australasian journal of
TECHNOLOGY EDUCATION

The Australasian Journal of TechnologyEducation is a peer refereed journal, and provides a forum for scholarly discussion on topics relating to technology education. Submissions are welcomed relating to the primary, secondary and higher education sectors, initial teacher education and continuous professional development, and general research about Technology Education. Contributions to the on-going research debate are encouraged from any country. The expectation is that the Journal will publish articles at the leading edge of development of the subject area.

The Journal seeks to publish

- reports of research,
- articles based on action research by practitioners,
- literature reviews, and
- book reviews.

Publisher: The Technology, Environmental, Mathematics and Science (TEMS) Education Research Centre, which is part of the Division of Education, The University of Waikato, publishes the journal.

Contact details: The Editor, AJTE, wendy.fox-turnbull@waikato.ac.nz

Cover Design: Roger Joyce

ISSN: 2382-2007

australasian journal of TECHNOLOGY EDUCATION

The technology education curriculum in New Zealand: Implications for initial teacher education programmes

Elizabeth Reinsfield

Abstract

The changes to the New Zealand Curriculum in technology education has implications for the nature of Initial Teacher Education (ITE) programmes, which prepare secondary technology teachers for the profession. This article reports on a secondary technology student teacher's evolving understanding during her one-year ITE programme. Data were collected of her learning process, to extrapolate findings about curriculum meaning-making and knowledge for practice. The student's learning journey reflected similar challenges to existing secondary technology educators in the profession, and imply a need to support the development of resilience and self-regulatory practices, to enable a transformation of understandings. Recommendations advocate for the use of strategies which foster positive learning environments and expose student teachers to anchored approaches to learning. Such strategies are promoted as a means for student teachers to navigate disparities between what practicing teachers may value and what academic researchers assert is important to enable a future-focused approach for education.

Keywords

Initial Teacher Education; New Zealand Curriculum; Secondary technology teachers; Threshold concepts

Introduction

Initial Teacher Education programmes in New Zealand have traditionally offered a range of pathways for specialist secondary teachers of technology education. For example, the University of Waikato has provided two pathways for gaining a Graduate Diploma in Teaching (GradDipT) (Secondary). Entry into the programme has been for graduates with a University degree (through a one-year pathway), the alternative was for students to complete a suite of papers culminating in a Graduate Diploma (in Engineering or Hospitality Management) and a GradDipT. The latter programme was for those students who had significant work experience in the trades, thus undertaking a two-year pathway to teaching.

At the University of Waikato student entry into the two-year pathway was at the discretion of each faculty, who considered the student's work experience and prior qualifications. However, this pathway became untenable and it was no longer fit-for-purpose as it did not reflect the changing nature of the school-based curriculum. Also, reduced university staff capacity and fiscal challenges meant was no longer possible to accommodate programmes with small student numbers. Additionally, feedback from student teachers indicated that they felt ill prepared for university study, and found the expected level of academic engagement problematic; particularly at the beginning of their qualification. A review of

ITE programmes resulted from a policy change and presented an opportunity to reconceptualise the nature of secondary technology teacher education.

The teacher shortage in secondary technology education does not appear to be declining (See Reinsfield & Lee, 2021). Staff at the University of Waikato remained committed to the two-year pathway, which was reconceptualised to scaffold those from the trades into university study through a Diploma in Education. After success at this level of study, students then join the Graduate Diploma in Teaching. Applications for this pathway have increased for the 2021 intake, which also reflects a reported increase in the number of applications for teacher education in New Zealand. It is timely in such a climate to ensure that students' experiences in teacher education programmes are positive, seek to reduce attrition, and continue to prepare them for an education system, which is rapidly changing.

Student teachers' perceptions

The diverse experiences and knowledge that individuals' value and bring to teaching can mean that there are disparate expectations about the role of the technology teacher in the secondary school setting. Perceptions about the nature of technology education in New Zealand have been further complicated by the recent revision to its curriculum (MoE, 2017). There are now five technological areas, which provide the context for students' engagement with curriculum concepts. These areas are:

- computational thinking for digital technologies;
- designing and developing digital outcomes;
- designing and developing materials outcomes;
- designing and developing processed outcomes; and
- design and visual communication.

In New Zealand schools, technology education provides a means to support learning, which is theoretical, practical, and authentic in nature. Authentic learning contexts can be used to support understanding about real-world issues or to identify needs or opportunities within local or global communities (Lombardi, 2007; Peacock, 1997; Snape & Fox-Turnbull, 2013). By engaging in authentic learning, (student) teachers can consider knowledge from a range of disciplines, and others' perspectives. Learning of this nature can provide opportunities for sustained problem-solving and decision-making, exposure to a range of theoretical concepts, and collaborative working methods (Lombardi). Whether school-age learners are provided with this opportunity however, is likely to be determined by what teachers' value in their classroom.

Programmes of work can be highly technological and innovation-focused, or alternatively, centred on the development of traditional and/or vocationally based skills. The knowledge that student teachers value inevitably has implications for their engagement with learning both during their university-based-campus and school-based professional experiences. Learning can depend upon an individual's understanding of their discipline, which translates into the ways that student teachers make meaning of the technological concepts that define the technology curriculum in their technological area (MoE, 2007, 2017). As a result, student teachers need to be introduced to a range of ways to teach the subject. Anchored instruction can model approaches to learning, which foster understanding of a new concept in a differentiated manner, and acknowledge student teachers' perceptions and previous experiences (Bransford et al., 1990). In this case, the stages of anchored instruction assume a student teacher will take increasing ownership of their learning, as it progresses. According to Baumbach, Brewer, and Bird (1995) there are six key decision-making points that can define anchored instruction:

1. Choosing the anchor (the *why*).
2. Developing an understanding of the key ideas (the *what*).
3. Expanding the anchor (the strategies for teaching or the *how*).
4. Testing the anchor (in a simulated environment, or in the classroom).
5. Exploration (and developing evidence of the learning).
6. Sharing the learning or self-reflection.

This article reports on one student teacher's evolving understanding of her role as a food technology teacher during a one-year Graduate Diploma of Teaching. This research is deemed pertinent to understanding how engagement *with* and enactment of the technology curriculum is deemed imperative to effective professional practice, and because understanding the curriculum has been identified as troublesome for practicing secondary teachers (Reinsfield, 2018).

Students' professional experience in schools

One-year ITE programmes require student teachers to be resilient, to value their professional learning, and acknowledge the importance of their individual identity; in this case as a secondary teacher of technology. During their qualification, student teachers have professional experience placements, comprising a number of weeks in at least two schools. These professional experience placements regularly highlight a disparity between what practicing teachers believe students need to know and what academic researchers assert is important to enact the technology curriculum. For example, secondary school teachers often prioritize students' need to manage a practical classroom and use equipment safely. Whilst such factors are important to a student teacher's evolving pedagogical practice, of equal importance is the need to have a deep understanding of the nature of technology education, as represented through enacting the curriculum. It is imperative that student teachers can objectively and professionally critique the practice that they observe in schools, with a view to identifying factors that they may find problematic, and to consider how what they see reflects the curriculum in action (Reinsfield, 2019).

Research design

The research was situated within an interpretivist framework (Reeves & Hedberg, 2003). A socio-cultural lens accommodated a deliberate focus on student teachers' understandings of technology education. Thematic analysis allowed for the extraction of meaning and reporting of emerging knowledge (Javadi & Zarea, 2016). The conceptual framework provided a way to explore the transformation of student teachers' thinking and practice, whilst aligning their specialist understandings and meaning-making of the technology curriculum. The research design was chosen to focus on the transformation of a student teacher's evolving understandings throughout one year.

Threshold concept theory was used to explore tensions that, once understood, could further support student teachers' engagement with the technology curriculum (Reinsfield, 2018). A threshold concept is described as being "akin to a portal, opening up a new and previously inaccessible way of thinking about something" (Meyer & Land, 2003, p. 1). Threshold concepts provide the opportunities to represent new ways of understanding how student teachers make meaning of their role as a technology teacher educator (Lather, 1998; Meyer & Land, 2003, 2005, 2006). This article describes the ways in which a student teacher connected their previous professional experience with the ideas represented in the curriculum, for application in practice.

Data were collected as a result of the student teacher's usual engagement in on-campus classroom activities. The context was a full-year curriculum-focused technology education paper for students wanting to teach in the secondary school sector. The delivery medium for this paper was blended, and required both face-to-face and online contributions from students. Face-to-face classes were always recorded, providing capacity for student teachers to engage synchronously or asynchronously, as appropriate. From an ethical perspective, only the data from the contributions of those who agreed to be participants in the research were transcribed for the purpose of the research. Student contributions in this context consisted part of the data collected to represent their journey. Data was also generated from face-to-face and online tasks, which included:

- engagement with and responses to academic readings;
- group work;
- individual online contributions and group discussion (e.g., to explore personal attitudes and valued knowledge);

- engagement with a range of activities (including assignments) pertaining to pedagogical practice in technology education; and
- critical reflection about the professional learning during school-based placements.

Data analysis followed a sequential process whereby the data was collected, and key ideas were recorded, coded and analysed concurrently (Cohen et al., 2011, Miles et al., 2014). Key themes were determined from the research questions:

> How do pre-service secondary technology teachers' make meaning of the curriculum and develop their knowledge for practice?
>
> How do pre-service teachers' perceptions influence their understanding of technology education?
>
> How can university lecturers support the development of pre-service teachers' understanding?

Findings and discussion

Molly was selected because she made significant changes to her understanding throughout the year. The researcher identified and approached Molly, who agreed to participate in the study. Data collected from her engagement in the paper demonstrated how she was using her previous professional experience to make meaning of the curriculum concepts, and served to inform the ways that university lecturers can support the development of future student teachers.

Molly had been a pastry chef (overseas) before applying to become a secondary technology teacher (food). She enrolled in the two-year pathway. She was a considered, articulate, and conscientious student. In her first online post, she reflected on her perceptions and the first on-campus class, where the nature of technology education in New Zealand was introduced. Students were asked to consider this information in relation to their backgrounds. Molly stated:

> … what I found surprising were the misconceptions surrounding technology education [and its associated] subjects… I see technology as knowledge put to practical use and something that is constantly changing and developing as human need and demand change.
>
> I agree with the thought that a teacher's interpretation of technology and their understanding of the New Zealand curriculum will in turn affect how they choose to teach their particular area of technology (Reinsfield & Williams, 2018). The way in which they interpret this has a huge impact on the students that they pass their knowledge and concepts on to.
>
> In Years 7 & 8 I enjoyed food technology as it wasn't just about reaching an end product but included processes, cultural influences, history and societal impacts. Looking back … and thinking about the New Zealand curriculum, I can see how the teacher allowed us to think critically and creatively by using a technological approach. In Years 9 &10 I recall only copying down a recipe and replicating said item, which resulted in me dropping the subject.

Molly used her previous experiences as a pastry chef when interpreting the curriculum concepts, for enactment. This starting point appears to be the default for many student teachers; they connect their new learning to what is well-established, representing a form of sub-cultural retreat (Paechter, 1995). Whilst such practice is not unusual, it is important that student teachers move beyond such thinking because (in New Zealand) some teachers of technology can be regressive or indifferent to the enactment of their subject (Reinsfield, 2018). If student teachers do not appreciate the need to develop their understanding beyond what is known to them, they are less likely to seek ways to be responsive to diverse learners' needs.

One of Molly's assignments throughout the year required her to develop an authentic brief. Her brief stated:

> New Zealand has seen an increase of food allergies and Allergy New Zealand encourages schools to support students with food allergies and educate the school community.

Figure 1 shows how Molly developed initial concepts in response to the initial brief as part of an assignment.

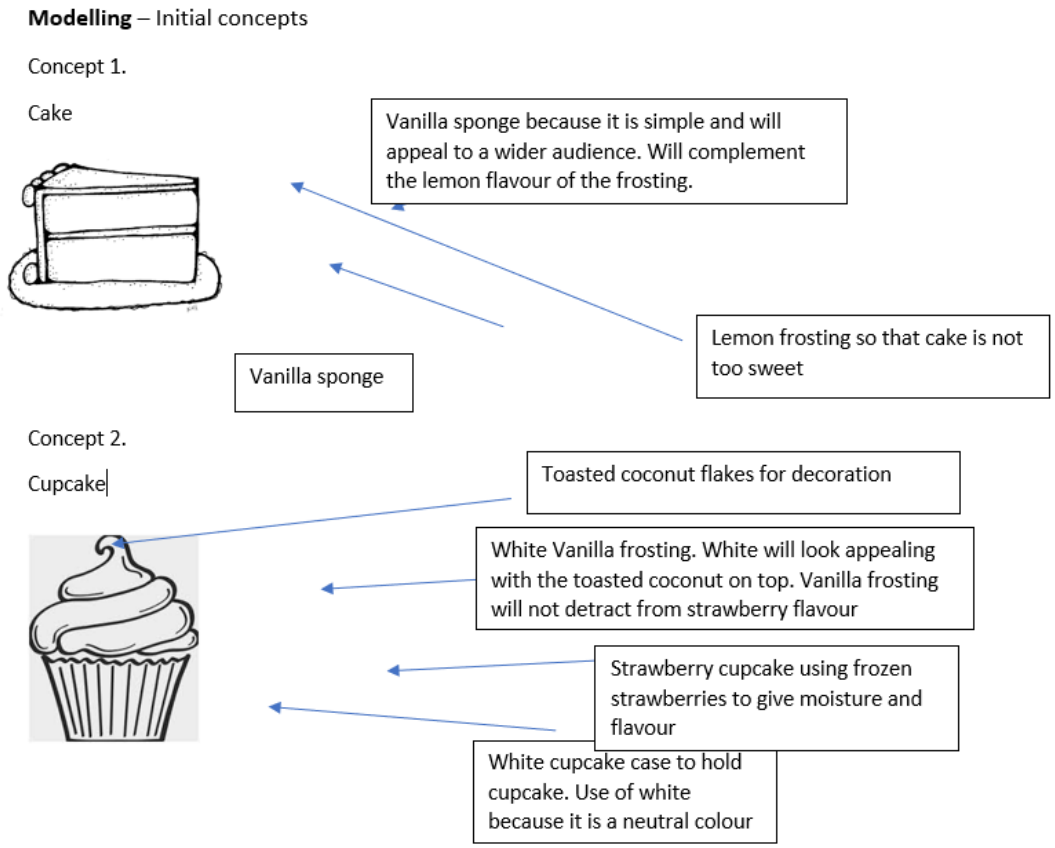

Figure 1. Developing initial concepts of cupcakes for people with food allergies.

Molly then made meaning of her thinking by ordering planned learning into *what* students could do and then *how* this would be facilitated. When reflecting on her practice, she stated:

> A possible way to approach this would be to have students look at and deconstruct a cupcake and come up with the different ingredients that go into one. Have them explore the different aspects - what is the purpose of a cupcake? Why would we eat it? What does it taste and look like? … [I could] help students to understand the purpose of each ingredient. What makes it rise, what gives it flavour and texture?
>
> Students could then move on to exploring and researching eating trends, based on diets. They might identify different dietary needs such as gluten free, dairy free, sugar free... [I could] set up a range of different dietary goods for students to sample and discuss… can they identify ingredients, textures and different tastes?
>
> … students [could] identify how different ingredients alter existing products. Students would then be placed into groups and develop a brief centred around meeting a dietary need, and could identify stakeholders and [the] purpose of their product. Students should have ideas of what they can incorporate into their own product [development], based on previous lessons.

> … Provide activities and worksheets to help students begin the process of justifying their product. Explain ingredients used and reasoning so that they learn to communicate the different aspects of their product verbally, visually, and on paper.
>
> Reinsfield's book had an interesting idea on creating food labels that included all the information on the product, including information required by law. I think that could be a good idea to implement. Have students come up with different ways they can analyse their product such as taste testing and writing up questionnaires and decide if they met their brief. Create a presentation where they can present their findings.

Later in the year, Molly was required to write an essay as one of her assignments. She was asked to (professionally) critique her final professional experience placement, by describing:

- the school, department or classroom curriculum for technology education;
- a learning event in relation to the curriculum; and
- the implications for her ongoing professional learning and practice.

She stated:

> My practicum school is a mixed gender public school with around 1600 students. During my time there, I was able to observe the curriculum intentions, the alignment to the technology curriculum and create a basis for my own curriculum practice.
>
> The Food Technology Department had undergone a few changes, which were driven by the Principal some time ago. It was restructured to cater to students who were struggling in more academic classes, and for students with behavioural issues. The idea being, that students struggling in other subjects would be able to pass, while students with behavioural issues, that were too disruptive in other classes would be kept busy and they too would be able to gain a passing grade. Food Technology is now only taught in Years Nine and Ten, while senior Food Technology has been replaced by Hospitality.
>
> Junior Food Technology, although labelled Food Technology, is taught as Home Economics and students are working towards level four of the curriculum. Senior Food Technology has been replaced by Hospitality, using a programme designed by industry. It focuses on industry standard[s] and is a skills-focused subject with the intent for students to move on from school and gain an apprenticeship or a career in a service-based workplace. Assessments in this context do not allow for students to be creative or innovative but only require them to be able to follow a recipe.

She also stated:

> One major outcome I identified while at my professional experience school, is how school management can impact the way in which technology is taught, as well as the structure of classrooms. Rather than directing students on an outcome, creating an assessment that allows them to design a product, in response to an identified need or opportunity, would be more beneficial.
>
> Another approach for me is to be involved in what is going on within the technology department and the changes being made to the curriculum. It seems that change is a constant for the technology department and if I want students to be taught in a way that aligns with the curriculum, I need to be aware and engaged in that process.

Molly's curriculum understanding evolved as a result of both her campus-based and school-based experiences. She used her previous professional expertise (as a pastry chef) to contextualise her learning, and make sense of the disparities she was observing in school; between the nature of the subject knowledge that her students were being exposed to, and the lack of relationship between this

and the intent of the curriculum concepts. Molly reported that the nature of learning appeared to be more focused on Home Economics content, rather than technology education. Home Economics (in New Zealand) is situated within the Health and Physical Education curriculum, and is derived from manual training (Street, 2006).

Molly's changing pedagogical perspectives were also significant. Her initial statements imply a transmissive view of education, where teachers "pass their knowledge and concepts on" to learners. As a result of her online engagement throughout the year, Molly reflected new understanding, particularly about collaborative approaches to learning, stating:

> A socio-cultural perspective, being the influence of society (social norms and structures) language and interaction with others, plays a role in the learner's approach and understanding… the constructivist approach has learning through experience and interaction. In both these ideas the learner's interactions with others can expand their existing knowledge or even replace it. If peer assisted learning and collaborative learning is fostered in the classroom as well as encouraged outside of the classroom, we can then apply the practice of scaffolding old knowledge with new knowledge. This will ensure that students, the teacher, and the wider community will benefit from shared knowledge and skills thus assisting in the learner's growth. This would essentially make it possible for the learner to develop new skills that will aid in completing tasks unassisted in the future.

The secondary technology curriculum paper was deliberately designed to ensure that student teachers were exposed to the types of learning that they were encouraged to facilitate in their own future classrooms; learning was organised as a form of anchored instruction.

Such an approach can be problematic if what student teachers see in a classroom appears disparate to what they have been exposed to at university. Whilst Molly's thinking was initially derived from her experience as a pastry chef, she developed to use this experience to contextualise her ideas and determine *what* she might teach. The *how* came afterwards. This finding aligns with Reinsfield's (2018) work, which determined that there were various factors mediating a technology teacher's practice, but the persisting threshold limiting technology teachers' evolving understanding appears to be centred around how they *make meaning* of the curriculum concepts to develop their knowledge for practice – in differing contexts. Threshold concept theory can provide a means to support the development of new ways of thinking, and be organized in three phases:

1. The ability to apply [new] knowledge (with understanding).
2. Engagement with that knowledge.
3. Awareness of where it is relevant (Meyer & Land, 2006, Meyer et al., 2008).

Molly was enacted each of these stages during the year, as outlined below.

1. *Applying new knowledge*: Connections were made to the New Zealand curriculum content through technological modelling to understand how design concepts could be used to justify the ongoing refinement of outcomes. There was evidence that Molly was informed about how materials were selected and used, based on performance criteria (Assignment: Authentic brief).
2. *Making-meaning*: Molly reflected that learning was more meaningful if the students were allowed to design and develop an outcome in response to an authentic issue, rather than being told what to do (Assignment: Essay).
3. *Deliberate enactment*: Molly translated her ideas into practice when she described the types of learning activities she would provide to scaffold students' learning. Research, sensory analysis (taste tests), analysis of existing products and brief development were cited examples (Assignment: Authentic brief).

Molly made meaning of the curriculum content, which required her to translate her ideas and thus became more problematic when she was required to teach Home Economics during her first professional experience placement because she had been prepared to teach technology education, where the focus of learning is on the *why*. For example: Why might we need to develop new products for those

with special dietary needs and how might this type of learning experience be pertinent for learners in their future?

Recommendations

To ensure that student teachers can make sense of their role as a technology teacher, their positioning needs to be established in relation to their perception of the purpose of technology, and their previous professional experience. This information serves as a means to determine how student teachers evolving understanding can be responsive to their previous experiences, and to support them to approach the teaching of the technological curriculum concepts in schools.

To counter any potential misconceptions, student teachers should be exposed to activities that encourage them to plan for learning which is driven by technological concepts rather than their known content or experience. This is likely to support their ability to articulate the purpose of their teaching, particularly when they observe practice that does not align with the teaching of curriculum concepts. Resilience and self-regulatory approaches to learning are required to enable such processes. The following recommendations are represented according to the ways that the anchored instruction was modelled during the research project, and with a view to translating practices to foster the type of positive learning environment we anticipate seeing our student teachers enact:

- provide learning activities which seek and connect to learners' point of view, challenge or validate suppositions;
- openly discuss issues that have relevance for learning, to support the creation of personal meaning, in a timely way (Kariuki & Duran, 2004; Novak, 2011; Osmond & Goodnough, 2011); and
- provide opportunities for anchored learning (in a simulated environment initially), to allow student teachers to have similar experiences to the learners they will teach in the future and for them to make meaning of the curriculum.

To negotiate student teachers' thresholds of understanding, the 'anchor' can be negotiated with the teacher, based on *what* they know, value, find troublesome, or wish to explore further. Such an approach implies a collaborative approach to learning, where there is a common goal. This idea is conceptualised in Figure 2, and questions are posed for both lecturer and students.

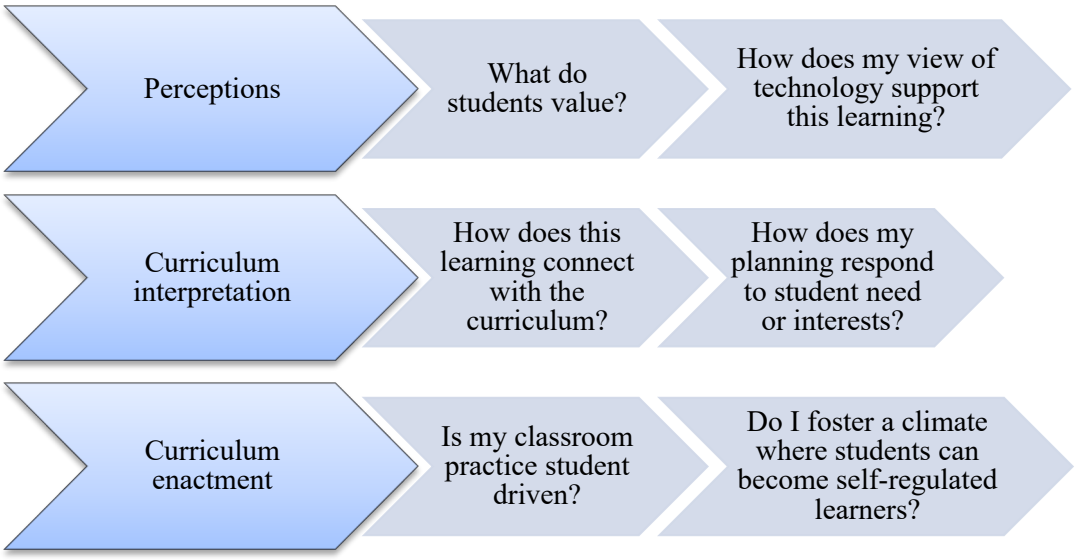

Figure 2. Questions to support teacher's evolving thinking.

Professional learning of this nature encourages student teachers to consider whether their espoused theories and practice align, and aims to guide reflection on how they could adapt their practice.

Conclusions

The changes to the *New Zealand Curriculum* in technology education (MoE, 2017), as well as the nature of Initial Teacher Education programmes have implications for how we prepare specialist secondary technology teachers for the profession. This article reports on a student teacher's evolving understanding during a one-year ITE programme. The student's learning journey suggests a need to focus on the development of student teachers' resilience and self-regulatory practices. Recommendations are made, which present ways to foster positive learning environments, and expose student teachers to anchored approaches to learning. Such strategies aim to support student teachers to navigate the disparities between what practicing teachers may value and what academic researchers assert is important to enable a future-focused approach for education.

Affiliations

Elizabeth Reinsfield
Senior Lecturer
University of Waikato
reinsl@waikato.ac.nz

References

Baumbach, D., Brewer, S., & Bird, M. (1995). Using anchored instruction in in-service teacher education. In Society for Information Technology & Teacher Education International Conference (pp. 809-813). Association for the Advancement of Computing in Education (AACE).

Bransford, J. D., Sherwood, R. D., Hasselbring, T. S., Kinzer, C. K., & Williams, S. M. (1990). Anchored instruction: Why we need it and how technology can help. In D. Nix & R. J. Spiro (Eds.), Cognition, Education, and Multimedia: Exploring Ideas in High Technology (pp.115-141). Lawrence Erlbaum Associates.

Cohen, L., Manion, L., & Morrison, K. (2011). Research methods in education. Routledge.

Javadi, M., & Zarea, K. (2016). Understanding thematic analysis and its pitfall. Demo, 1(1), 33-39.

Kariuki, M., & Duran, M. (2004). Using anchored instruction to teach preservice teachers to integrate technology in the curriculum. Journal of Technology and Teacher Education, 12(3), 431.

Lather, P. (1998). Critical pedagogy and its complicities: A praxis of stuck places. Educational Theory, 48(4), 487-498. https://doi.org/10.1111/j.1741-5446.1998.00487.x

Lombardi, M. M. (2007). Authentic learning for the 21st century: An overview. Educause Learning Initiative, 1, 1-12.

Meyer, J. H. F., & Land, R. (2003). Threshold concepts and troublesome knowledge: Linkages to ways of thinking and practicing. In C. Rust, (Ed.), Improving student learning: Theory and practice ten years on (pp. 412-424). Oxford Centre for Staff and Learning Development.

Meyer, J. H. F., & Land, R. (2005). Threshold concepts and troublesome knowledge: Epistemological considerations and a conceptual framework for teaching and learning. Higher Education, 49(3), 373-388. https://doi.org/10.1007/s10734-004-6779-5

Meyer, J. H. F. & Land, R. (2006). Threshold concepts and troublesome knowledge: Issues of liminality. In J. H. F. Meyer, & R. Land (Eds.), Overcoming barriers to student understanding: Threshold concepts and troublesome knowledge. (pp. 19-32). Routledge.

Meyer, J. H., Land, R., & Davies, P. (2008). Threshold concepts and troublesome knowledge: Issues of variation and variability. Sense.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). Qualitative data analysis: A methods sourcebook. Sage.

Ministry of Education [MoE]. (2007). The New Zealand Curriculum. Wellington, New Zealand: Learning Media.

Ministry of Education. [MoE]. (2017). Digital technologies: Hangarau Matihiki. Wellington, New Zealand. Retrieved from https://education.govt.nz/assets/Documents/Ministry/consultations/DT-consultation/DTCP1701-Digital-Technologies-Hangarau-Matihiko-ENG.pdf

Novak, G. M. (2011). Just-in-time teaching. New Directions for Teaching and Learning, (128), 63-73. https://doi.org/10.1002/tl.469

Osmond, P., & Goodnough, K. (2011). Adopting just-in-time teaching in the context of an elementary science education methodology course. Studying Teacher Education, 7(01), 77-91. https://www.learntechlib.org/p/52280/

Paechter, C. (1995). Sub-cultural retreat: Negotiating the design and technology curriculum. British Educational Research Journal, 21(1), 75-87. http://www.jstor.org.ezproxy.waikato.ac.nz/stable/1501284

Peacock, M. (1997). The effect of authentic materials on the motivation of EFL learners. ELT Journal, 51(2), 144-156. https://doi.org/10.1093/elt/51.2.144

Reeves, T.C., & Hedberg, J.G. (2003). Interactive learning systems evaluation. Educational Technology.

Reinsfield, E. (2018). The potential for a future-focused curriculum in New Zealand: The perceptions and practice of six secondary school technology teachers (Doctoral thesis). Retrieved from https://hdl.handle.net/10289/11939

Reinsfield, E. (2019). Technology teacher education: Best Practice. In *Encyclopedia for Teacher Education*. Retrieved from https://link.springer.com/content/pdf/10.1007%2F978-981-13-1179-6_161-1.pdf

Reinsfield, E. & Lee, K. (2021). Exploring the technology teacher shortage in New Zealand: The implications for quality teaching and learning. *International Journal of Technology and Design Education*. http://link.springer.com/article/10.1007/s10798-021-09668-4

Reinsfield, E. & Williams, P. J. (2018). New Zealand secondary teachers' perceptions Technological or Technical thinking. International Journal for Technology and Design Education. DOI: 10.1007/s10798-017-9418-z.

Snape, P., & Fox-Turnbull, W. (2013). Perspectives of authenticity: Implementation in technology education. International Journal of Technology and Design Education, 23(1), 51-68. https://doi.org/10.1007/s10798-011-9168-2

Street, P. (2006). Home economics education in New Zealand: A position statement. TKI NZ Curriculum Marautanga Project: Wellington, New Zealand.