An innovative approach to planning education for post-normal times: a case study involving enhanced bushfire risk in periurban areas

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ABSTRACT: *Climate change is described as a "super-wicked problem", inferring that it is a problem involving great complexity and deep uncertainties. Climate change is expected to exacerbate current levels of risk in the periurban areas of Australia's cities and so intensify the complexities of environmental planning and management. Such complex problems are making novel demands on environmental planners' and managers' capacities. This paper reports on use of an innovative WIKI platform to give environmental planning and management students the opportunity to (i) develop their capacities for addressing complex climate change problems; and (ii) undertake strategic approaches to environmental planning and management. The WIKI approach involved small teams working collaboratively to critically analyse existing strategies and develop strategic frameworks aimed at increasing social-ecological resilience in the study area. Subsequent review and reflection lead the authors to reframe their view of the requirements of planning education in equipping student planners to deal with wicked climate change problems. In this paper we canvass the implications for planning educators and planning students.*

Keywords: *wicked problems; climate change; online learning; bushfire risk; planning education*

Introduction

This paper reports on a joint project between the Bushfire CRC Teaching and Learning Unit, which is responsible for incorporating bushfire research into higher education in Australia, and the University of Tasmania's School of Geography and Environmental Studies' planning course. The project concerned the incorporation of bushfire planning and management for climate change into the School's postgraduate planning course, specifically a unit entitled *Planning and Managing for Climate Change*. The unit coordinator was seeking appropriate case study material that might be utilised in demonstrating planning and managing for very complex or wicked problems that climate change poses for such areas. The Bushfire CRC had identified key gaps in higher education where it might be important to build the capacity of future students to deal with increasing risk of bushfire in Australia and was keen to build partnerships with planning educators to develop and trial learning experiences around bushfire risk. This interdisciplinary project grew out of this convergence of needs.

There were several key parameters that the design of the learning task had to take into account. The case study material had to have a strategic focus[1]; it had to be delivered online with students engaged in distance learning from across Australia; it had time constraints of two to three weeks; it was to be underpinned by the pedagogy of collaborative problem-based

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[1] Planning staff wished to develop students' strategic planning and management skills in the realization that a strategic focus is important in dealing with longer-term problems.

learning; it had to demonstrate the different aspects of climate change as a wicked problem; and it had to provide an opportunity for students to apply their coursework learning (key ideas of adaptive management and resilience) to an authentic situation. The challenge for the unit designers was to create a learning task that could build a range of student capacities and develop novel understandings which could then inform the fire management industry.

A Planning and Science Officer from the Tasmanian Fire Service contributed to framing the learning task to represent an authentic need that the Fire Service had: *to create a strategy to build the social-ecological resilience of a peri-urban fringe suburb prone to bushfire.* The authors' role was to provide the students with a comprehensive "environmental scoping" of a particular suburb (the case study) alongside eight key research or knowledge perspectives drawn from the Bushfire CRC (see Figure 1). Each student would be required to build their expertise in two of these perspectives to interrogate existing strategies applying to the case study area. Small groups of students were required to "integrate" these different perspectives in developing a comprehensive "framework" for a new strategy, informed by adaptive management and resilience approaches. The students were given an opportunity at the end of the learning task to relate their insights and learnings to an informal industry audience.

In this paper, our main purpose is to outline the process of reframing our view of the requirements of planning education in equipping student planners to address wicked climate change problems. To substantiate the reframing process and guide our curriculum judgements, we utilize a dialogical framework consisting of seven modes of enquiry (Henderson and Kesson, 2004). Before exploring the critical reflection framework, we outline the methodologies that we rely on to inform our work. In the fourth section, we canvass the implications for planning education and, in the conclusion, we offer some reflections on student needs including appropriate learning tools, and challenges for planning education to produce planners as reflective thinkers and as agents of transformation.

Methodology

Our research is drawn from the Action Research and Lived Experience genre, in which practitioners choose a key goal that they wish to achieve, or a dilemma or question that they wish to explore and use *plan-act-reflect* cycles that inform and modify practice (Whitehead and McNiff, 2006; Torbert, 2004; Argyris et al., 1985; Kemmis and McTaggart, 1982). In this project, the 'plan' phase involved the design and creation of the bushfire case study and engagement of industry stakeholders. The 'act' phase entailed trialling the learning element

and gaining data about its efficacy, while the 'reflect' phase used dialogue and critical reflection by means of a critical reflection framework - Henderson and Kesson's (2004) seven modes of inquiry - to draw deeper understandings and generate new questions for the next year's coursework.

Plan phase

The key goal for the learning task was to create a learning experience for students that would:

- help them integrate their learnings from the course through application to an authentic problem;
- build their understanding and capacity to deal with bushfire planning and/or management issues; and
- expose them to some of the experiences that they might have when engaging with wicked problems, particularly the issues of working collaboratively across disciplines areas.

 In considering how to develop the learning task we drew on three key areas:

- the fields of post-normal science (Funtowicz and Ravetz, 1993), and adaptive management and resilience (Walker and Salt, 2006) because of their relevance for contexts where there is a high level of uncertainty and complexity;
- educational approaches to learning such as constructivism (Costa and Kallick, 2004), problem based learning (de Graaf and Kolmos, 2003), collaborative learning (Bruffee, 1999), learning ecologies (Bateson, 1972; Capra, 1993; Davis et al., 2008), and post-modern curriculum metaphors (Doll, 1993); and
- interviews with 20 industry leaders and researchers in the bushfire field about the skills, knowledge and capacities needed for future management of the bushfire risk. These include: understanding the tensions between perspectives, considering regional approaches and long time frames, interrogation of assumptions and frames, and the ability to think flexibly and imaginatively about possible scenarios.

In light of the constraints and needs mentioned in the introduction, we created a multi-media interactive online learning environment using a WIKI platform[2], the key elements of which included:

- a challenge for student groups to develop a framework for a planning or management strategy[3,4] that would help to build social-ecological resilience to bushfire in periurban bushland localities;
- the case study which involved a comprehensive "environmental scoping" of a suburb of Hobart with a history of bushfire risk, plus stakeholder interviews and documentation;
- resources based on eight key perspectives relevant to bushfire management, students being required to become "expert" in two of these perspectives while being encouraged to scan the whole (figure 1);
- a structured approach for teams to investigate the case study including individual team workspaces;
- a navigation guide which included an introduction to the WIKI, how to navigate it, and indications of the types of thinking and group processes required; and
- opportunities to discuss and ask questions with two industry people in a forum.

Our thinking was influenced by the sense that dealing with wicked problems such as those of climate change demands new modes of thinking and learning and new ways of working (Frame, 2008). Wicked problems are characterized by scientific uncertainty as to causes and impacts, complexity from the multiple activities and interactions across multiple scales, multiple and contested interpretations of the problem, and multiple and contested solutions with possible perverse effects (Rittel and Webber, 1973). In addition, climate change has been labelled 'super wicked' because time to find solutions is running out; there is no central authority to lead or direct action; and those who call for action are also those who are causing the problem (Levin et al., 2007).

Figure 1. Resource perspectives (https://wikis.utas.edu.au/display/ext03/Resources+-+Understanding+Bushfire)

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[2] wikis.utas.edu.au/display/ext03/Bushfire+Case+Study.

[3] Some groups consisted of environmental planning students while others involved environmental management students.

[4] It was felt that students would only have time to develop the framework rather than detailed strategies.
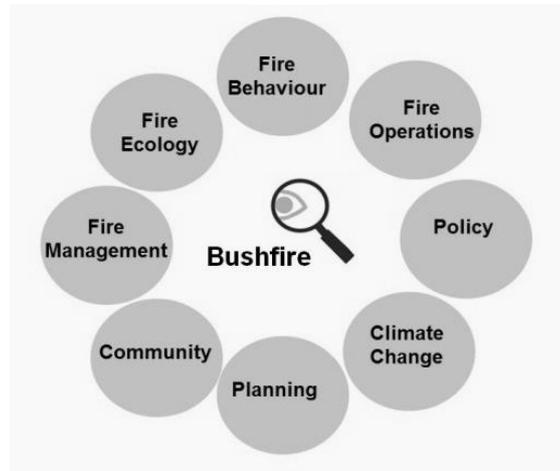
The wicked nature of environmental change problems also demands new planning pedagogies, which model the required new ways of working and incorporate learning approaches that reflect and support alternative modes of thinking and learning. The design is underpinned by learning pedagogies such as problem-based and adaptive learning because their teaching practices and tools support a learning environment that is suitable for climate change education (Davidson and Lyth, 2011). The learning environment modelled these influences by:

- involving small teams of student experts working collaboratively on a real-world problem in the knowledge that the results would directly influence bushfire planning and management policy;

- fostering aspects of adaptive learning such as experimentation, reflection and self-reflection, and self-evaluation;

- encouraging networked learning by stressing the importance of supporting the learning of other team members through developing connections with them and other sources of information;

- linking theory of resilience and adaptive management to planning and management practice by requiring students to consciously articulate how they were applying theory; and

- provision of a strategic focus to the case study in recognition of the long-term nature of climate change.

In designing the learning activity we had no initial expectation on the substance of the student product; rather, our aim was to provide a learning environment for emergent and co-creative learning.

Act phase

In order to scaffold the students through the task we broke it into four sections. Section 1 required teams to analyse existing planning and management strategies. Students individually interrogated existing strategy documents from different expert perspectives and from the resilience and adaptive management conceptual lenses from the coursework. We provided feedback at this stage and then helped the students to begin to draw generalisations from this analysis by asking them in Section 2 to identify potential criteria for their strategy. However, when the students had to move to designing a strategy framework in Section 4, we saw that they were unable to achieve this objective because the task required them to go beyond individual synthesis and integration into a collective creative development of a new systemic structure. They resorted to an individual 'dump and drop' of information rather than its unified integration through a coherent vision of all the parts.

At this stage the students were contacted to point out the need for collective, coherent and creative thinking in developing their framework. It was suggested that they might consider real time conversations using SKYPE as well as communication through the WIKI. Immediately we began to see greater coherence in the frameworks.

The most remarkable outcome of the activity was the quality of students' collective thinking manifested in the WIKI product, evidence that in a short period of time the students were able to come to terms with a complex issue, and of their ability to apply the conceptual lenses[5] from their coursework for enhanced understanding and the development of creative recommendations. However, a few students struggled and were unable to transcend their "expert" perspective in order to contribute to a coherent larger vision.

Reflect phase

Our analysis of the WIKI work and experience with the WIKI-based case study stimulated us to think in greater depth about what should be valued in terms of student thinking, learning processes and collaborations. We were motivated to give greater consideration to:

- further preparation of students to fit them to deal with the super wicked problems of climate change, both in thinking and learning, and in modelling work modes;

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[5] Students were prompted to say how they were applying adaptive management and resilience approaches to their strategies to value-add to existing strategic approaches.

- learning theories that could be drawn on to underpin design of future learning experiences; and

- our understanding of "quality thinking" and "integration" in terms of valuing students' efforts.

During the "reflect" stage we used dialogical and critical reflection processes (Brookfield, 1995) to help tease out deeper meaning of the data collected in the "act" stage. We used the principle of conversation as a means to turn our thinking about in order to converge on something which is beyond us (Doll, 1993).

Our self-reflections on the learning task led us to study in greater depth the conceptual streams informing our curriculum design including those drawn from educational theory and the adaptive management and resilience literature. In particular, we realised we needed to consider more educational dimensions to understand the learning that was required of the students and to interrogate whether our learning design offered alignment between expectations and support. To expand and structure our reflection to draw out deeper implications for planning education, we drew on the "7 inquiry modes" process (Henderson and Kesson, 2004).

Critical reflection framework

Founded on seven critical modes of enquiry, the critical reflection framework is proposed as a guide for teachers in designing curriculum informed by sophisticated forms of intelligence more appropriate to the current level of societal change (Henderson and Kesso, 2004). This framework has much in common with the key conceptual and practical preoccupations of planning for complex problems – complexity, uncertainty, diversity, holism, reflective learning, dialogism, and values –making the framework particularly appropriate to climate change planning education. We use the framework not only to reflect on the case study design and experience and to suggest improvements in design but also to draw implications for the kinds of thinking and practice dispositions, cognitive skills and thinking tools, values and planner roles that should be considered in designing climate change planning curriculum.

The framework's components – *techne* (craft reflection), *poesis* (soulful attunement to the creative process), *praxis* (critical inquiry); *dialogos* (multiperspectival inquiry); *phronesis* (practical, deliberative wisdom), *polis* (public moral inquiry); and *theoria* (contemplative wisdom) – are modes of enquiry that provide an integrated approach to curriculum design for

they are linked relationally by their interdependence, dynamic balance, feedback loops, and synergy, "much like a healthy ecosystem" (Henderson and Kesson, 2004, 48). The framework encompasses both ontological and epistemological concerns; it is therefore more than simply an analytical approach. Use of the framework should enable us to more comprehensively account for the varied and novel demands of climate change planning education.

In the following table we list some key questions in each category of the framework that we considered in order to understand the learning that occurred and means to improve learning opportunities. Following the table we summarise some of our explorations in an integrative way. Due to word limits, we restrict the discussion to the most salient points for planning education designers, drawing mostly on questions from *techne, phronesis* and *dialogos* enquiry modes.

Table 1. Critical enquiry modes framework with questions relevant to student and educator learning needs

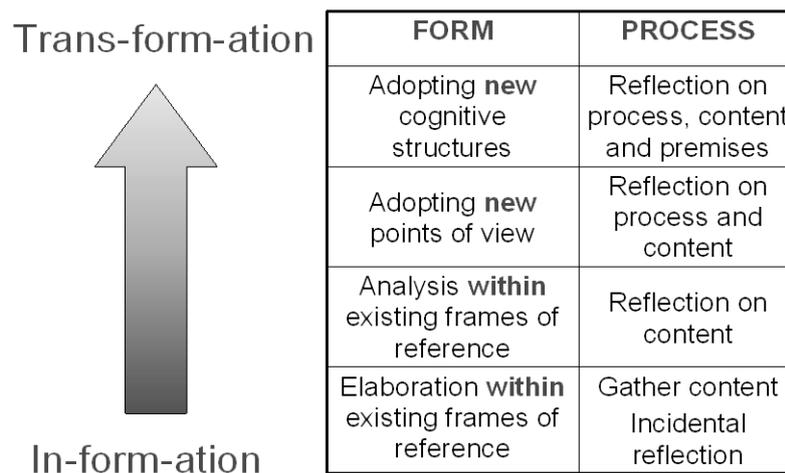| Inquiry mode	Our questions
Techne – inquiry into one's craft-method, process, technique; concerned with 'how' questions. How do we do it? How can we improve it?	*To what extent did we achieve our goals (ie. provide an opportunity for students to **integrate** course concepts in a practical situation, develop understanding of the bushfire domain and expose them to experience of dealing with wicked-problems)?* *To what extent could all students engage fully with the exercise and what might have been barriers to their engagement?*
Phronesis – deliberate collaborative inquiry, practical wisdom, wise judgement. Exploring deeper – suspending initial judgement in order to understand the reasons behind actions and perceptions. Changing one's perceptions, finding courses of action based on strengthened awareness, embodied wise judgement.	*What capacities did this learning activity give an opportunity for students to particularly develop (eg. meta-systemizing) and how might we give opportunity for students to explicitly develop others?* *What assumptions are we as educators bringing in regard to the pedagogies, the underpinning curriculum paradigms, the expectations we have of the cognitive capacities of students and their learning resourcefulness?*
Poesis – soulful attunement of the	*To what extent did students engage with the problem and feel a*

creative process. How can we include a sense of beauty (love, receptiveness, passion, soulfulness, fulfilment) to what we do? How does it foster perceptiveness, imagination, creativity and intuitive self?	*moral commitment to developing recommendations for a stakeholder audience and what might enhance this engagement?* *To what extent did students feel able to be creative?* *Was there alignment between our goals, the pedagogies, the curriculum metaphors and the support we gave students?*
Dialogos – multi-perspectival inquiry – different voices, enabling dialogue, critical self-examination, openness to new possibilities	*To what extent were students able to hold in view the many different perspectives – of stakeholders, experts, their own and other group members?* *What perspectives do we need to bring to help us make our framing visible?*
Theoria – contemplative wisdom – visionary intelligence (reason and intuition), thinking about thinking. What is the purpose of education, what does it mean to vision?	*How can we help our students to be more visionary? (eg. coherent understanding, thinking outside existing frames, sense of purpose, creative imagining.)* *What is the key aim of what we are doing? eg aiming for transformation of planning and through that of society.*
Praxis – critical inquiry – unity of theory and practice, social context. What are the underlying power structures? Whose needs are being served?	*What evidence was there that students managed to achieve unity of theory and practice? How could we improve this element of the design?* *What constraints does a university context place on developing learning activities that enable the development of such capacities? Do we still think this task is worthwhile pursuing?*
Polis - public moral inquiry - what are the underpinning values and ethics? What constitutes a good planner?	*How are we redefining the roles of planners? eg. Agent of societal change, bridging, brokering, building community capacity and empowerment.* *How did we support student planners in playing transforming roles? How could we do it better?*

Our first reaction to thinking about improving the learning task was a sense that the bushfire WIKI was a very worthwhile platform for students to explore and test approaches to solving complex problems; however, we felt the learning activity needed to be extended over a longer period for students to engage at the various levels needed, thus enabling greater opportunity for critical reflection and feedback from industry.

In designing this learning task, we made some initial assumptions about the bushfire planning and management field in that key elements might be captured by a framework of eight different perspectives. The aim was to provide an initial coherent structure so that students could quickly acquire a system overview of the different possible approaches, given the task's time constraints. While we wanted each student to take on expert roles for two of the perspectives, we also wanted them to be mindful of these perspectives within a greater context and bring critical reflection to the way they framed their understanding.

In considering the struggle students had in moving from their expert role to collectively designing a new coherent vision for the development of their strategy, we began to realise that the task actually required post-conventional/post-formal/post-normal cognitive and egoic development stages (Wilber, 2000; Kegan, 1994; Cook-Greuter, 2002; Stack, 2007; Gidley, 2010). First, there is the ability to hold various paradigms in mind and understand their differences without collapsing them to a view through one perspective or epistemology – *pluralistic, dialogical.* Second, there is the ability to organize or "integrate" pluralities and contradictions into a new coherent system (framework) without losing the complexity/diversity - *meta-systemization, holism.* Third, there is the ability to critically reflect on the systemizing process, making transparent the "view" being taken and the epistemologies/ontologies being used – *construct-aware, reflexive*.

Figure 2. Learning as transformation (Stack, 2007, adapted from Yorks and Marsick, 2000)

	FORM	PROCESS
Trans-form-ation ↑	Adopting **new** cognitive structures	Reflection on process, content and premises
	Adopting **new** points of view	Reflection on process and content
	Analysis **within** existing frames of reference	Reflection on content
In-form-ation	Elaboration **within** existing frames of reference	Gather content Incidental reflection

We observed some of the students operating at the first and second post-conventional stages, but none of the students had shifted from the task plane to critically consider their assumptions in designing their framework (the third stage). Reflection is a key tool that helps

people untangle themselves from their plane of operation in order to gain greater "height" and so transform their existing cognitive frames (Yorks and Marsick, 2000), but it requires time, iteration, embedding in actual experience, and students' openness to transformative change.

How can we better support that reflection and what might it look like?

Costa and Kallick (2004) emphasise the importance of making visible to students undertaking self-directed learning the learning goals, and required skills and learning dispositions. Until the task was completed, we were not able to fully explicate these learning intentions. We now think it valuable to help students understand upfront some of the capacities and competencies that they need to bring to tackling wicked problems. These dimensions include:

- ability to see, appreciate or inhabit different truths, paradigms and values;
- ability to meta-systemize – or "integrate" pluralities without collapsing them – to provide a coherent vision;
- ability to identify the paradoxes and to bring dialectical and imaginative processes to exploring them in order to create new ways of framing;
- ability to use past experiences and understandings to concretise the abstractions and a willingness to reframe these experiences in light of evolving views;
- *dispositions* or *habits of mind* (of successful people) – including persistence, thinking inter-dependently, thinking about thinking, creating and imagining, and thinking flexibly (Costa and Kallick, 2004). (*Persistence* was a key disposition which students needed in order to overcome the initial sense of being overwhelmed by the sheer volume of information and complexity of the task); and
- *a tool box of processes* – such as group collaboration processes, triple loop learning , critical reflection, visual modelling, dialogical inquiry, and scenario construction.

In reality, it is a substantial expectation for any one student; such a complex task requires a collective effort with different group members taking on different roles and drawing on different processes. To make the learning visible and manageable, each student could suggest particular capacities or skills that they would like to build in the activity (eg. group processes) alongside the expert roles that they assume. They could then reflect on what they have learnt and understood through experimenting with these roles.

Although the students had been introduced to triple loop thinking (Flood and Romm, 1996) as an adaptive management tool (Armitage et al., 2008), they did not apply it to themselves to bring a critically reflective approach to their practice. We would therefore recommend timely intervention from the teacher to help students move from the task plane to a critical meta-cognitive frame by, for example, asking them to reflect on the paradigms underpinning the existing strategies, paradigms they are bringing to the task, and the epistemological methodology used in their analysis.

In reflecting on the various capacities that we think are important for this task, we are mindful that as this is an artificially constructed task it is only likely to reveal some of the capacities needed to manage wicked problems in the profession. Pruitt and Waddell (2005) suggest key roles for those dealing with complex problems at a governance level: bridging adversarial positions, brokering resources and activities, building learning communities, consensus building, promoting cross-sector collaboration, strengthening actors (to play a role in system transformation), and building systemic awareness amongst actors.

Does a task like ours enable students to try out such roles? Although a real-world community resilience project would be a very useful learning platform in enabling students to experience these different roles, we have since realised the importance of our particular activity in modelling the role of meta-systemization and helping students to build their skills in this area. We believe that this exercise simulates aspects of a complex problem and students are able to practise many of the necessary skills within a protected environment.

We think that the authenticity of the task was important in engaging students, giving a sense of purpose and service which helped to motivate them through the initial "overwhelm" stage of the task. We saw a moral commitment to achieve outcomes useful to the stakeholders and as a result we saw a number of students being deeply satisfied with the significance of their accomplishment and a continued commitment to apply these understandings to their practice. These were the students who created new frameworks, new ways of thinking about the stakeholders or new individual strategic approaches. McGonigal (2011) would call them *super-empowered hopeful individuals.*

However, there were some students who felt dissatisfied; they struggled with the task gaining only a partial understanding, or did not experience the group work as a co-creative

partnership. They hadn't been able to move from the parts to the "imaginative whole". While some of the reasons for this might be explained by the difficulty in achieving the cognitive height needed (post-formal development stages), or not having a sufficient tool box of cognitive processes, perhaps this should also remind us of the importance of attending to our emotional relationships and sense of wellbeing when immersed in complexity. Because the thinking and navigation around complexity is such hard work, we suggest that it is important to recruit more than thinking. Gidley (2010) suggests that imagination is an essential activity for a post-normal world; imagination vitalises concepts, bringing them to life, helping us to think beyond the already known in order to access and enact wisdom.

Discussion: Implications for planning education

Although this curriculum project was originally conceived as a practical response to the competing demands of climate change planning education and university requirements for online curriculum delivery, learnings from its development and delivery have generated several deep insights for planning education. These relate to the design of learning environments and learning tasks relevant to developing the thinking and practice dispositions and skills needed to address the complexities of climate change planning. In particular, they concern the roles of planners and of planning educators as transformative agents.

Planners are uniquely placed for the task of responding to the unexpected changes in earth and human systems that scientists now suggest are likely, but it will involve specific cognitive and affective skills, capacities and dispositions, and capability to deploy a range of thinking tools or processes. Moreover, it will mean extension and transformation of planners' current roles.

To deal with change and complexity, the upper or meta-cognitive stages of theories of learning and cognitive development are the most relevant (Moseley et al., 2005). These cognitive abilities confer the cognitive height necessary to meta-systemize across diverse bodies of knowledge, values and paradigms, interrogate underlying assumptions, and undertake the deep reflection and self-reflection that societal transformation demands.

A key thinking tool in discerning the level of change is the concept of multiple-looped learning (Argyris and Schon, 1978; Armitage et al., 2008; Bateson, 1972; Folke et al., 2009; Isaacs, 1993; Folke et al., 2009; Schusler et al., 2010). Double and triple-loop learning (TLL) approaches are needed when problems can only be addressed by working with the system as

a whole, accepting that solutions or improvements emerge as situations unfold, and that these must involve all affected people. TLL, which is most pertinent to the discussion of planners as agents of transformational change, is a collective process of reflection and dialogue to reassess current worldviews, values, norms and protocols that structure the organization of a system in order to make decisions about its transformation to another governance regime if that becomes necessary. The reassessment and questioning processes facilitate the possibility of envisioning alternative futures.

Reconceptualising a system through processes of reflection and engagement has also been referred to as transformational learning (Folke, 2009), for which critical reflection is thought to be a crucial process and therefore in societal learning and transitions to more sustainable futures (Pahl-Wostl, 2009). The challenge for planning educators is to help students develop an appreciation of transformational learning and especially their abilities for critical reflection and envisioning. Students should also be afforded opportunities to undertake self-development through transformative learning, which aims to foster societal transformation through self-transformation (Wilhelmson, 2002). This involves perspective change through critical reflection on one's own assumptions. Dialogue through group conversation is an important pedagogical tool for perspective change (Wilhelmson, 2002) as well as to address complex problems (Apgar et al., 2009).

When we review the new roles for planners we realise that it requires consideration of inter-personal, ethical and leadership qualities in addition to cognitive dimensions. Leadership characteristics which confer leadership agility (Joiner and Josephs, 2007) are particular attributes we think are necessary for planning students to develop. The implication for planning educators is that they should endeavour to assist students on a path of commitment to continuing self-development within a context where they are developing leadership for societal change. By providing a task which requires some of these higher capacities, it can help students reflect on their self-capacities and generate a sense of a continuing journey.
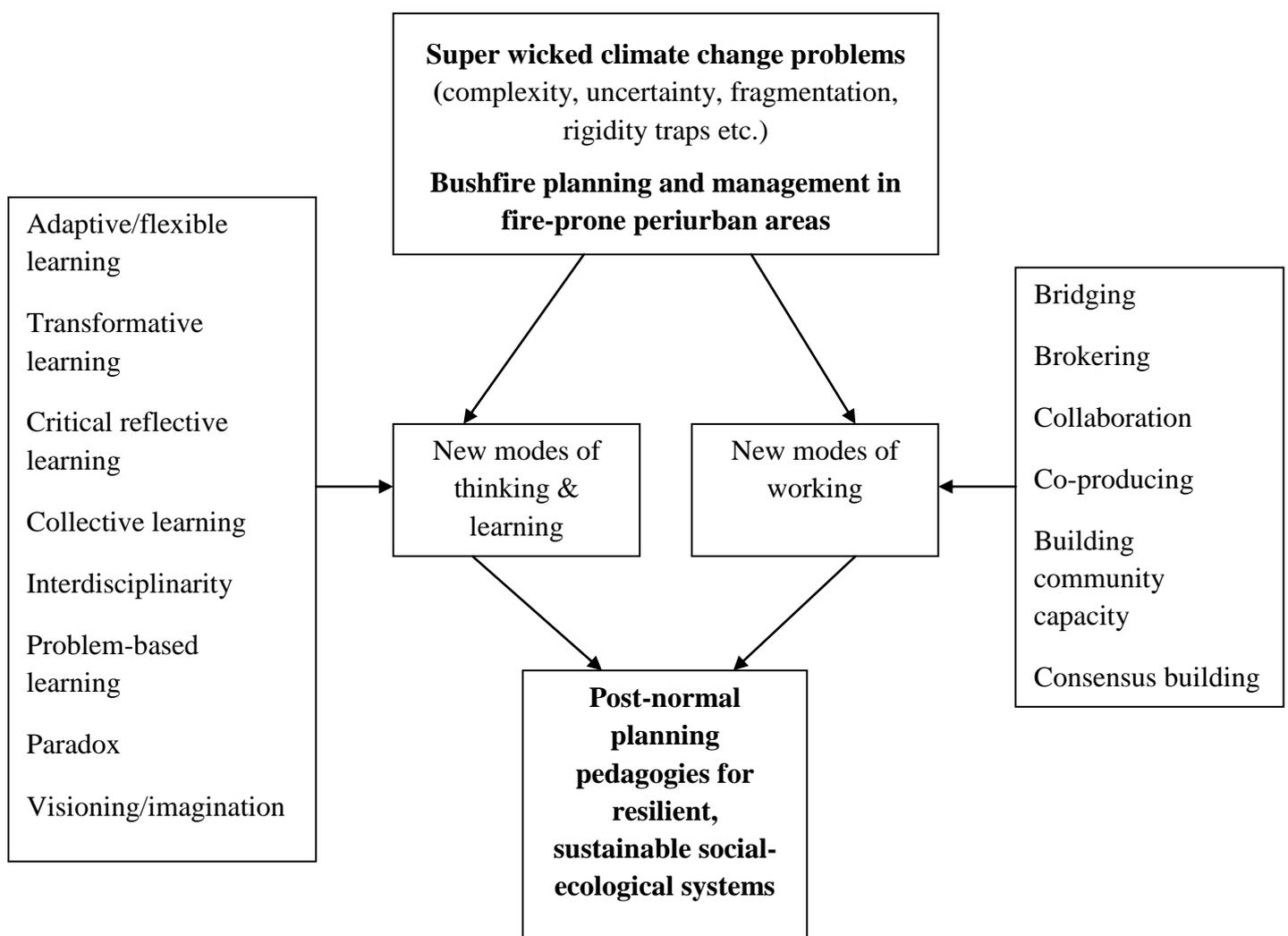
Conclusions

We have found the seven modes of inquiry framework highly valuable in stimulating us to think/feel/see deeper and broader than we might have initially been inclined to do under a critical reflection process. Have we been transformed in the process? This whole project has

certainly required us to lift our cognitive height and to call forth the deeper wisdom within. Our use of the critical enquiry framework has also proved the merit of integrating educational learning theories into planning education theory.

In this discussion, we've alerted the planning education community to the cognitive skills and working modes required for planning in post-normal times (Figure 3). We also alluded to other affective dimensions of self-development that should be considered in designing planning curriculum.

Figure 3. Thinking/learning and working modes for post-normal planning

Super wicked climate change problems (complexity, uncertainty, fragmentation, rigidity traps etc.)

Bushfire planning and management in fire-prone periurban areas

Adaptive/flexible learning

Transformative learning

Critical reflective learning

Collective learning

Interdisciplinarity

Problem-based learning

Paradox

Visioning/imagination

New modes of thinking & learning

New modes of working

Bridging

Brokering

Collaboration

Co-producing

Building community capacity

Consensus building

Post-normal planning pedagogies for resilient, sustainable social-ecological systems

We endeavoured to conceptualize a good planner in a context of great uncertainty and complexity as an agent of societal learning and transformation. Through our process of critical self-reflection we developed a more comprehensive understanding of the capacities that we could assist students to develop, such as the value of paradox and dialectical and imaginative processes in creating new ways of framing issues; the ability for critical self-

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reflection through TLL; the thinking dispositions needed to be successful people; the importance of meta-systemization in processes of climate change planning; and the leadership dimensions necessary for planners to be agents of transformation.

As for the WIKI platform, our reflection process exposed some of the limitations of online learning in developing the kinds of capacities that we identified as important to planners. First, there are more possibilities to cultivate depth in relationships in face-to-face contexts, although it should be noted that one advantage of e-learning is that it provides time for reflection. Secondly, our exposure to post-normalcy led us to conclude that more elements of play and imaginative content should be incorporated into the WIKI design.

For us as educators the most significant take-home message is that post-normal times have created post-normal (wicked) problems that require post-normal capacities. Gidley (2010) summarises these post-normal capacities as complexity, contextualisation, creativity, dialectics, dialogue, holism, imagination, construct aware, paradox, pluralism, reflexivity, spirituality, values and wisdom – and we would agree and add some that are specific for planners. To develop these capacities requires post-normal pedagogies, which involve more than simply providing a collaborative problem-solving platform, or an opportunity to deal with pluralities and contradictions as we provided in our initial design. Among the specific learnings for us is the importance of making explicit the goals, capacities and thinking dispositions that students need to tackle wicked problems. Another key element is the conscious attunement of both teacher and student to the process of evolving post-normal capacities. For us, this exercise served to mesh the theory/practice divide, giving us rich lived experience of what post-normal pedagogies and capacities look like within the planning context.

References

Apgar, J. M., Argumedo, A. and Allen, W. (2009). Building Transdisciplinarity for Managing Complexity: Lessons from Indigenous Practice. *International Journal of Interdisciplinary Social Sciences,* 4(5), 255-270.

Argyris, C., Putman, R., and Smith, M.C. (1985). *Action Science: Concepts, Methods, and*

Skills for Research and Intervention. San Francisco: Jossey-Bass.

Argyris, C. and Schön, D. A. (1978). *Organizational Learning: A Theory of Action Perspective*. Reading, MA: Addison-Wesley Publishing Company.

Armitage, D. (2008). Governance and the Commons in a Multi-Level World. *International Journal of the Commons*, 2(1), 7-32.

Bateson, G. (1972). *Steps to an Ecology of Mind*. Jason Aronson Inc.: Northvale, New Jersey.

Brookfield, S. (1995) *Becoming a critically reflective teacher*. San Francisco: Jossey-Bass.

Bruffee, K. (1999). *Collaborative Learning: Higher Education, Interdependence, and the Authority of Knowledge*. Baltimore: Johns Hopkins University Press.

Capra, F. (Ed.) (1993). *Guide to Ecoliteracy.* Berkley, California: Elmwood Institute.

Cook-Greuter, S.R (2002) *A detailed description of the development of the nine action logics adapted from ego development theory for the leadership development framework,* available from www.harthillusa.com.

Costa, A.L. and Kallick, B. (2004) *Assessment Strategies for Self-directed Learning*, Thousand Oaks, CA: Corwin Press.

Davidson, J. and Lyth, A. (2011). Re-invigorating Planning Education Quality, Relevance and Innovation via Education for Climate Change Adaptation, *World Planning Schools Congress*, Perth, WA, 4-7 July 2011.

Davis, B., Sumara, D. and Luce-Kapler, R. (2008). *Engaging Minds: Changing Teaching in Complex Times*. New York: Routledge.

de Graaf, E. and Kolmos, A. (2003) Characteristics of Problem-Based Learning, *International Journal of Engineering Education*. 19(5), 657-662.

Doll, W.E. (1993) *A Postmodern Perspective on Curriculum.* New York: Teachers College Press.

Flood, R. and Romm, N. (1996). Contours of diversity management and triple loop learning. *Kybernetes*, 25(7/8), 154-163.

Folke, C., Chapin III, F. S. and Olsson, P. (2009). Transformations in Ecosystem Stewardship. In Chapin III, F. S.,Kofinas, G. and Folke, C. (Eds.), *Principles of Ecosystem Stewardship: Resilience-based Natural Resource Management in a Changing World* (pp. 103-125). New York: Springer.

Frame, B. (2008). 'Wicked', 'messy', and 'clumsy': long-term frameworks for sustainability. *Environment and Planning C: Government and Policy*, 26(6), 1113-1128.

Funtowicz, S. O. and Ravetz, J. R. (1993). Science for the post-normal age. *Futures*, 25(7), 739-755.

Gidley, J. (2010) Postformal Priorities for Postnormal Times – a rejoinder to Ziauddin Sardar, *Futures*, 42, 625-632.

Henderson, J. G. and Kesson, K. R. (2004). *Curriculum Wisdom: Educational decisions in democratic societies*. Upper Saddle River, N.J.: Pearson Prentice Hall.

Isaacs, W. N. (1993). Taking flight: Dialogue, collective thinking, and organizational learning. *Organizational Dynamics,* 22(2), 24-39.

Joiner, B. and Josephs, S. (2007) *Leadership Agility: five levels of mastery for anticipating*

and initiating change, San Francisco: Jossey-Bass.

Kegan, R. (1994) *In over our heads: the mental demands of modern life,* Cambridge, MA*:* Harvard University Press.

Kemmis, S. and McTaggart, R. (1982). *The Action Research Planner.* Deakin University, Victoria: Deakin University Press.

Levin, K., Bernstein, S., Cashore, B. and Auld, G. (2007). Playing it Forward: Path Dependency, Progressive Incrementalism, and the "Super Wicked" Problem of Global Climate Change, *International Studies Association Convention*, Chicago, February 28 - March 3, 2007.

McGonigal, J. (2011) *Reality is broken: Why games make us better and how they can change the world.* Penguin Press.

Moseley, D., Elliott, J., Gregson, M. and Higgins, S. (2005). Thinking skills frameworks for use in education and training. *British Educational Research Journal,* 31(3), 367 - 390.

Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environmental Change,* 19(3), 354-365.

Pruitt, B, Waddell, S. (2005) *Dialogic Approaches to Global Challenges: Moving from "Dialogue Fatigue" to Dialogic Change Processes,* available from http://www.redesedesenvolvimento.org.br/filemanager/download/484/Dialogic%20Approaches%20to%20Global%20Challenges.pdf.

Rittel, H. W. J. and Webber, M. M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences*, 4(2), 155-169.

Schusler, T. M., Decker, D. J. and Pfeffer, M. J. (2003). Social Learning for Collaborative Natural ResourceManagement. *Society and Natural Resources*, 15, 309–326.

Stack, S. (2007) *Integrating Science in Soul in Education: The lived experience of a science teacher bringing holistic integral perspectives to the transformation of science teaching.* (Doctoral Dissertation). Curtin University of Technology, Bentley, W.A., available from www.stack.bigpondhosting.com/thesis.

Torbert, W.R (2004) *Action Inquiry: the secret of timely and transforming leadership*. San Francisco: Barret-Koehler Publishers.

Walker, B. and Salt, D. (2006). *Resilience thinking: Sustaining ecosystems and people in a changing world*. Washington, Covelo, London: Island Press.

Whitehead, J. and McNiff, J. (2006) *Action Research Living Theory*, London: Sage.

Wilber, K. (2000) *Integral Psychology*, Boston; Shambhala.

Wilhelmson, L. (2002). On the theory of transformative learning. In Bron, A. and Schemmann, M. (Eds), *Social science theories in adult education research* (pp. 180-210). Bochum: Münster.

Yorks, L. and Marsick, V. (2000) Organizational Learning and Transformation. In Mezirow, J. (2000) *Learning as Transformation: Critical Perspectives on a Theory in Progress.* (pp. 253-281) San Francisco: Jossey Bass.