledge. Thus, PBL is not about problem solving per se, but rather it uses appropriate problems to increase knowledge and understanding. The process is clearly defined, and the several variations that exist all follow a similar series of steps (Wood 2008). While there are a number of possible options to ensure that effective progression from being a student to trained practitioner, in-depth examination on these alternatives becomes imperative.

2.3 Summary

This review has established that professionals who can effectively link theory to practice are observed to be more competent, employable and can easily assimilate the rigours of the workplace (Shinkman and Montross 1992). While both transport planning (and engineering) educators say that they are preparing students for professional practice, the divide between

academia and the professional world continues (Handy et al. 2002). In addition, many of the skills that are important for today's transportation planners are not skills that are traditionally imparted through the classroom, particularly skills related to working with people, thus, a need to re-examine transport planning curriculum design is in order. The need to explore the extent to which course design can be improved to address the dual challenge of honing practical skills that are relevant to practice while being able to develop appreciation towards planning theory is important and critical. While as early as 1997, the Transport Research Board in the US has commissioned a comprehensive study on transport planning education (see Handy et al 2002), to the authors' knowledge, only very sparse study of this kind has been conducted outside of the United States. Thus, if planning theory pertains to good practice, what then should the learning and teaching of transport planning include and how should this be transferred?

3. Methodology

This paper draws on two data sources: the electronic course profiles of transport planning courses offered across universities in Australia, and an interview/survey administered to students, tutors and markers involved in the delivery of the transport planning course at the University of Queensland.

First, a web search was conducted to identify 'transportation' courses being offered at various academic institutions across the country. Course profiles that included 'transport,' and/or 'urban' or 'planning' in their course titles were collated and included in the analysis. Second, to evaluate the course profiles a scoping framework was developed to serve as an exploratory tool to conduct an inventory of university-level transport planning courses being offered at various academic institutions. The scoping framework evaluated available course profiles based on their content, structure, and other course attributes, including learning objectives and learning activities. Courses that did not offer adequate information were not included in the analysis for this paper. Third, using the same framework, a more comprehensive analysis was undertaken on the design of the transport planning course curriculum being offered at the University of Queensland. Fourth, a semi-structured interview/survey was administered to seven transport planning students, two tutors and two markers involved in the delivery of the transport planning course at the University of Queensland so as to gather their perception on curriculum design, learning activities and course assessments with respect to the extent that the course and its learning activities were able to link theory to practice.

4. Results and discussion

Results from the analysis are presented in three sections: (1) Transport planning courses in Australian higher education; (2) Designing an integrated transport planning curriculum; and (3) Linking theory to practice: transport planning course in UQ.

4.1 Transport planning courses in Australian higher education

The Planning Institute of Australia (PIA), the country's peak body in urban planning, stipulates in its Accreditation Policy document released in November 2010 that planning programs must advance one or more of the five supportive knowledge areas (i.e. urban design, social planning, environment planning, transport planning and economic planning) to emphasize the importance of integrated approaches to planning. Most, if not all, of these supportive knowledge areas are taught as part of urban and regional planning program curriculum across Australian academic institutions. For example, at the University of Queensland's (UQ) School of Geography, Planning and Environmental Management (GPEM), 'Transport and infrastructure planning' is being offered as a core course in both undergraduate and postgraduate planning degrees. It is one of the interdisciplinary courses being offered by the School, along with urban design, and planning theory, among others.

Same goes with the 'Transport planning' course at Griffith University which sits in the School of Environment, and offered in both the Nathan and Gold Coast campuses.

A total of 16 academic institutions out of 39 universities across Australia offered 'transport' courses both at the undergraduate and postgraduate levels. Table 1 shows the list of transport and transport-related courses being offered across Australian academic institutions. Some of the academic institutions offer transportation as a postgraduate degree program (see for example, Monash University), but in general, 'transport' is being offered as a single course in a planning or engineering program. When there is only one transport course being offered in a program, the content is generally broad and covers various topics (see Table 2), while programs that offer two or more transport courses seem to provide more in-depth and specialised discussion of a particular aspect of transportation. While these courses seemed to offer a large variation in content and structure, and therefore, presented a significant challenge in the analysis, given that the task is exploratory in nature, the sample of courses still allowed an overview of course content and structure, as well as their capacity and capability in addressing current and emerging needs of the profession and industry.

Table 1: Programs that offer transport planning courses

Variables	Program	Faculty/School	Campus location	Course title	Course coordinator
Griffith University	Urban and Environment Planning Program/	School of Environment	Gold Coast/ Nathan Campus	4037ENV Transport Planning	A/Prof Neil Sipe and Dr Matthew Ian Burke
The University of Queensland	Planning program/	School of Geography, Planning and Environmental Management	St Lucia (Brisbane), Queensland, Australia	PLAN3002 Transport & Infrastructure Planning	Dr Derlie Mateo-Babiano
Queensland University of Technology	Faculty of Engineering/ Department	Faculty of Engineering/ Department	Kelvin Grove	ENN576 Transport Planning and Strategic Modelling	Dr Zuduo Zheng
University of New South Wales	Planning and Urban Development/	Built Environment	Kensington Campus	Transport Planning - BENV2938	Mr P Williams
University of Sydney	Institute of Transport and Logistics Studies	Faculty of Business		TPTM6240 - Public Transport Policy and Planning	Professor Corinne Mulley
University of South Australia	School of Natural and Built Environments	Division of Information Technology, Engineering and the Environment	City East Campus	ARCH 5014 Transport and Planning	Dr. Andrew Allen
University of Melbourne	Urban Design and Planning	Melbourne School of Design	Parkville	ABPL90090 Public Transport Network Planning	Dr John Stone
University of Adelaide		Department of Planning, Transport and Infrastructure (DPTI)	Ngee Ann-Adelaide Educn Ctre	TECHCOMM 7043NA Infrastructure 1 - Transport, Roads & Rail	N/A
Monash University	Department of civil engineering/	Faculty of Engineering	Clayton	CIV4283 - Transport planning	Assoc Professor G Rose
Southern Cross University	School of Environment, Science and Engineering	Bachelor of Engineering (Honours) in Civil Engineering	Lismore	ENG40002 - Transport Engineering	
University of Tasmania	Science, Engineering and Technology		Hobart	KNE314 – Transport Engineering	Mr K Midson
University of the Sunshine Coast	Bachelor of Regional and Urban Planning	Faculty of Arts and Business	Sippy Downs	ENP336 Regional Infrastructure Planning	Associate Professor Johanna Rosier
University of Southern Queensland	Faculty of Engineering and Surveying	Agricultural, Civil, Environmental Engineering	Toowoomba	CIV3703 Transport Engineering	Trevor Drysdale
Swinburne University of Technology	Master of Engineering Science (Civil)	Faculty of Engineering and Industrial Science	Hawthorn	CVE80003 Transport Planning, Modelling and Economics	N/A
Curtin University	040100 Architecture and Urban Environment	Department of Urban and Regional Planning	Bentley Campus	12730 (v.3) Transport Planning 212	N/A

4.2. Designing an integrated transport planning curriculum

The design of curriculum, whether at the program or course level, demands new ways of engaging students. The aim is to encourage greater student involvement and stimulate deeper student learning (Ramsden 2003) so as to effectively link knowledge to action (Friedmann 2008). According to Drake (2007), enhanced student learning and engagement can be realised by constructively aligning (Biggs 1999) and integrating various elements within the course or program (Drake 2007; Cowan 2004; Laurillard 1993), including its learning objectives, learning activities, and course assessments. Cowan (2004) states that instructional approaches, if not aligned with its learning objectives, would fail to elicit the desired outcomes or target identified graduate attributes (Cowan 2004; Laurillard 1993), thus, the need to establish concrete and measurable learning objectives is an essential first step in curriculum design (Ramsden 2003). Table 2 summarizes course backgrounds, aims and/or objectives of the various transport courses being offered across Australian universities included in the sample. Learning objectives of transport planning courses are assessed based on the performance outcomes set by PIA (2010). These include: knowledge of the relationship and integration between transport and land use; knowledge of the principles of transport planning and modelling; knowledge of various transport modes and their operation; capacity to critique plans and design proposals, according to sustainable transport planning principles, linking these with other forms of planning and urban change influences; and capacity to produce transportation plans at a level demonstrating understanding of the main components of transport plan production and implementation.

Table 2: Course background, aim and learning objectives, selected transport courses

Variables	Course title	Course background/Course aim/learning objectives
Griffith University	4037ENV Transport Planning	This course explores the theory and practice of transport and land use planning <ul style="list-style-type: none"> To learn what transport planning is, its theoretical underpinnings and its practice. To understand key concepts in transport, land use and urban form. How to conceive and operationalise travel behaviour and transport networks, evaluate schemes, and conduct basic accessibility and transport modeling. Working knowledge of policy options available to manage traffic and travel demand. Ethical practice in public engagement and information gathering. Critical research and problem solving skills
The University of Queensland	PLAN3002 Transport & Infrastructure Planning	The overall aim of the course is to increase student competency in the production and implementation of transport and infrastructure plans in various context. <ul style="list-style-type: none"> Discuss the relationship and integration of transport and land use. Differentiate between transport modes and their operational characteristics. Demonstrate understanding of transport modelling, and the principles of transportation and infrastructure planning and policy. Integrate theory and practice of transport and infrastructure planning. Critique transport and infrastructure plans according to transportation and infrastructure theories and principles. Demonstrate capacity to develop, produce and implement transport and infrastructure plans.
Queensland University of Technology	ENN576 Transport Planning and Strategic Modelling	The aim of this unit is to provide students with a professional education in the transport engineering practices of transport planning, modelling and evaluation.
University of New South Wales	Transport Planning - BENV2938	This course aims to provide an introductory understanding of the role of transport planning as a planning tool that can be used to achieve positive planning outcomes in the urban built form. It provides an introduction to the theoretical, applied and policy aspects of transportation planning with special reference to public transport issues in Sydney built environment
University of Sydney	TPTM6240 - Public Transport Policy and Planning	Having relevance to all areas of transport, urban planning, public administration and passenger logistics, this unit provides an understanding of the characteristics of public transport systems and creates a framework to analyse public transport performance. It considers topics relevant to an appreciation of public transport operations and the role of public transport in the overall transport 'offer'. The key focus is to instil a broad understanding of the concepts, issues and impacts of public transport for intra- and inter-urban areas and for rural areas. Within the context of an analytical framework,

		this unit builds an appreciation of the importance, the drivers and the problems of achieving efficient operation of transport systems. Public transport management is heavily influenced by the regulatory and institutional framework and the financial environment in which public transport operates: these key issues are explored to explain why countries/states have different levels and types of public transport.
University of South Australia	ARCH 5014 Transport and Planning	To provide planning students with an understanding of urban transportation planning issues and of contemporary policies and strategies for managing demand for travel.
University of Melbourne	ABPL90090 Public Transport Network Planning	This subject will enable students to begin to develop expertise equivalent to that which underlies traditional traffic planning and engineering. It will allow them to participate confidently in professional processes to improve urban transport systems.
Monash University	CIV4283 - Transport planning	Examines the performance, impacts and costs of various urban passenger transport modes and the factors influencing the level, pattern and trends in urban travel demand and the issues relevant to selecting a mode for a particular urban passenger transport task. The role of the analytic methods used in transport planning is examined as are the factors to be considered in conducting transport surveys including sample design, questionnaire design and survey administration.
University of Adelaide	TECHCOMM 7043NA Infrastructure 1 - Transport, Roads & Rail	Objective of the course is to assist project managers appreciate planning and delivery aspects of transport and road infrastructure. Introduction to an infrastructure planning model which recognises 1- Definition of project goals within a framework of community needs (recognition of Australian economic, social & environmental strategies and goals; assessment of community needs; assessment of alternative proposal), 2- Long term planning issues (involvement of level of government; objective appraisal of economic, environmental and social costs of current deficiencies, 3 - Business case issues (funding model; identification of technical and business risks and management; use of a phase-gate model for approval; identification of whole of life costing, 4- project delivery issues (identification of alternatives; creation of a project board), 5- Ongoing management (operation and maintenance responsibilities. Application of the above model to planning of transport and roads; planning of road systems and integration with rail and transport interchanges; identification of responsibilities at levels of government and the delivery sector; application of project management planning and control systems.
Southern Cross University	ENG40002 - Transport Engineering	This unit introduces students to transport planning and design for urban, regional and national transport systems. It builds upon the previous unit of Fundamentals of Traffic Flow. The unit covers the design, operation and maintenance of transport infrastructure and deals with environmental impacts and efficiency of transport systems. Topics include: travel demand forecasting and analysis; transport planning; sustainable transport; geometric design; pavement technology; and road safety.
University of Tasmania	KNE314 – Transport Engineering	Transport modes and planning; economics of transport; traffic and highway engineering including vehicle characteristics, collection of traffic data, parametric and non parametric tests applied to traffic engineering problems, headway distributions, gap and delay models, speed and flow relationships, roadway capacity -- uninterrupted and interrupted flow, isolated traffic signals, coordinated traffic signals, traffic accidents; environmental problems associated with roads, road design standards, geometric design of roads, pavement materials, design and evaluation of road pavements, maintenance strategies.
University of Western Australia	CIVL5502 Transportation Engineering	This unit is designed to develop students' knowledge in road transportation engineering and studies (e.g. road transportation and the societies, geometric design of roads, pavement design, fundamentals of traffic flow and queuing theory, road capacity and level of service analysis, traffic control and analysis at signalised intersections, travel demand and traffic forecasting, and economic evaluation of road projects). Students who pass the unit have opportunities to work in transport planning, traffic engineering and road design. The objective of the unit is to develop an understanding of the composition and behaviour of traffic, its demands on the road system and project evaluation, and a working knowledge of the functional design of highways. On completion of the unit, students are able to apply knowledge of highway engineering, traffic analysis, design of signalised intersections and road project evaluation. The topics include (1) introduction to road transport; (2) geometric design of roads; (3) pavement design; (4) fundamentals of traffic flow and queuing theory; (5) road capacity and level of service analysis; (6) traffic control and analysis at signalised intersections; (7) travel demand and traffic forecasting; and (8) economic evaluation of road projects.
University of the Sunshine Coast	ENP336 Regional Infrastructure Planning	This course focuses on the planning and provision of regional infrastructure. Need and distribution are considered for various types of infrastructure, including transport, roads and rail, water and sewerage, disposal of solid and liquid waste, energy, and services such as schools, health, communications and recreational facilities. Students will consider demand management land use planning implications for water and transport

		infrastructure including integrated urban water management, active transport, public and private sector provision, and how government expenditure can be targeted to those areas of greatest need
University of Southern Queensland	CIV3703 Transport Engineering	The planning, construction and operation of civil engineering works is critical to the well being of societies within the modern world. It is important that the graduate civil engineer has a broad understanding the role and planning of transport systems. As the majority of civil engineers working in the transport sector are concerned with road transport, a greater emphasis will be placed on this mode of transport. Students of this course will be assumed to have a basic understanding of statistical techniques, spreadsheets, soil mechanics, engineering materials and technical drafting skills (including CAD).

In general, transportation courses covered a range of transportation and transport-related topics. It appears that these courses were intended to acquaint students with the diverse themes covered within the transport discipline, and not necessarily encourage an in-depth understanding of a particular subject matter. Regardless of the course being delivered in the planning or engineering program, all of the courses aimed to “enhance one’s capacity to plan,” a performance outcome explicitly identified by PIA (2010). The document stipulates the need for planners to enhance one’s “capacity to produce transportation plans at a level demonstrating understanding of the main components of transport plan production and implementation.” While five courses aimed at gaining knowledge and skills in “modelling,” four transport courses studied various “modes of transport.” Both “modes of transport” and “transport modelling” were also explicitly identified as performance outcomes in transport planning (PIA 2010). Transportation engineering courses being offered in four academic institutions had strong emphasis on road transport and traffic. Among the 14 transport courses, only two courses explicitly focused on public/passenger transport. These two courses provided an in-depth focus on public transport management, policy and planning. While two of the performance outcomes emphasized ‘integration,’ for example, “integration between transport and land use” and “linking these [transport plans and proposals] with other forms of planning,” only two of the 14 courses mentioned “integration” and only three course offerings included “land use” in their backgrounds/aims/learning objectives. “Linking theory to practice” was not a specific performance outcome identified by PIA. However, as noted earlier, various authors have suggested this should be an important focus. Only three courses have mentioned the need to link theory to practice. A number of courses have explicitly mentioned the need to increase the knowledge of transport professionals and/or managers alluding that transport planning is a practice-based and a professional course. Interestingly, some of the topics identified by transport professionals that needed priority focus in Handy et al.’s study (2002), such as public involvement, bicycle and pedestrian planning, transit planning, regional transportation planning, and multi-modal integration - are missing in most of these transportation course offerings.

4.3. Linking theory to practice: transport planning course in UQ

Transport planning is one component offered in the ‘transport and infrastructure planning’ course offered at the University of Queensland. As a result of the PIA accreditation board review as well as student feedback, the course curriculum was redesigned in 2011. The underlying principle in the curriculum revision of the transport and infrastructure planning course was guided by the need to ensure the connection between theory and practice. Given that Transport planning is a practice-based course, the course structure and content included various elements that would encourage experiential education. For example, assessments took on a real-world project example (Freeland 2009), the course also invited practitioners to lecture into the course (similar to the approach of Balsas 2001), and tutorials were developed based on a problem-based learning framework (Wood 2008). In so doing, students were exposed to authentic hands-on activities that provided experiences in team processes, real world examples, and case studies, which made the curriculum more relevant to practice.

4.3.1. Learning activities

The learning activities were combined and developed into three modules using a mixed teaching approach as opposed to a pure lecture delivery (Fortin and Legault 2010). Transport Planning modules were delivered in 2 weeks of 2-hour weekly blocks drawing upon various domestic and international case studies and examples. This was followed by an hour of problem-based tutorial (Wood 2003; Drake 2007). PBL-based module design was in accordance with the process outlined by Wood (2008). Each module incorporated a weekly tutorial. The tutorial served as venue for small group activities, expanding on a specific aspect of the module. The role of the tutor was to facilitate student's self-directed learning. The success of the tutorial is highly dependent on experienced tutor facilitation. Therefore, a workshop before the initial tutorial session is conducted to prepare tutors on their role as facilitators (Wood 2008; Wood 2003).

4.3.2. Assessment design

Evidence drawn from the academic literature show that assessments significantly influence student learning behaviour (Frankland 2008; Wedlund et al. 2009; Gibbs and Simpson 2004-2005). Ramsden (2003) affirms how students learning is largely influenced by how students perceive they will be assessed (Ramsden 2003; Frankland 2008) while Gibbs and Simpson (2004-2005) attest that students tend to put more effort on aspects of the course that are assessed. Therefore, assessments can be a good predictor of student learning.

While it was crucial that the sequence of assessment tasks were developed to align with the course aim and learning objectives, it was also important that these assessments enabled the link between theory and practice. Boud's (2010) seven principles served as a useful guide in the development of the scope and sequence of course assessments in the transport and infrastructure planning course that was offered in UQ. For example, providing different types of assessments "responds to the diverse expectations and experiences of entering students" (Boud 2010) and can, therefore, enhance student engagement and learning. Two assessment tasks measured student learning in the transport component of the course. These included a (1) critical essay and (2) a major transport project with an oral presentation and short reflection component. Table 3 provides a summary of the assessment tasks and the learning objectives these assessments address.

Table 3: Assessment Design of Transport planning offered at UQ Programs

University	Item No.	Assessment Description	Weighting	Learning objectives
The University of Queensland	1	Critical essay of a transport issue	20%	Discuss the relationship and integration of transport and land use. Critique transport and infrastructure plans according to transportation and infrastructure theories and principles.
	2	Transport project	40%	Discuss the relationship and integration of transport and land use. Differentiate between transport modes and their operational characteristics. Demonstrate understanding of transport modeling, and the principles of transportation and infrastructure planning and policy. Integrate theory and practice of transport and infrastructure planning.

Boud (2010) pointed out the importance of developing independent learners through "early engagement in manageable assessed tasks" by the students. This not only provides initial progress but also identifies areas requiring further support. In the case of the design of Assessment item 1, the task was carefully structured so that students are encouraged to be independent learners. Students were asked to identify a transport issue by critically reviewing

various articles dealing with that particular issue. By doing this activity, students were “inducted into the practices and cultures of higher education” (Boud 2010).

While assessment item 1 was an individual undertaking that encouraged independent learning, Assessment item 2 was a team-based project conceptualised to provide experiential education (Kotval 2003). For assessment item 2, each group consisted of three members. Each member took on a specific role simulating a project team in the workplace. Aside from providing hands-on experience and a real world setting, learning in a collaborative environment facilitated the development of generic skills and capabilities (e.g. teamwork, analytical and cognitive, collaborative, organisational skills and time management), which are highly valued by future employers (Handy et al. 2002). It was expected that the full list of learning objectives would be met at the end of this assessment.

Through Assessment item 2, students were expected to demonstrate knowledge and understanding of the transport planning process; their ability to apply transport planning theories and principles towards completing a project; develop transport planning plans and strategies; and demonstrate capacity to develop policy and controls towards achieving stated transport planning outcomes. Students were also expected to work in a group setting, explore factors that affect design decision making and develop transport planning and communications skills (Friedmann 2008; Ozawa and Seltzer 1999).

Formative feedback on their attempts as well as a group oral presentation were expected to actively improve student engagement and learning (Boud 2010). Presentation was set two weeks before the final submission of the transport planning project, allowing ample time to incorporate feedback and constructive criticism. Individual critical reflection on one’s actions and learnings was an essential part of the whole learning process. When done regularly, critical reflection assisted in developing the reflective practitioner (Schön 1983).

Perception on the transport planning course curriculum

According to Nocks (2002), practice-oriented pedagogies such as transport planning would benefit from experiential education wherein learners are highly engaged in the activities at hand. Perceptions of individuals involved in the course were elicited in terms of the extent to which the transport planning course curriculum and its elements explicitly and effectively enabled the link between theory and practice.

Two learning activities incorporated into the curriculum, in the “*transport project assessment*” and “*case studies discussed in class and tutorials*”, were considered to encourage the link from theory to practice. This was confirmed by one interviewed ‘marker’ who stated that “*best practices from other countries*” and “*the local transport project*” were important aspects that enabled the link from knowledge to action. One tutor further articulated, “*the transport project was practical and application of theory was at its best as they [the students] could do it as part of their assessment,*” and in doing so, “*students began to show some deeper understanding of [the] role of each transport mode and the importance of sustainable transport options.*”

It was also helpful to identify which aspects of the transport project assessment motivated students to link theory to practice. Six of 7 students strongly agreed that “*identification of a transport issue*” and “*consideration of the triple bottom line outcomes*” allowed them to link theory to practice while seven agreed that “*consideration of transport modes and their operations*” and “*land use and transport integration*” provided them the opportunity to link theory to practice.

A question was then posed to the participants on what aspects of the transport project should be improved to better link theory to practice. Student-, tutor- and marker- participants uniformly agreed that although the lectures touched extensively on principles, theories and concepts dealing with transport data, modelling and analysis, this was not effectively translated in the transport project assessment due to time and resource constraints. The short time frame of the transport project did not allow them to conduct even a simple

modelling activity. As one student participant indicated, a minimum of 3 months is required from data collection, encoding and analysis for a simple micro-simulation modelling. A tutor expressed this observation quite aptly: *“major limitation of the assessment is the availability of data. Groups who were not able to access accurate data did not get the full experience of data synthesis and analysis and the impacts on real life projects. I feel that this lack of data and information meant that some groups did not explore the options and develop recommendations to the fullest extent...”*

Because of identified constraints, although students realised the importance of having both quantitative and qualitative aspects, and combining the two, most groups ended up focusing only on the qualitative aspect. Improvement suggested by student respondents included further support through lectures and/or tutorials on *“how to construct a transport model...”* and *“how to obtain data from main sources in QLD [Queensland] would be extremely helpful.”*

Some of the student respondents expressed that discussion with project stakeholders had been overall valuable and insightful. One improvement suggested was the need to increase involvement of stakeholders in the project. For example, a student put forward a recommendation to involve a ‘real client’ and one tutor suggested a close supervision by a Brisbane City Council staff on a council project. This recommendation reflects the critical role of actors in planning and the experiential knowledge developed through action. The move towards social planning is strongly advocated by Friedmann (1995) stresses the importance of shifting from a “document-oriented and anticipatory mode of planning to a transactive-style between planner and action.”

5. Summary, conclusion, and recommendation

If the aim is to successfully educate what Sussman calls the “new transport professional,” the call to examine transport planning education is in order. This paper is an initial attempt at examining transport planning education in an Australian context. Whilst from the outset, the intent of the scoping study was not to undertake an extensive audit of teaching and learning practices in transport planning education, the exercise allowed an initial documentation of the diversity in transport courses being offered across academic institutions. A more comprehensive and in-depth evaluation of these courses will therefore improve our understanding about transport planning course curriculum design, especially within the context of Australian transport education.

It also showed that current courses that are being offered in Australia, when assessed against the Planning Institute of Australia’s identified performance outcomes for transport planning, still fall short in a number of aspects such as the lack of focus on integration, and integrating land use and transport, among others. Through the investigation of the curriculum design of one transport planning course, it was able to examine the extent to which practice-based courses such as transport planning benefit from experiential learning approaches. While the paper was able to examine innovative practices and highlighted good pedagogical practices that assisted in the translation of knowledge into action, gathering a more diverse viewpoint and perception not only of students but of other stakeholders and actors, including professionals in practice, would provide a more holistic view about the gaps in curriculum and education.

To develop a more integrated and coordinated transport planning curriculum which more closely aligns with the needs of industry and practice, transport planning education must encourage deep rather than surface learning amongst its students to further encourage appreciation of planning theories; must be able to link theory to practice so as to effectively address the needs of industry and be relevant to practice; and maximize the potential of learning and teaching transport planning within the context of a more interdisciplinary and multidisciplinary program.

A rolling research program, working with transport employers across jurisdictions, is needed to continually ascertain industry needs for planning and engineering graduates. Other research needs include analysis of whether transport planning education in emerging regions is adequate for the pressing demands in such locations as Asia's mega-cities (see Burke, Mateo-Babiano and Pan, Forthcoming). And further interrogation is required to clarify further as to whether and how the curriculum changes made at university like UQ and Griffith are leading to improved student learning outcomes and graduate readiness.

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