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The Teaching of Food Technology in Secondary Schools

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Abstract

This paper presents a summary of findings from a recent Australian study that investigated perceptions of 'food technology' as viewed by teachers in secondary schools compared to a wider professional view. Maintaining and fostering a coherent and accurate perception throughout the food technology career, from school leaver to professional undergraduate studies, is critical for both the evolution of the field of knowledge and the need to keep up with increasing world demand for food technologists and food innovation. While 'food technology' has been well established in most secondary school curriculum offerings, a contradiction has emerged between the 'school view' of the Food Technology label, and the 'professional view' of the same. A point for debate is that career pathways are confused because of the use of identical language to describe different approaches causing a significant problem for the food profession. The research reported here draws on an emerging framework known as 'Technacy Genre Theory'. It offers an index that defines the nature of the degree of agreement between two forms of technological practice. The research confirmed that the label of 'Food Technology' is perceived significantly and substantially differently between schoolteachers and the wider relevant food profession. The paper concludes with the proposition that Technacy Genre Theory offers a new method for comparing and clarifying many combinations of technological typologies of practice.

Key Words: Vocational Education; Vocational Education Training; Technological and Applied Studies Training; life skills; Food Technology; food profession; science; innovation; sustainability Technacy Genre Theory.

Introduction

The data for the study was collected during 2009 as part of a doctoral thesis entitled: *A Critique of Food Technology, Innovation and Teacher Education*. The summary of findings presented in this paper is taken from a larger report being made available to the Australian Institute Food Science Technology Inc and the Department Education Training library. The survey instrument collected information that sought to establish contemporary perceptions about the study of Food Technology in Australia and the role secondary education may play in 'supplying' people into professional studies towards a career as a food technologist. In this arrangement, the food profession represent the 'demand' side of the process that starts with receiving students 'supplied' by the schools sector into undergraduate food science and technology courses. The survey questions aimed to compare the degree of alignment between the "supply" side (secondary teacher perceptions) with the "demand" side (food profession perceptions) of what is meant by the label "Food Technology" and its practical manifestation. The areas compared included: academic culture and knowledge in food technology and innovation; technical systems and equipment used, and relevant material ingredients involved in food technology practice. The study

also aimed to gauge relative attention given to goals concerning sustainability, economic trends and innovation capacity building as these areas remain topical in the wider context of the field of food science and technology research and emerging world concerns. The key question this study sort to clarify is: Do state secondary education providers and teachers share the national vision of knowledge and innovation with the food profession?

Research MethodThe research design for this study drew on a mixed method approach where historical literature was reviewed around the evolution and understanding of food technology curriculum and the food science industry. This sought to understand in particular the purpose of the subject area over time and in an economic context. Contemporary knowledge and understanding of teachers (secondary in service or undergraduate teachers) and non-teachers (food science professionals and food science undergraduates) were identified through fieldwork that involved school visits, class observations and informal teacher discussions. Personal interviews were undertaken with the New South Wales Department and Education and Training (NSW-DET) curriculum personnel and informal phone conversations were undertaken with food technologists and academics. Questions were formulated and a pilot survey tested. The population was chosen through a confidential stratified random sample of stakeholders associated with the food technology field. Sampling included the use of hard copy and online media. The survey instrument collected respondent profiles, dispositions and affect, and technological understandings. Empirical analysis was conducted on data from 382 survey returns during 2009. The data aimed to clarify what the state of play is in schools for the subject Food Technology, what the state of play is beyond school, and what alignments and ideas there might be for a common future.

The main school system sampled was the NSW Department of Education and Training (NSW DET) in Australia, partly because of accessibility, but also because this school system is generally regarded as one of the biggest 'centralized education systems' in the world, and so has a significant mass impact on society both in Australia and internationally (NSW Government, 2010). Perception grids, framed using Technacy Genre Theory, were used to compare professional food technologists' responses with schoolteacher responses. The perception grid method is an adaptation from similar work used by Provost, Martin, Hannan, Bath, & Lipp (2007) designed to discern psychology student views about the nature of human knowledge. This work drew on Sperandio-Mineo's earlier studies that investigated the epistemological beliefs of schoolteachers about the nature of science and the relationship beliefs had with teaching expertise and academic background.

The data analysis was arranged under three core sections:

1. Demographics

Participants involved teachers in secondary schooling, higher education Food Technology, Technological and Applied Studies (TAS) and non-TAS academics and Food Technology, TAS and non-TAS undergraduates studying to be teachers, food science technologists and academics and undergraduates studying to be food

science technologists. The food profession present as the reference group, while the teachers present as the comparative group. The data findings also refer to participants as Teacher Training and Non-Teacher Training and are used interchangeably. The demographic profiles examined their area of expertise; state of employment; gender; age; teaching or working years; employment type; qualifications and educational background; areas of teaching qualified to teach and areas taught but not qualified to teach; undergraduate year level and postgraduate study.

2. Food Technology and General Education

This section sought to identify academic culture for knowledge and techniques, tools and equipment and materials and ingredients (inclusive of ecology) for the teaching of Food Technology; Food Technology as an area of study and scholarly choice; various technologies that may support the teaching and learning for Food Technology; professional development; secondary curriculum and, knowledge sources to inform the area of study. General education was used to include teachers who teach in areas other than Food Technology.

3. Innovation, Food Technology and Technology Education

Directions for an innovation climate have been evident since 1996, when the Federal Government endorsed the Australian Science, Technology and Engineering Council for its first comprehensive foresight review that identified essential priorities for the national interest of technology and science. This section sought to identify participant perceptions and values for intellectual capital and to what degree there is a culture of continuous innovation through design, technology and food science based education. This section is largely based on reports and peer reviewed papers from ASTEC (1996); Slaughter (1999); Innovation, Summit, Implementation Group (2000); NSW Department of Education, Training Youth & Affairs (2000); Fee & Seemann (2002); Commonwealth and Australia (2003); Department of Education, Science and Training (2003); KPA (2003); NSW Department of Education, Science & Training (2003); Ramsey (2004); Business Council of Australia (2006) and Seemann (2003, 2004, 2006).

Framework

The study was guided by Technacy Genre Theory, which provided the conceptual framework to identify and measure inter-relationships and subtle differences between typologies (genre) of technology practice for Food Technology. Perceptions were gathered around contextual and goal oriented aspects of practice, with a specific interest in the:

1. Human elements of practice (e.g. agency, knowledge, techniques, values, social organisation)
2. Tool elements of practice (e.g. enabling technical devices, equipment and systems)
3. Material or ecological elements of practice (e.g. consumable ingredients, properties, aesthetics, impact on ecology)

The above three elements represent, according to Technacy Theory, both resources and constraints evident in all forms of technological practice (Seemann, 2009; 2003). Each element exists in a dependent relationship with the other elements of practice, and is defined via the purpose and context of application. Thus, the purpose and context of Food Technology curriculum, the Food Profession, and Innovation as an economy agenda were each framed as follows:

1. The purpose of Food Technology given the contemporary context of economic and lifestyle drivers
2. Knowledge, concepts and techniques in Food Technology (school teachers vs. wider profession of food technologists)
3. Tool elements for technical production systems and devices used in Food Technology
4. Material and environmental factors including ingredients, data or ecological resources used in food technology practice

Summary of Findings

The key outcome of this research clarifies, under the label of 'Food Technology', that two domains of practice (aka two forms of Technacy Genre) are at play. Further, two themes emerging from the findings suggest that the food professionals are mostly goal oriented and expect of high school leavers entering their field to value innovation, research and development (a culture of science), while the school's are mostly goal oriented and expect of their high school student to view the subject as life-skills and vocational in purpose (a culture of the humanities). Where the humanities place less emphasis on the study of a discipline but more about experiencing a general education in the "study of languages and literatures, the arts, history, and philosophy (Farlex, 2010)", the sciences are largely driven through "investigation, systematic knowledge or practice (ibid, 2010)," and where explicit scientific content and methods are not sacrificed. It is this contrast in disciplines that may help explain the differing perceptions between both sectors for what ought constitute the study of Food Technology.

A key finding identified that the teaching collegiate as a whole perceived priority systems of Food Technology knowledge/techniques, tools/equipment and ingredients/materials significantly differently to the wider professional community of food scientists and technologists. This significant finding also explains a likely reason why many Australian Food Science Technology undergraduate degrees have expressed concern for a drop in enrolments in Food Science and Technology (FST) courses (Education Providers Working Group, p.16, 2009). This situation has also been compounded by the dropout rate in the first year of high school leavers who have come from a 'food technology' course in their secondary studies but upon commencement in their university degree, have often expressed that the degree in food technology is incorrect, and should convey the school form of its name (KPA, 2003). The data presented in this report validates that students have been presented with a different practice for Food Technology in schools that is dislocated from the wider professional practice of the field.

Other results fundamental to this study reveal that even though food teachers may aspire to be science driven, the genre of practice was found to be life skills orientated. It is asserted that the tools and method (to a slightly less extent, the ingredient resources) used ultimately determines genre practice. In the case of curriculum design and subsequent tool choice in schools, the equipment used is primarily Vocational Education (VOCED) orientated. While in the Food Technologists genre of practice the methods, tools and much of the ingredients used are clinical experiment laboratory orientated. The teaching collegiate were weak in cross-referencing externally for knowledge, but were strong in networking within their fold with other teachers, sourcing mostly in-school workshops for their professional development, reading school based textbooks or food and Vocational Education Training (VET) trade magazines. On the other hand, the wider professional group were strong in networking across and outside their fields of discipline, attending and publishing into research based conferences and industry based workshops, and reading peer reviewed journals or books for sources of knowledge. The only common relationship between the two groups for sourcing information was the Internet as a tool choice.

Food Technology as an area of study revealed confusion among (TAS) teachers for where the subject is currently sitting and where it needs to go i.e. vocational vs. science. However, the teachers who teach core areas such as Maths, Science and English were more aligned with the wider professional group who saw or expected the subject to be more orientated towards the science domain. Where TAS teachers perceived social and life skills, cooking and food processing as core to the study of Food Technology (as was the case with the type of professional development sought); the wider professional group perceived science and research, food experiments and processing for product development as the foundations to the study of Food Technology (as was the case with the type of professional development sought). The only relationship common between the two groups concerned nutrition, but the teachers displayed a highly skewed lean toward nutrition compared to 1) the Food Science Technology professionals and 2) other elements of technological practice. This trend for nutrition studies appears to have impacted on the quality of undergraduate degree content offerings in FST courses, and as a result has marginalised food engineering and other food science skills required for the food profession (Education Providers Working Group, p.16, 2009). Additionally, both groups noted eco sustainability extremely low compared to other elements of technological practice. This is evidence that Technacy Genre Theory is able to make transparent when an element of technological practice is marginalized in favour of another. The result is an uneven distribution in technological knowledge as a basis for rounded judgement in the respective genre of practice. Both sides appear to be in need of increasing their respective understanding of the ecological aspect to their forms of practice.

When asked to rank the academic demands of “Food Technology” relative to other subjects, the subject was ranked last by the teaching collegiate but fourth highest by the wider professional group, while Mathematics, Science and English were recorded

as the top three scholarly subjects by both groups. At best it is seen as a soft subject by the teaching collegiate that offers vocational operational skills rather than a scholarly subject driven through science and innovation as commonly practiced in the wider food profession.

A high proportion of undergraduates from both groups appeared dissatisfied with the lack of school practicum or industry internships offered in their undergraduate degrees. For the undergraduate teachers, and where only school placements were noted as the most preferred, compared to showing an interest for industry placements, suggests that pedagogy (teaching method) is more valued than understanding discipline content. On the other hand, the non-teacher undergraduate food science students expressed the need for more science industry placement or internship. Written responses indicated that this would make them more confident in the discipline and therefore 'lab bench ready' for the food profession upon graduation, but there appears to be some resistance from food manufacturing industries to collaborate with universities. It was beyond the scope of this study to follow up the detail of why this may be the case.

Recommendations

Ideas and suggested recommendations are put forward in this section that may help develop strategies and raise opportunities for discussion concerning either alignment or separation for the different forms of food technology practice between the teaching profession and the food profession. It is proposed that school curriculum designers change the label from Food Technology to a more generic form such as "Food Studies" and that a new syllabus be designed and positioned under the VOCED strand of subjects if current practice in schools are seen to be sufficiently important to the main as is. Teachers appear to be maximising internal, localised referencing rather than wider contextual (out of education sector) scoping which has produced an internal closed feedback cycle of refinement drivers to the curriculum rather than drivers of evolution and innovation in the curriculum. This confusion has had a significant undesirable impact on both school leavers entering into the food profession, and the supply of next generation food scientists. It is recommended professional development involve mandatory FST industry workshops targeting the laboratories of the food science industries. With regard to eco-sustainability, there is a need to raise the bar in training to link eco-footprint more deeply into teaching and learning and the expertise and purpose of food research. There is an opportunity for the FST profession and schools to be champions in food sustainability and new science research in design. This would raise the knowledge and market agency of Australian expertise in food sustainability and security. Technacy Genre Theory provides a framework to do this. A way forward for this message to be heard is for school curriculum designers, in collaboration with food professionals and university academics, to design a new Food Science syllabus that is positioned under the sciences strands for national curriculum consideration and run as a curriculum alternative in addition to the abovementioned shift to 'Food Studies' and existing Food Hospitality offerings in schools. Food Science and Innovation Studies would be a potential 'strand' in science to maximise laboratory devices, contexts and cultures of practice.

Conclusion

This paper concludes that the teaching profession and the wider community of food professionals practice very different forms of technology genre, even though they both use the same label 'Food Technology' for their practice. This was made transparent through Technacy Genre Theory. The theory also offers a valid framework to arrive at a balanced view for technological choices for not only the FST profession in that it allows for sustainable and effective understandings and learning of technological practice and innovation, but also "Food Technology and associated technology genre" in secondary schools and teacher education. Although our technological decisions do not necessarily provide immediate feedback for the benefits of climate change, students in particular need to discern that what food technology ought constitute should embrace the greater good for both people and ecology. It is proposed that the knowledge gained from this research will inform and better align educational services towards the national priority in innovation and sustainability and thereby stimulate research concerning food education and associated teacher capital.

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