Personalisation of learning and reflective frameworks: Example from an industry-focused, post-graduate transdisciplinary degree.

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The New Zealand government has determined strategies to encourage research-driven innovation which include close collaboration between industry and the academic communities. In response to such direction, the Waikato Institute of Technology (Wintec) has developed a set of research-based, transdisciplinary qualifications grounded in real-world industry contexts. To assist learners in undertaking successful research inquiry, the transdisciplinary curriculum development team has developed an online training needs analysis instrument that enables learners to identify their readiness to undertake transdisciplinary research. The training needs analysis tool is supported by a reflective framework which assists the learner to self-reflect upon their levels of skills and knowledge against internationally-accepted standards. The intention of such tools is to enable the learner to commence the process of self-empowerment within the learning environment.

self-regulated learning, training needs analysis, reflective frameworks

Background

Over the last two decades the New Zealand government has introduced a range of strategies to encourage industries and educational institutions to collaborate on educational initiatives that result in a more productive, higher performing and competitive workforce (Ministry of Education (MoE), 2014). These reforms have been focused firstly, on individual capability building within the workplace and secondly, strengthening the applied research linkages between industry and tertiary institutions. To specifically address identified workplace initiatives, the Waikato Institute of Technology have begun the process of developing a curriculum to offer work-placed, post-graduate courses in transdisciplinary studies to commence in 2015. The *Post-Graduate Certificate of Transdisciplinary Research* (PCTR) and *Master of Transdisciplinary Research and Innovation* (MTRDI) have been designed to develop intellectually-capable, work-based and work-focused graduates with demonstrated research competencies, able to contribute to business-led innovation and applied research by working on industry-provided problems (Waikato Institute of Technology, 2014). There is a notable shift from the existing delivery system, where the curriculum is described in terms of knowledge contained within individual courses and qualifications, to a clearly defined specification of the outcomes that will be achieved during the guided conduct of exploring and coordinating collective enquiry.

It is anticipated that unlike traditional post-graduate, single discipline, course-prescribed, environments, where all participants are bound by time, place and pace (Syed-Khuzzan & Goulding, 2009), the learning environments developed for these outcomes based post-graduate programmes will provide learners with more choice in the time they learn, the tasks undertaken and the places that learning will occur. While industry mentors and academic supervisors will have clearly defined outcomes to monitor candidate progress against, the ultimate responsibility of achieving those outcomes will be transferred to the learner. In these more personalised environments learners require self-motivation and self-direction (Clayton, 2009). They will have to become self-regulated learners (Zimmerman, 2002).

Self-regulated learning and reflective frameworks

In educational settings self-regulated learning (**SRL**) has been loosely framed around four sequenced and recursive steps (Winne, 2010):

- *Step one*: Learners construct a personalised understanding of the context in which a learning task is to be completed
- *Step two*: Learners establish goals and design a plan to enable achievement
- *Step three*: Learners employ tactics and strategies to achieve established goals
- *Step four*: Learners reflect on the processes used and the goals achieved and evaluate the appropriateness of the tactics and strategies employed.

In workplace settings similar recursive steps can be identified. In these settings it is argued SRL occurs through the application of systematic approaches. For example,

- *Step one*: Employees should be encouraged to plan for the completion of an identified task by acquiring strategies and knowledge that match the task
- *Step two*: Employees should monitor their performance against their plans and, if required, adopt different approaches
- *Step three*: Employees should evaluate the outcome and their performance to refine their approaches to task completion in the future.

From the workplace perspective, knowledge and skills are acquired as participants actively engage with and reflect upon the authentic tasks presented to them (Munby, Versnel, Hutchinson, Chin, & Berg, 2003). The knowledge and skills acquired in workplace environments do not occur in isolation. They are socially constructed within the context and culture of the situation in which they are created, developed and implemented (Brown, Collins, & Duguid, 1989).

A critical concept underpinning both approaches is self-reflection. The concept of self-reflection (the individual conscious act of purposefully thinking about actions undertaken) has been debated at length in educational circles (Kreber, 2004; Korthagen & Vasalos, 2005). Advocates of reflective practice argue deep learning, learning retained for future reference, is dependent on individuals making meaning from their experiences through the process of reflecting on the approaches used and the outcomes generated, in completing an activity (Brockbank & McGill, 2007). Self-reflection helps individuals firstly, highlight their current skill and knowledge base, secondly, identify areas for development and, thirdly, consider the significance of outcomes. It is argued this on-going reflection helps individuals iteratively improve their performance (Carlson & Parry 2003). In essence, reflection can create individualised learning environments that are on-going (sustained), connected to their needs (situated) and focused on individually generated tasks (authentic) (Clayton, 2012).

However, an inherent risk in the reflective process is that not all participants have the cognitive ability, in isolation, to understand and execute the processes that will lead to increased competence and capability. For these participants to succeed they need support and guidance (McLoughlin, 2002). To support participants engaged in the reflective process, to guide them in making connections between their current state and desired state, reflective frameworks, based on industry standards of accepted competencies and capabilities, have been developed (Clayton, 2012). This comparative process, using industry-accepted standards, enables the individual, no matter their location, culture or context, to identify which competencies and capabilities they consider themselves to be proficient in and those competencies and capabilities they need to develop. The outcome of this reflective process is an individually-generated, industry-grounded, personalised learning plan (Ward & Richardson, 2007).

A personal learning plan can be defined as a resource that identifies the current competencies and capabilities of the individual (looking back) and of the competencies and capabilities the individual needs to acquire to improve their performance (looking forward) and is used as a base to stimulate further learning (Beausaert, Segers, Fouarge, & Gijselaers, 2013). Fundamentally, personal learning plans develop the awareness to identify the need for learning, provides the confidence to articulate identified learning requirements and the ability to initiate action to accomplish their goals.

Personalisation of learning

The design of personalised environments is a complex task. These environments need to be able to continually respond to the idiosyncrasies of the individual. Constructivists argue learning is constructed through reflection and interaction. To constructivists learning occurs as individuals reflect on their current knowledge and interact with their surrounding physical and social environment (Brown, Collins, & Duguid, 1989). Therefore, any process implemented needs to be cyclic and agile. The development these agile cyclical processes are based on

fundamental building blocks (Clayton, 2012). These include:

1. *Reflective Framework*: Individuals interact with an intuitive, industry standards-based, reflective framework. Through responses to identified statements information on current knowledge, skills and capabilities is obtained,
2. *Learning Needs Identified*: Individuals' responses to statements identify knowledge and skill weaknesses and gaps that need to be addressed to improve performance,
3. *Personal Learning Plan Generated*: Individuals prioritise their learning needs and systematically plan how they will acquire the required skills and knowledge,
4. *Learning Needs Addressed*: Individuals undertake formal and informal learning activities to address skills and knowledge weaknesses and gaps identified,
5. *Progress Evaluated*: Individuals interact with a reflective framework to measure the improvement of their performance against industry standards.

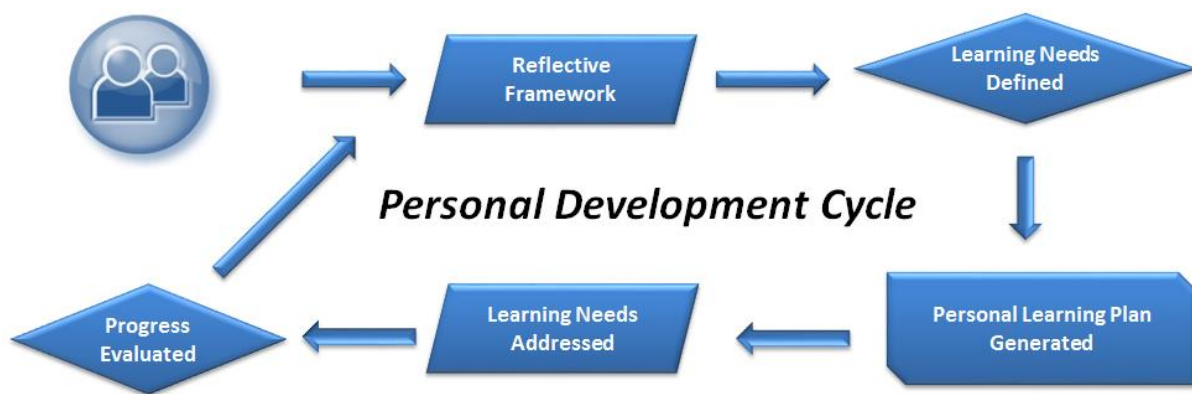A schematic diagram of this process is illustrated in Figure 1 below:

Figure 1. Personalisation of learning

Personalising post-graduate courses in transdisciplinary studies

In response to the New Zealand government's strategies for research-driven innovation, the Waikato Institute of Technology (Wintec) has c the development of industry research-based qualifications. During the developmental process members of the Post-Graduate Programmes Transdisciplinary curriculum development team at Wintec identified that a range of workplace, community and industry problems or contexts would be best met by a transdisciplinary research approach. A transdisciplinary approach to research is one where solutions are context-based rather than discipline-based and can involve any discipline or expertise relevant to a specific problem or context. The transdisciplinary approach requires collaboration across a multiplicity of stakeholders, such as customers, staff, discipline experts, business owners and industry leaders. Transdisciplinary research requires the researcher to possess the capacity to move outside discipline-imposed boundaries and to assimilate ideas and input from a range of disciplines and other sources to find practical, acceptable solutions to workplace problems. Given the varied nature of the research problems to be solved and the complexity of transdisciplinary approaches to research, it is expected that all candidates will need to create a personalised learning programme. The personalised learning programme should reflect accepted industry standards. The capacity for learners to engage in open, critical and imaginative forms of enquiry needs to be founded on acknowledged professional standards which tolerate rigorous assessment. These standards set by a particular knowledge community enable assurance that the researcher is capable of meeting the unique challenges of transdisciplinary enquiry.

Development of a reflective framework

The growing global trend to establish the career of 'researcher' as a valued profession has resulted in the identification of the fundamental knowledge, behaviours and attributes that the higher education sector has deemed significant for researchers. For the purposes of the transdisciplinary qualifications Wintec has been

developing, a specific framework - the Researcher Development Framework (RDF), created by the Careers Research and Advisory Centre (CRAC) (2010) – has been selected as a robust framework to guide developing researchers. The framework is structured into four domains and associated sub-domains:

1. *Domain A:* Knowledge and intellectual abilities: The knowledge, intellectual abilities and techniques to do research. (Sub-domains: Knowledge base, Cognitive abilities, Creativity)
2. *Domain B:* Personal effectiveness: The personal qualities and approach to be an effective researcher. (Sub-domains: Personal Qualities, Personal Qualities, Professional and career development)
3. *Domain C:* Research governance and organisation: Knowledge of the professional standards and requirements to do research. (Sub-domains: Professional conduct, Research Management, Finance, funding and resources)
4. *Domain D:* Engagement, influence and impact: The knowledge and skills to work with others to ensure the wider impact of research. (Sub-domains: Working with others, Communication and dissemination, Engagement and impact)

These domains and associated sub-domains establish the wide-ranging knowledge, intellectual abilities, techniques and professional standards required to undertake research, as well as the personal qualities, knowledge and skills to work with others and ensure the wider impact of research. They are illustrated in Figure 2 below:

Figure 2. Researcher Development Framework (CRAC, 2010)

Implementing a reflective framework

To engage developing researchers in the self-reflective process and to assist them in making connections between their previous experiences, their current skills and knowledge and identified standards in research, assessment frameworks have been created. For example, staff at Leeds Metropolitan University in their Research Training Programme use a Training Needs Analysis (TNA) instrument exploring six themes: research skills and techniques, research environment, research management, personal effectiveness, communication skills, networking and team work and career management. As individuals address identified skills, (such as the ability to recognise and validate problems, show a broad understanding of the contexts in which research takes place, use information technology appropriately for database management, record and present information) they use a set of standard questions to prompt their responses:

- I have no experience of using this.
- I have some experience but feel I need to improve

- I have experience of using this skill but still need to improve in certain aspects
- I am an expert and feel that this is not a priority for my development

Fundamentally, the structure of the TNA is relatively simple:

- *Step one*: Individuals carry out an analysis of their existing skills and their levels of competency,
- *Step two*: Individuals formulate a plan to acquire the requisite skills and knowledge,
- *Step three*: Individuals detail how they are going to evidence that they have acquired the skill identified. (Clegg, 2014)

Based upon the TNA and RDF, Wintec created an Online Training Needs Analysis instrument (OTNA) for post graduate learners. The OTNA was designed to enable learners to assess their current research capability against the internationally-defined standards in the RDF.

The OTNA interface provides the individual with a series of statements relating to each of the four dimensions within the RDF. The statements within each domain are classified within two categories, competent and capable. Learners are asked to reflect upon, and then respond to, individual statements using a 'drop-down' menu using a scale from Disagree to Strongly Agree. This is illustrated in Figure 3 below:

Figure 3. Example questions and responses

Individual responses to statements are colour coded using a spectrum from white (Disagree) to dark green (Strongly agree). This provides learners with a visual display of their current capabilities against that standard, as illustrated in Figure 4 below:

Figure 4. Colour coded responses

As learners progress through the OTNA their answers affect the indicator colour on the index page. The indicator colours are based on the familiar "traffic light" theme:

- Red: This indicates to the learner they have limited knowledge and/or experience in the attribute
- Yellow: This indicates to the learner they have some knowledge and/or experience of the identified attribute
- Green: This indicates to the learner they meet the requirements of the identified attribute.

A pictorial reflective framework carpet begins to emerge as the learner progresses through the domains, categories and statements. This reflective process and visual carpet enables learners to select which attributes they need to review and those they need to develop. This is illustrated in Figure 5:

Figure 5. OTNA visual carpet

The visual carpet produced from learner engagement provides the learner with:

- An initial assessment of their current knowledge, experience and understanding of each domain,
- An indication of potential starting points to begin their learning journey, and
- A map of a learning route from starting points to intended achievements.

Engaging with OTNA is intended to assist the learner in the creation of their personalised learning plan which will provide a framework for discussion with other stakeholders and, ultimately, empower them to become self-regulated learners.

Conclusion

Acknowledging the national impetus for continuous, self-regulated learning underpinned by the ability for the learner to reflect upon capabilities, Wintec has undertaken the development of an industry research-based qualification. Recognition that learners require guidance in identifying capability/knowledge gaps has resulted in members of the Post-Graduate Programmes Transdisciplinary curriculum development team using a theoretical framework of self-regulated learning. The key domains identified in the researcher development framework have been complemented by the development of an online instrument designed to enable learners to identify their readiness to undertake transdisciplinary research. The reflective framework developed is intended to allow learners to align their current skill and knowledge levels against accepted international standards. This activity will enable learners to generate a provisional personal learning plan and commence the process towards self-regulated learning.

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