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ACADEMIC, INDUSTRY AND STUDENT PERSPECTIVES ON THE INCLUSION OF "VOCATIONAL KNOWLEDGE" IN A 'LEARNING AND TEACHING ACADEMIC STANDARDS STATEMENT' FOR AGRICULTURE

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Abstract

This paper reports on the perspective of industry stakeholders in a national project to develop a Learning and Teaching Academic Standards (LTAS) Statement for the Agriculture discipline. The AgLTAS Statement will be aligned with the Science LTAS Statement published in 2011 and comprise a discourse on the nature and extent of the Agriculture discipline and a set of Threshold Learning Outcome (TLO) statements specific to Agriculture.

Agricultural research and teaching relies on strong links with industry due to the applied nature of the discipline. Without these links, sustainable and profitable practice change in agricultural systems cannot be achieved. A pilot project, in 2011-2012, with academic staff from three Australian universities identified vocational knowledge as a potential focus for a TLO. The AgLTAS project provides the opportunity to validate or refute this TLO by seeking input from a wider group of stakeholders, including industry. National consensus is being sought by a process of iterative consultation with academics, students and industry stakeholders and tested across four Australian universities. We have collected qualitative and quantitative data from industry participants who attended a series of workshops across most

Australian States and Territories and through an online survey. Surprisingly, and contrary to the findings of the pilot project, industry representatives considered vocational knowledge of lesser importance to the need for students to attain highly developed problem solving and communication skills that can generate new opportunities and innovation in agriculture. Industry-specific (vocational) knowledge was generally regarded as attainable during on-the-job training after graduation. This finding prompts the question whether the AgLTAS Statement should be linked to professional accreditation that may be attained after graduation.

Keywords

Threshold learning outcomes, vocational knowledge, curriculum design, undergraduate agriculture

Introduction

In 2011, the Australian government introduced the Tertiary Education Quality and Standards Agency (TEQSA) Act. It mandated that the delivery of courses by higher education institutions for Australian higher education awards be regulated using a standards based quality framework, including Teaching and Learning standards (Commonwealth of Australia, 2011).

Several discipline groups in the tertiary sector have recently published Learning and Teaching Academic Standards (LTAS) Statements which are intended to describe what pass-level graduates of each discipline know, understand and can do upon graduation. These Statements were developed through wide consultation with the higher education sector and associated industry and are implemented through the design and quality assurance of curricula. The Science discipline, for example, formulated statements defining key threshold learning outcomes (TLOs) for five domains: knowledge, understanding, inquiry and problem solving, communication, and personal and professional responsibility (Jones, Yates, & Kelder, 2011). Several sub-disciplines of science, such as chemistry (Mitchell Crow, O'Brian, & Schultz, 2012) and the biological sciences (VIBEnet, 2013), have since interpreted the Science TLOs to suit their discipline contexts using the methodology established by the Australian Learning and Teaching Council (2011a) for defining and disseminating LTAS Statements.

For the purposes of this project, the term ‘agriculture’ encompasses three- and four-year bachelor degrees offered in Agriculture and various related disciplines (e.g. Wine Science, Horticulture and Agribusiness) around Australia. Graduates of agriculture and related sub-disciplines are employed in diverse roles, including but not limited to research, development and extension (R, D and E); primary production in the value chain; policy; finance and marketing; and media. Collectively these roles contribute to the successful practice of agriculture to meet the needs of society. Annually, some 2000 jobs are available relative to the 800 graduates in agriculture and related disciplines (McSweeney & Rayner, 2011;

Pratley, Copeland, & ACDA, 2008). A recent inquiry into higher education and skills training for agriculture and agribusiness by the Senate Education, Employment and Workplace Relations References Committee (Australian Government, 2012) highlighted the importance of ongoing tertiary education in agriculture for Australia's economic prosperity. Similar inquiries were recently undertaken in Western Australia (Cowan, 2010), Victoria (Parliament of Victoria, 2012) and New South Wales (Pratley, 2013). Tertiary skills in Agriculture will underpin Australia's ability to meet the objectives for safe, reliable and sustainable food production and supply for domestic consumption but also for its Asian neighbours, as outlined in the National Food Plan Green Paper (DAFF, 2012) and Asian Century White Paper (Commonwealth of Australia, 2012), respectively. Critical issues affecting the ability of universities to meet the skills shortage in agriculture include the design, content and delivery of the agriculture curriculum, and the promotion of agriculture as a career to new students.

The landscape of teaching Agriculture in Australia is explored in more detail in Botwright Acuña, Kelder, Lane, Hannan, and Jones (2013). In particular, greater engagement between universities and industry in curriculum design and cooperation between providers is necessary for curriculum rejuvenation (Bellotti, 2012; Dunne, 2010). The development of a specific LTAS statement in the context of agriculture (including the nature and extent of Agriculture and Agriculture TLO statements) will therefore be important to inform curriculum design.

In 2012, a pilot project undertaken by the University of Tasmania demonstrated that the nationally agreed TLOs for Science (Jones et al., 2011) could be adapted successfully to the specialist, agricultural science discipline (Botwright Acuña, Kelder, Lane, & Hannan, 2012). The AgLTAS draft statement was written in the context of Agricultural Science, capturing its multi-disciplinary nature. A distinctive variation from the Science LTAS Statement was a recommendation that the TLOs should incorporate minimum levels of achievement in vocational knowledge, although not all participants agreed with this outcome.

Vocational education and training (VET) in agriculture in Australia has traditionally been undertaken by agricultural colleges (Black, 1976). Several of these colleges have amalgamated with the university sector, e.g. Muresk in Western Australia, while recently the University of New England introduced a Dual Sector degree that enables students to undertake concurrent articulation in the Bachelor of Agrifood Systems and VET qualifications through Technical and Further Education (TAFE). Another source of tension is debate over whether universities should deliver "employment-ready" graduates, armed with content knowledge and generic skills applicable to the work force (Bath, Smith, Stein, & Swann, 2004), or aim for "job-ready" graduates who typically require on the job training, such as that provided through graduate recruitment programs (Bennett, Dunne, & Carré, 1999). Wider discussion with a range of stakeholders was acknowledged as being required to explore the details and clarify this proposed TLO and how it relates to generic graduate attributes (Botwright Acuña et al.,

2013). Broader consultation with academics, students and industry across Australia was therefore undertaken as part of the AgLTAS project (ID13-2982). In this paper, we explore the interplay between vocational skills training, industry and the higher education sectors through the development of an LTAS Statement for Agriculture. A key question is: how do we articulate a national statement on academic standards for agriculture in the context of the diverse expectations and practice of our academic, student and industry stakeholders? Implications for the development of TLOs will be discussed.

Methods

Ethics approval for data collection was gained by the leader of the AgLTAS project, University of Tasmania (UTAS), from the UTAS Social Sciences Human Ethics Research Committee before the start of the project (HREC 13526). Partner universities in the AgLTAS project (University of Adelaide, Charles Sturt University and the University of Western Sydney) gained ethics approval from their respective institutions.

We broadly followed the approach developed by the national LTAS project (Australian Learning and Teaching Council, 2011b) but with adaptations developed in the AgLTAS project pilot (Botwright Acuña et al., 2013). Specifically, the AgLTAS project method consisted of two parallel, interacting streams of activity: 1) a *consultation* activity stream and 2) *drafting AgLTAS statement* activity stream.

The consultation activity stream used an engagement strategy outlined by Hinton, Gannaway, Berry, and Moore (2011) and included: 1) assessing the readiness for change, which was initiated in Botwright Acuña et al. (2013); 2) engagement with a range of stakeholders throughout the project (Table 1); and 3) transfer of project outcomes. Consultation data were collected using a mix of quantitative and qualitative methods (Creswell, 2003) including an online survey and workshops. For the purposes of the project, "academics" were defined as participants who identified as being employed in the tertiary sector. "Industry" stakeholders by default encompassed other roles in agriculture, exclusive of academics in higher education, in both the public (e.g. State Departments of Agriculture; Australian Government Departments and research organisations with an agricultural focus) and private sector (e.g. agribusiness; R, D & E providers). Recent graduates were not identified in the project as a discrete stakeholder group and these participants instead self-selected into either the academic or industry cohorts.

Project team members from each university organised consultation workshops within their own and other universities and with members of their professional networks. Participants recruited from students, academics and industry stakeholder groups were exposed to a draft AgLTAS statement with structured questions and activities designed to elicit feedback on the core elements of the Statement (nature and extent of the discipline, the TLO domains and TLO statements). A national online survey with the same questions was also

administered. Participants were recruited using the email lists from key contacts including the Australian Council of Deans of Agriculture (ACDA, the peak body for tertiary education in agriculture in Australia), the project team and project reference group.

Table 1

Stakeholder groups and number of participants who participated in the online survey and workshops 2012-2014

Stage[1]	Location	Stakeholder groups[2]	Activity[3]	Participants (*N*=290) #	Date
1	Online 1	V	S	27	Nov 7, 13
	University of Adelaide Agriculture	A	W	10	Sep 30, 13
	University of Adelaide Viticulture	A	W	10	Sep 23, 13
	SA Industry	I	W	7	Sep 30,13
	SA Agricultural Consultants Group	I	W	15	Sep 31, 13
	University of Adelaide BAgSci	S	W	21	Sep 20, 13
	UTAS Alumni/Industry	I	W	21	Oct 25, 13
	UTAS School of Agricultural Science	A	W	11	May 7, 12
	TAS Industry	I	W	7	Oct 15, 13
	UTAS student forum	S	S	20	Oct 4, 13
	University of Western Sydney 1	S	W	12	Oct 25, 13
2	University of Queensland	A	W	7	Nov 11, 13
	CSIRO Canberra + RDCs	I	W	14	Nov 18,13
	University of New England	A	W	7	Dec 3, 13
	La Trobe & Melbourne Universities	A	W	7	Dec 10, 13
	Charles Sturt University (Wagga Wagga)	A	W	7	Nov 21, 13
	Charles Sturt University (Orange)	A	W	8	Dec 2, 13
	Curtin University	A	W	10	Feb 4, 14
	University of Western Australia	A	W	17	Feb 4, 14
	University of Western Sydney 2	A	W	16	Feb 20, 14
	Online 2	V	V	18	Mar 2, 14
	Murdoch University	A	Sub	1	Mar 7, 14
	NSW Industry	I	W	7	Mar 14, 14
	University of Sydney	A	W	10	Mar 20, 14

Notes to Table 1.

1. Participants in Stages 1 and 2 commented on different versions of the AgLTAS statement.
2. Stakeholder Groups: A, Academics; I, Industry; S, Students; V, various.
3. Activity: S, survey; Sub, submission; W, workshop.

The design of questions for the workshops was based on the different cognitive skills stakeholders would employ for different questions about their response to the Statement as the drafting activity progressed. Workshops and surveys were undertaken in two stages (Stages 1 and 2). The workshop process in the first stage was designed to ensure that the understanding of different parts of the AgLTAS statement and relationships between them was clear and facilitated participants synthesising their own and others' viewpoints. This ensured alignment of project purpose with project method so that questions and tasks designed to facilitate collaborative discussion would result in data that were targeted towards informing the redrafting of the Statement. For example, the first step of a consultation workshop was directed towards identifying what academics, students and industry stakeholders understood to be expectations of vocational skills of graduates ("knowledge" and "understanding" purpose). Later steps in the consultation workshop (Steps C1 to C4) were directed towards eliciting participants' "analyses" and their "evaluations" of those expectations. Workshop and survey participants were then asked to analyse the AgLTAS draft statement from the pilot project (the TLO statements in particular) (Steps D1 to D5).

In parallel, the project team used Bloom's Taxonomy of Cognition (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956) to provide a conceptual framework to guide the analysis of the aggregated participant responses to the pilot draft in order to structure the process of redrafting the AgLTAS statement. Bloom's Taxonomy is widely used in education to classify learning objectives in terms of a progression from lower to higher orders of thinking. The taxonomy has six levels: knowledge; understanding; application; analysis; synthesis and evaluation. The first two levels of Bloom's Taxonomy, namely, knowledge, comprehension (understanding) were applied to Consultation Step 1 (C1) and Drafting Step 1 (D1). The third level, application, was also applied to Step C1 as well as Drafting Step 2 (D2) while the fourth level, analysis, was applied to Step C2 and Step D3. Bloom's fifth and sixth levels, were reversed in order in this study with evaluation being applied to Steps C3 and D4, and synthesis being applied to Steps C4 and D5.

Embedding Bloom's Taxonomy in the method (Figure 1) provided a structure for collecting and analysing participant responses as data, and provided a transparent process that enables us to explain and justify our decisions on what TLOs to include in the final version of the AgLTAS statement. Although the taxonomy is an artificial construct and participants are likely to use all of the cognitive skills at various points in the consultation, using the taxonomic framework did aid in determining whether the Statement should include reference to vocational training in the TLOs (as indicated in the pilot) or not (as determined by the consensus process in the national project). In the second stage of the workshop, and using the same methodology, participants were asked to analyse a subsequent version of the AgLTAS statement (V1).

Cognitive skill (Bloom et al., 1956)	Consultation activity stream (C): academics, students, industry		Drafting AgLTAS statement activity stream (D): project team, project leader, reference group
1. Knowledge 2. Understanding	**Step C1**: Workshop part 1; Survey What do participants know, understand and do with respect to their own expectations about vocational skills of graduates	→	**Step D1**: Appreciation of participants' knowledge, understanding and application of vocational skills of graduates from their perspective in a workshop setting, reserving judgement (Project team) ↓
3. Application			**Step D2**: Preparation of summaries from individual workshops (Project team) ↓
4. Analysis	**Step C2**: Workshop part 2 Discussion by participants in workshops and free text survey comments ↓	←	**Step D3**: Thematic analysis of collated feedback from participants, here focussing on i) vocational skills and ii) inquiry and problem solving (Project leader) ↓
5. Evaluation	**Step C3**: Workshop part 3 Shared judgements about vocational training in workshops by participants	→	**Step D4**: Judgement made without bias by the project team on the value of the pilot project TLO on vocational skills, based on collated feedback (Reference Group) ↓
6. Synthesis	**Step C4**: Presentation to stakeholders Shared understanding across stakeholders: AgLTAS statement that is representative of the majority of participants	←	**Step D5**: Synthesis of the AgLTAS statement: A TLO for inquiry and problem solving that integrates vocational skills; explored further in explanatory notes (Reference Group, Project Leader, Project team)

Figure 1. Activity streams (consultation; drafting the AgLTAS statement) aligned with Bloom's Taxonomy.

The intended outcomes for the consultation activity stream were for participants to articulate their knowledge and understanding of agriculture and apply that knowledge to the task of drafting a consensus Standards Statement via evaluating the current draft. The intended outcomes of the drafting activity stream were for the project team to: (a) analyse participant data in order to demonstrate knowledge and understanding of the different perspectives on the form and content of an AgLTAS statement; and, (b) apply that knowledge to draft new versions of the statement.

Each draft was also evaluated to determine how accurately it reflected the consensus view emerging from the consultation activity stream. The evaluation process is a necessary benchmark prior to the activity of synthesising the data into

the final Standards Statement, to be presented to the ACDA for approval and subsequent dissemination via publications and the Australian government's Office for Learning and Teaching (OLT, which has replaced the ALTC).

Results

The two parallel approaches for consultation with stakeholders and drafting the AgLTAS statement are presented as a case study, applied to participant responses about themes including vocational training, and inquiry and problem solving. Table 2 lists the number of respondents and level of agreement for each category of TLO from the online survey. Draft TLOs for these categories as defined in the pilot project are presented in Table 3 (Botwright Acuña et al., 2013). Note that the full AgLTAS statement will be reported in a subsequent paper.

Consultation with stakeholders

Workshops followed the approach described in Figure 1, which is aligned with Bloom's Taxonomy of Cognitive Skills. The first step was to seek the perspectives of the participants about what they knew and understood about learning outcomes in agriculture and how they applied it in their own experience (Consultation Step C1: Knowledge, Understanding and Application). This was achieved by asking participants in the workshops two focus questions:

- What are the key attributes of Agriculture that should be reflected in a statement of the nature and extent of the discipline?
- What threshold learning outcomes should a student of agriculture possess upon graduation?

Participants' understanding of vocational knowledge varied among stakeholders. For example one academic stated that:

> *Not sure that vocational knowledge is correct – aren't these skills? What do we mean by vocation? What does industry think vocation means? …Because there is no accreditation of the degree it cannot be considered to be a vocational or professional degree (as there are no industry standards) – compared to vet science, for example.*

Another academic made a distinction between vocational training and academic study at university, stating that a *"vocational career was the 'doing' (being told what to do and so a TAFE degree would provide this) while a professional career was what we should provide at University.*" In comparison, a student stated that some classmates were gaining vocational skills through the TAFE sector "*other undergrads are doing a diploma in agriculture as well as the B.Ag. [Bachelor of Agriculture]. This will give them an advantage and more skills in the workplace.*"

Some respondents from industry considered that vocational knowledge was not an expectation of higher education at university, stating that "*Industry don't want this – they want people who can think about what is required and where to get it*" and *"this is not essential to degree course; industry doesn't expect certification.*"

An academic stated that vocational knowledge had more in common with practical experience than certification, "*In the draft TLOs, [I] don't like 'Vocational knowledge' – really practical experience and higher order skills and its importance is below the others. Actually it probably is part of professional responsibility*."

Industry instead placed more emphasis on application of skills rather than vocational knowledge, which is reflected by more comments being grouped into the inquiry and problem solving theme (*N*=51, 16%) than comments concerning vocational knowledge (*N*=10, 3%). For example, respondents emphasised the application of knowledge as a key theme "*important to have problem solving skills to apply the knowledge*" and "*Applied degrees are what is needed – needs to have enough science and practical application and accessibility – so they can make an impact on industry by asking the right questions*." While it was generally recognised there was a need for some of these practical skills to be acquired during degree study, a need for work experience was also emphasised. For example, one respondent offered that a "*Base level of practical experience – at a minimum tours - ... would be better for them to work in real context (in the real world)*."

The discussion at workshops (Consultation Step C2: Analysis) by stakeholders thus led to groups making shared judgements (Consultation Step C3: Evaluation) about problem solving and the application of practical skills, while vocational knowledge was not consistently shared.

Creating the AgLTAS statement

The process of developing the AgLTAS Statement also followed Bloom's Taxonomy (see Figure 1). Leading the workshops and engaging in discussion with stakeholders enabled the project team to develop an initial appreciation of what participants regarded as important attributes of learning outcomes in Agriculture (Drafting: Steps D1 & D2. Knowledge and Understanding), which was followed by the preparation of workshop notes (Drafting Step D3. Application).

Qualitative data from the workshops were coded by the project team (Drafting: Step 4. Analysis) and comments grouped into broad themes. Bias was mitigated through consultation with diverse stakeholders. A project reference group, including academics, industry and recent graduate representatives, met to evaluate the judgments made in translating the thematic analysis into a draft AgLTAS statement. Their feedback was forwarded to the project team for consideration (Drafting: Step D4. Evaluation).

Criteria used to make judgements on what TLO categories should be prioritised or excluded included the frequency that sub-themes were represented and any key words or phrases and survey data. For example, in the survey, 42% of respondents (n = 50) considered the TLO for inquiry and problem solving to be of greater

importance than that of vocational knowledge, which had only a moderate rating (Table 2). Interestingly, the TLO for vocational skills previously identified in the pilot project (Botwright Acuña et al., 2013) was excluded as the reference group considered this TLO to be adequately represented by the revised TLO for inquiry and problem solving.

Table 2

Number of respondents and level of agreement for each category of TLO

TLO	Level of agreement					Total respondents
	low *n* (%)				High *n* (%)	
Understanding	1 (1.96%)	2 (3.92%)	3 (5.88%)	23 (45.10%)	22 (43.14%)	51
Knowledge	0	2 (4.17%)	7 (14.58%)	20 (41.67%)	19 (39.58%)	48
Vocational	2 (4.00%)	4 (8.00%)	20 (40.00%)	15 (30.00%)	9 (18.00%)	50
Problem solving	1 (2.13%)	0	6 (12.77%)	12 (25.53%)	28 (59.57%)	47
Communication	0	2 (4.17%)	6 (12.5%)	20 (41.67%)	20 (41.67%)	48
Responsibility	1 (2.08%)	2 (4.17%)	6 (12.5%)	21 (43.75%)	18 (37.50%)	48

Note to Table 2. Data is combined across stakeholders and is from the online survey

It is important to note that there are differences in how individuals define *problem solving* in agriculture. Typically problem solving for students is undertaken through hands-on, experiential learning but, according to Bloom's Taxonomy, the level of cognitive skill employed is actually analysis and synthesis. The revised TLO for problem solving emphasised the agricultural context in *inquiry and problem solving* and the requirement for graduates in Agriculture to identify issues, conduct appropriate experimentation and draw conclusions that are used to inform decisions requiring action (Table 3).

The AgLTAS statement was thus a synthesis of the collated knowledge, understanding and application by the reference group and project team to define threshold learning outcomes for Agriculture (Drafting: Step D5. Synthesis). Our shared understanding represented in version 1 of the AgLTAS Statement was communicated to all stakeholders via an electronic newsletter with an invitation to provide feedback through a follow-up survey (Consultation: Step C4. Synthesis).

Table 3

Threshold learning outcomes (TLOs) relating to Vocational Knowledge, and Inquiry and Problem Solving in the pilot and AgLTAS project

Pilot project TLOs 3 & 4 (Botwright Acuña et al., 2013)	**AgLTAS project version 1, TLO 3**
Vocational knowledge 3. Exhibit technical skills in the application of agricultural science by: a. Attaining professional standards or certification relevant to their discipline area, (when possible) b. Demonstrating proficiency in technical skills relevant to their discipline area (in the workplace)	Inquiry and problem solving 3. Critically analyse and address complex problems in agriculture by: a. Identifying contemporary issues or opportunities in agriculture. b. Gathering, synthesising and critically evaluating information from a range of sources and disciplines. c. Designing and planning an investigation. d. Selecting and applying appropriate and/or theoretical techniques or tools in order to conduct an investigation. e. Collecting, accurately recording, analysing, interpreting and reporting data. f. Drawing conclusions from data and information and making decisions from them that could form the basis of advice or actions, with consideration of the profitability and sustainability that may exist in agricultural systems.
Inquiry and problem solving 4. Critically analyse and solve scientific problems by: a. Gathering, synthesising and critically evaluating information from a range of sources b. Designing and planning an investigation c. Selecting and applying appropriate and/or theoretical techniques or tools in order to conduct an investigation d. Collecting, accurately recording, interpreting and drawing conclusions from scientific data.	

Discussion and Conclusions

The methods, based on Bloom's Taxonomy for Cognitive Thinking (Bloom et al., 1956), provided a framework for the project team to develop the AgLTAS statement through consultation with academic, industry and student stakeholders. The focus of this paper on the judgements made by the project team to exclude the TLO for Vocational Knowledge and, instead, expand that of Inquiry and Problem Solving represents a key decision point that we have explored as a case study for our methodology.

The inclusion of a TLO on Vocational Knowledge in the draft AgLTAS Statement for Agricultural Science (Botwright Acuña et al., 2013) was the outcome of a relatively small consultation process with academics at the University of Tasmania plus a few representatives from the University of Adelaide and Charles Sturt University ($N = 26$). At the time, survey results flagged that this TLO was regarded by participants to be less important than TLOs linked with attributes such as Knowledge, Understanding, Inquiry and Problem Solving and Personal and Professional Responsibility. In effect, the draft AgLTAS statement was broadly similar to the Science LTAS statement (Jones et al., 2011) but written in the context of Agricultural Science (Botwright Acuña et al., 2013). Small numbers of participants increased the probability of strong

individual influences on the development of the draft AgLTAS statement for Agricultural Science. We mitigated this via broad consultation across a range of academic, industry and student stakeholders through workshops and an online survey. The survey confirmed that respondents regarded the TLO for Vocational Knowledge to be less important compared with other categories. This, combined with participant feedback, led to the reference group and project team excluding the TLO on Vocational Knowledge and instead expanding Inquiry and Problem Solving to be inclusive of applied skills in the Agriculture discipline.

A lack of consensus about what to include in the AgLTAS statement can unintentionally reduce the broad acceptance of the Statement by stakeholders. For example, the lack of explicit reference to a TLO for Vocational Knowledge may be regarded negatively by those who rated this as highly important in the online survey (n= 50, 18%). A further limitation is that the defined stakeholder groups used in the research were relatively broad. Thus, potentially important perspectives on vocational knowledge from cohorts such as recent graduates, or smaller agribusiness providers, are not clearly identified in the data. Increased participation in the study would be required for the responses of stakeholders to be considered as representative when divided into further cohorts. Although agricultural education in the tertiary sector is widely acknowledged to be of strategic importance to meeting future challenges for food security (Commonwealth of Australia, 2012; DAFF, 2012), participation by industry stakeholders in such a study will be weighed against tactical decisions (e.g. provision of advice to farmers following a disease outbreak) that may be of higher priority to the business. This was mitigated by the opportunity for stakeholders to participate in the study via an online survey.

The reputation of the agricultural discipline in tertiary education has sometimes been maligned by a perception of being a hands-on career with an emphasis on skills-based training rather than the full set of intellectual capabilities expected from a university graduate. This implies a parallel between agriculture and vocational training which can be defined as a program where students are being prepared for a defined role (Kerka, 1997). A study by Shelley-Tolbert, Conroy, and Dailey (2000), albeit for secondary education in the United States, described the shift from skills-based training in agriculture to a greater emphasis on knowledge and understanding. This change was concomitant with an altered perception of the discipline to being regarded to have more scientific rigour. The ability to make decisions or solve problems as described in the AgLTAS statement can therefore be considered as reflecting the integration of experiential or skills-based learning and their application using inquiry and problem solving. An emphasis on problem solving skills in context is also aligned with an increasing demand on agricultural graduates to provide input into the process of developing public or private policies associated with agriculture and food systems.

There is also lack of consensus between industry and universities about the distinction and provision of employment- versus job-ready graduates. For example, agriculture consultants working in small businesses feel less equipped to

train students with job-ready skills and stated a desire for students to possess these generic skills on graduation. However, the requirement for work experience during many of the Australian Agriculture degrees provides students with the opportunity to develop additional skills suited to particular professions. This work-integrated learning experience that draws heavily upon interactions with industry also appears important for the forging of future employment prospects in industry and ensuring industry's perspective of student learning is captured. This is consistent with Dunne's (2010) commentary that greater engagement between universities and industry is necessary for curriculum rejuvenation.

Beyond university, employers have a role in preparing recent graduates for their particular job requirements, such as through mentoring or graduate recruitment programs. Coates and Edwards (2011) have reported that the skills taught at university may take years for graduates to consolidate and master. However, the emphasis that agricultural education has on problem solving and agriculture, in general, has on the application of knowledge through synthesis has been shown to increase the cognitive ability of students (Cano & Martinez, 1991) suggesting that this approach to learning may in fact make students more likely to be able to perform more complex job requirements. The benefits of work placement as experiential learning (Burke, Marks-Maran, Ooms, Webb, & Cooper, 2009) that reinforces links to industry will be described in the final AgLTAS statement. This approach also meets the Australian Qualifications Framework (AQF) level 7 requirement which is summarised as: Graduates at this level will have broad and coherent knowledge and skills for professional work and/or further learning (Australian Qualifications Framework, 2013).

This paper has focussed on decision points around draft TLOs for Vocational Knowledge and Inquiry and Problem Solving as a case study in the development of the AgLTAS statement. Bloom's Taxonomy (Bloom et al., 1956) has been used to elucidate the relationship between these TLOs and their perception by different stakeholders. Broad consultation with our stakeholders has shown that the sector collectively agrees that the core attributes articulated through the AgLTAS statement should equip graduates for employment. The development of the remaining TLOs including Understanding and Knowledge of Agriculture, Communication, and Personal and Professional Responsibility will be explored further in a subsequent paper.

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