

The Motivations and Perceptions of Practicing Teachers Undertaking Technology Education Research

A Work in Progress Report from an Exploratory Case Study

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Technology education (TE) is a transient area of study. Few other subject areas require such levels of up-skilling similar to that of technology teachers in order for them to stay current and aligned with the developments of technology subject matter. The subject area has undergone a significant shift, from a predominantly vocational, skills or craft based area of study to one that is now concerned with key transferable skills and knowledge. Traditionally, the subject area has served as a utilitarian means of developing practical and vocational skills. More recently, technology education research has become an evolving and expanding field, exploring the intricacies of the subject area and highlighting the significance of discipline specific competences of technological capability and literacy. These research endeavours have aided in the relatively slow moving establishment of the subject area as a key contributor to the general education of national second level curricula. Looking to the future; these endeavours to research the critical trends and practices of TE need to continue, where key stakeholders of the subject area engage in undertaking or contributing towards research to further develop the subject area and the perceived values of technology education in our schools. This paper presents the early stages of a work in progress exploratory study that looks to practicing technology teachers (n=5) who are currently engaged in technology education research for their positional insights, motivations and perceptions. The aim of the study is to inform research agendas from a practice perspective that will constructively impact the provision of technology education.

Keywords: Contemporary goals of Technology Education, Technology Teacher-Researcher Positionality, Informing Future Research Agendas

Introduction

Particular subject areas are well established and deeply rooted in our education systems in relation to the perceived value that they bring to the general education of our young people. Other subject areas still grapple with reaching such a perceived status. Advocates of such subject areas are challenged to inform stakeholders within our education system that of the distinct educational value of their subject area. The subject area of technology education is relatively young, with its earliest conceptions stemming from as recently as the 1970's, having evolved from the industrial arts, craft based or vocational offerings in different international instances. It also has an ever changing subject matter portfolio due to the rapidly evolving nature of the technological world that we live in. Throughout its short history, the subject has already seen dramatic changes in its content matter, and from an outsider perspective it is often a subject area that is not fully understood in relation to its relevance and interdisciplinary educational goals (Bell et al., 2017).

Key stakeholders, including those involved in initial teacher education, curriculum development, assessment, and teacher continuous professional development all have critical roles to play in ensuring the appropriate development and promotion of the subject area. However, at the centre of this agenda are practicing teachers, who hold unique knowledge bases in relation to the successful enactment and delivery of the subject area. This initial stage of this work in progress study gathered the motivations

and perceptions of a group of Irish second level technology education teachers with the aim of developing future research agendas that will inform practice and contribute towards the development of the perceived value and associated status of the subject area on the national second level curriculum.

Theoretical background

Technology education's transient nature and identity struggle

Technology education has undergone a significant shift, from a predominantly vocational, skills or craft based area of study to one that is now concerned with key transferable skills and knowledge (Doyle et al., 2019). The associated subject matter is ever changing and in recent years has gathered even more momentum with growth in areas such as artificial intelligence, additive manufacturing, software development and immersive technologies. Technology education research has become an evolving and expanding field over the past 20 years or so (Xu, 2020), exploring the intricacies of the subject area and highlighting the significance of discipline specific competences of technological capability and literacy (Hansen, 1997). These advancements not only frequently change the conditions of the delivery of the subject in the classroom for practicing teachers, but also create a challenge for the technology subjects to form a rooted identity in our education systems' curricula (Bell, 2017) that is comparable to the enviable prominence that maths and science education enjoy (Benken and Stevenson, 2014). The constant and essential challenge of staying abreast of the skills development associated with new technologies is what is commonly seen as a main benefit, focus or purpose of the technological subjects' learning experience. A resulting perception is often that the primary goals of the subject area are to develop learner competences in utilising new technologies and to develop practical DIY or craft type physical skills in manipulating concrete materials (Middleton, 2005). However, this apparently positive but somewhat narrow perception may be a cause for the potential lack of appreciation of technological knowledge and its usefulness in technological tasks, such as the invention, development, maintenance and manufacturing of technical artefacts (Norstrom, 2015). Furthermore, there is often a lack of appreciation or understanding of how the technology subject area is oriented to develop a range of broader transferable educational competences and values. The key competences of technology education have been commonly reported as technological capabilities (Gibson, 2008) referring to technological skills, values, knowledge and heuristics, and technological literacy (Williams, 2009), referring to learners' abilities to interpret, critique and reflect upon the uses and impacts of technology and technological systems in all their forms.

Technology as a subject area is regularly described as not having an explicit epistemological boundary and instead having a fluid treatment of specific knowledge in its endeavour to develop students' competences (Buckley et al., 2019). To be a competent student of technology education within and beyond second level education, one must be an efficient, innovative, creative and analytical thinker, able to form judgements and to be agile and responsive to new technological developments (Cropley, 2020). They are also required to be forward looking and empathetic towards the challenges that our society and environment face, and reflect upon how technological advances may support or perhaps hinder sociological or environmental issues. It is a challenge for the technology subject area to highlight these critical competences from within a frantically changing and evolving subject matter. Technology education researchers therefore have a critical role to play in developing research agendas that highlight the broader educational values of the technology subjects.

Participants and method

The participants (n=5) of this work in progress exploratory case study are practicing second level technology teachers with varying levels of teaching experience (3 years to 16 years). They are currently undertaking a technology education research project as part of the structured Masters programme in Engineering Education. All of the participants have completed stage 1 modules on the structured research Masters programme, including *Graduate Studies* and *Research Integrity*. They are currently

taking the *Introduction to Research Paradigms* module and some are also engaged in a *Writing Skills for Graduate Students* module. The participants also engaged in an eight-part seminar series, where the members of the Technology Education Research Group (TERG) postgraduate supervisory team presented discipline specific topics for consideration when exploring and outlining a proposal in technology education research.

A semi-structured interview protocol was designed for the conducting of the interviews, encouraging the participants to outline their personal motivations and perceptions. Ethical approval was granted to conduct the study. Assurance was offered to the participants that they could remove themselves from the study at any stage, and that their responses would be anonymised to promote honest responses. The interviews were conducted online, where they ranged in duration from 22 to 27 minutes in length. The interviewer was at all times empathetic towards the participants' responses and cognisant of allowing the interviewees to steer the discourse towards the topics that they felt were relevant and of importance to them. The interview audio was recorded and transcribed for subsequent analysis. The resulting inductive analysis aimed to identify and retain the variance amongst the perceptions, attitudes and beliefs of the study's participants. The following section reports on the initial observations made as part of the analysis that was conducted using NVivo software.

Preliminary observations

Semi-structured interview responses

The conducted interviews aimed to capture and assimilate the participants' motivations to undertake technology education research and their positional views on what are the research topics and agendas that would be most valued and beneficial for practicing teachers of the technology subjects. The subsections to follow outline the participants' responses to the following primary questions of the interview protocol.

1. What experience do they have as a technology teacher to date and what were their motivations to undertake a Masters by research in Technology Education?
2. From their positionality as a technology teacher-researcher, what do they see as important research agendas to be explored for the development of the provision or practices within the technology subject area.

Positionality and motivations to undertake technology education research

Having briefly discussed the path that the participants took to becoming a technology teacher, the interview protocol then steered towards their teaching experience to date and if they had any other involvement in the subject area outside of the classroom. This gave the study insight into their positionality as a teacher-researcher, the breadth of their experiences, and gave context to their motivations to undertake technology education research.

One participant, Charlie, described his vocational background, and how throughout their life, he had always worked hard to be progressing. In his career, outside of his teaching role, he had significant involvement with a number of national educational organisations. He was also involved in middle management in his school. Interestingly, the opportunity to undertake a masters in technology education by research represented that next stage of progression for this participant where he felt that through his experiences, he had developed a confidence that he didn't always have. With this new found confidence, he now feels he is in a position where he has a lot to offer towards the development of the subject area and enhancing the practices of technology teachers through scholarly research combined with his professional experiences, which he outlined as his primary motivation to engage in research.

I think mixing up the academic side of it with my experience and my knowledge, I think there could be some really good stuff in there that might make a difference to someone.

Joan, a newly qualified teacher (NQT) that participated in the study offered different motivations as to why she engaged in research as primarily a means of expanding her knowledge of the subject area and developing her teaching in their classroom.

It'll just broaden the horizon of kind of what's out there, what's happening, what studies have been done, what could I look at, what could I inform to bring back to class. If there's something I can bring back to class, it'll be a benefit.

Alan, another NQT commented on how he sees great value in the technology subjects and relished the opportunity to identify and highlight possible issues, and through engaging in research both develop the subject area as a whole and inform his practices as a teacher also. He also recognised the academic qualification as a positive means of progressing their career but emphasised how his main goal was to contribute towards teaching and learning in the subject area.

The next interviewee, Keith, who was an experienced teacher with additional experience working with national bodies responsible for teacher in-service training, reported how initially his motivations were multi-faceted in relation to staying current, improving their teaching and the subject area, but predominantly oriented around the academic qualification and the opportunities it might bring about to progress their career. He went on to explain;

I'm actually seeing a massive benefit to my teaching... I'm now being more motivated by improving my teaching also.

As a result of engaging with technology education research, his motivations have changed where the benefits for his teaching are becoming apparent.

The final participant, Dean, had similar motivations where he commented on his interest in improving the subject area and how the qualification might lead to him developing his career as an educator in the future.

I'm interested in things that could improve our subjects and our subject content, make the subject more engaging. It could lead to further career prospects.

The preliminary thematic analysis highlighted the practicing teacher motivations for undertaking technology education research outlined in *Table 1* below. These emerging categories provide insight into the values of the practicing technology teacher-researchers.

Table 1. Emerging categories of teacher motivations to undertake technology education research

Category 1	Develop their professional career prospects
Category 2	Developing their pedagogical classroom practice and student learning
Category 3	Informing and Improving the future provision of technology education
Category 4	Opportunities to integrate teaching experience with scholarly research
Category 5	Exposure to contemporary discipline based educational research

It was noted that there were motivations aligned with undertaking technology education research to develop career prospects (category 1). Other motivations ranged across four categories (categories 2-5); from valuing the exposure to contemporary research in their discipline to informing their perspectives on the subject area and the impact it had on their teaching practices and the resulting benefits for their students.

Technology Education Research Agendas of value to Practicing Technology Teachers

The topic of discussion presented in this section is; from the technology teacher-researchers' perspectives, what areas of the technology subjects do they deem important to be investigated through

research. This discussion point was aimed at highlighting and developing opportunities to further investigate and develop relevant research agendas that would carry meaning and value for practicing technology teachers.

Keith outlined a need to investigate the overall educational contributions of the subject area that maybe lie beneath the shroud of the industrial arts or vocationally oriented stereotypes that are associated with the subject area. He highlighted a required research agenda around identifying the values of technology education, emphasising the role the subject plays in helping “*students to become more adept and astute in their own learning*”. He also outlined how he had teaching experiences in both rural and urban settings and as a result commented on possible research to look at the diversity of the offerings of the same technology subject syllabi and the impact that the geographic and cultural setting of the school has on the pedagogical enactment of the technology subjects.

Commentary from Alan similarly outlined how research needs to inform curriculum design and be utilised as a means of raising the profile of the technology subject to be on par with other subjects. They also referred to the pivotal role that the teacher plays in the subject area, and research that focuses on teaching practices, teacher values and teacher views would support the effective progression of our subject area.

The areas of problem solving, creativity and design skills were outlined by Dean as topics that would benefit from research outputs that would offer teachers more structure in relation to how they should effectively develop these competences in their students. The importance of positive teacher-student relationships to support learning in the practical learning environment was also suggested but also how the technology teacher has a responsibility to teach the students discipline through offering them opportunities to experience structure and routine that they can use in their day to day lives. Joan outlined feedback as a very topical issue, where it is a strength of the technology subject area and research in feedback practices in technology could perhaps inform feedback across the curriculum.

Table 2 presents the six categories of emerging research agendas that were identified from analysis of the interview transcripts.

Table 2. Emerging categories of research agendas valued by practicing technology teacher-researchers

Category 1	Highlighting the unique values and raising the profile of the technology subjects
Category 2	How the subject area develops pupils’ transversal skills and meta cognitive abilities
Category 3	The impact of community and school culture on the enactment of the technology subjects
Category 4	Gathering technology teacher values and perspectives to inform impactful curriculum design
Category 5	Learning that occurs as a result of the unique interactions and teacher-student relationships that are formed within the technology subject classroom
Category 6	Identifying support structures for teachers to develop the key skills of problem solving, creativity and design

Category 1 was outlined in relation to commentary on the pertinence of a research agenda to develop the status and profile of the technology subjects amongst key stakeholders such as parents, school management and pupils. The other identified research agenda categories resulted from first round coding that included comments around the skills that are ideally developed in technology education (category 2), school and community cultures (category 3), teacher informed curriculum design (category 4), the unique nature of the technology classroom learning environment (category 5) and the support structures that are necessary to aid teachers in developing technological capability oriented skills in their students (category 6).

Discussion

The initial preliminary findings of the conducted interviews highlighted a number of key areas for consideration. It is apparent from this inductive stage of the study that the undertaking of the technology education research programme to date has offered the participants opportunity and scope to expand their thinking on the subject area. From their commentary, it has emerged that the participant teachers are concerned with the status issues that exist within the technology subject area. The responses have also outlined a number of emerging issues that the participants believe would have meaningful impact on how the technology subjects are delivered and enacted within the second level technology classrooms. The associated derived agendas, that were identified from a practice perspective, that will benefit from the transactional nature of the research activity to have meaningful impact in the classroom include aspects of; the value and unique contributions of the technology subjects, the impact that the values and beliefs of the pupil, teacher, school and community have on the enactment of the technology subjects, and the importance of teacher-researcher perspectives to inform curriculum and policy.

Further interviews will be conducted with additional participants, where resulting coding and categorisation of responses will then be utilised to form specific discussions within focus groups to form deeper understandings around the key research agendas that the participants see as impeding or impacting on the quality of the teaching and learning and ultimately the student experience in technology education.

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