CHANGING KNOWLEDGE, CHANGING TECHNOLOGY: IMPLICATIONS FOR TEACHER EDUCATION FUTURES.

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ABSTRACT

Recent research in teacher education futures has identified two themes that require further study: the changing nature of knowledge and the changing capabilities of technologies. This article examines the intersection of these two themes and their implications for teacher education. The research employed futures methodologies based on scenario creation. With a focus on the above themes or dimensions, a panel of experts was interviewed to draw on its collective wisdom to explore alternative teacher education futures. Data from these interviews were analysed to stimulate the construction of four future teacher education scenarios. Feedback on the scenarios was obtained from teacher educators in Europe and Australia. The scenarios were then revised based on this feedback. The final scenarios are presented here as a way of provoking discussion amongst teacher educators about teacher education futures.

Keywords: knowledge; technology; education futures; scenarios; teacher education

INTRODUCTION

There is increased interest in teacher education from those outside the profession. The autonomy of teacher educators is severely challenged as policy makers, economists and governments make decisions about its structure (Darling-Hammond, 2010). This article attempts to reclaim the discussion about teacher education futures by opening this debate to teacher educators. In this article, we investigate the views of eight professors of teacher education, and use these views to develop four contrasting scenarios. We then use the scenarios to debate the implications of current drivers in teacher education for the future. In this way the scenarios become strategic platforms for envisaging teacher education futures.

This project builds on previous work in a special issue in the *Journal of Education for Teaching* (*Looking to the Future*, 2005). It examines two key areas pertinent to initial teacher education futures: knowledge and technology. (Initial teacher education will be referred to as

teacher education for the remainder of the paper.) The paper develops earlier work on teacher education futures (Aubusson and Schuck, 2013) which investigated a range of international educators' views on the future of teacher education. In that study, despite technology and the changing nature of knowledge being emphasised as possible drivers of future teacher education, these constructs were not discussed in detail by the participants.

The importance of looking at the impact of changing technologies or ICTs (information and communications technologies) on teacher education is supported by the earlier work in the *JET* special issue referred to above. A decade ago Williams (2005, p.328) indicated that technologies "may not only influence pedagogical practice but also transform the power balance between teacher and learner and threaten institutional structures in education." This point is taken up in a recent paper by Royle, Stager and Traxler (2014), which suggests that if teacher education does not consider the impact of current technologies and social media on the ways that student teachers learn, the institution of teacher education is in danger of becoming irrelevant. We can only imagine what future technologies may encompass, and how they might be used by students in the future. Nevertheless, it is essential to extrapolate their current effects to consider how the future may look.

The other area being examined here is that of the changing nature of knowledge. While our previous study indicated the importance of considering how knowledge creation and use may look in the future, this was not elaborated on, given the broad range of drivers discussed in that paper (Aubusson and Schuck, 2013). Like Newby (2005a), we believe that we cannot understand the

future of teacher education without understanding the skills and knowledge needed to prepare students for 20 years hence.

The purpose of this paper is to provoke debate and discussion about teacher education futures, with particular reference to the interactions between knowledge and technology, within the teacher education community. We do this by constructing four scenarios based upon the views of selected professors of education, using these scenarios as a vehicle to provoke debate amongst teacher educators more generally, and then providing the amended scenarios in this paper as a provocation for debate and discussion by the readers of this journal. We note that different scenarios start from different principles, and will differ according to the starting perspectives, as suggested by Newby (2005b). In this project we start with the drivers of technology and changing knowledge demands and their impact on each other, and develop the scenarios from these.

Much has been written about teacher education in terms of structures, alternative programmes, means of delivery, and desired outcomes and impact. Many researchers indicate ways of improving teacher education and teaching practice (e.g., Darling-Hammond, 2012; Korthagen, 2004; Korthagen, Loughran and Russell, 2006; Loughran, 2006). These authors make a critical contribution to the debate on what teacher education ought to be. They provide evidence-based elaborations of what is effective and make a case for shifting teacher education from its current position to new positions. This paper provides a complementary approach which does not attempt to privilege a particular future. Rather it uses futures methodology to extrapolate from the present to imagine diverse teacher education futures and to understand the consequences of current trends.

As noted above, knowledge and technology have been identified as critical in understanding teacher education futures. They are complex and contested domains in education. The purpose of this article is not to discuss and develop the constructs of knowledge and technology *per se* but rather to explore projections from current trends related to these constructs, and to explore the implications of their interactions for teacher education futures. Consequently, we first highlight some general trends in changing knowledge demands with implications for education and teacher education. We then explore how these interact with developments in technology.

CHANGING KNOWLEDGE DEMANDS, CHANGING TECHNOLOGY

> There are precious few certainties in today's classrooms ... About the only 'certainties' we can count on are that teachers' professional lives will be characterized by unstructured problems and unpredictable hourly and daily events. Therefore, the task for teacher educators is complex … Educators need to think how to prepare teachers for the knowledge era. (Jacobsen and Lock, 2004)

In this era, according to Gilbert (2007), what we mean by knowledge is changing. She argues that there is a shift in the way that knowledge is utilised, the way it is created and in the ownership of knowledge. The valued knowledge has changed, and this challenges the very foundations of the education system. Education should always be about preparation for the future but the future is uncertain and unknowable. It has always been this way. Presently, the key characteristic is the intensity of change and the super complexity of the world that humans navigate (Barnett, 2012). The inevitable rejoinder, according to Barnett (2012), is that if it is unknowable then how can one be prepared for it? However, the future is always uncertain, as education is about preparing for an

unknown world. Changing society, workplaces, industries and economies require changes in education (Bentley, 2012; Griffin, 2013; Griffin, Care & McGaw, 2012; Trilling, & Fadel, 2009). These changes require an ontological shift in the nature of the knowledge that learners need (Barnett, 2012).

The way in which we prepare for an unknowable future with uncertain knowledge demands is highly contested. Bates (2005) argues that discussion about how we address this changing future needs to be specific about content and context. To talk merely about preparing teachers for change, or for managing knowledge, are considered by him to be "entirely vacuous concepts" (p. 301). He goes on to suggest that we need to attach specific meaning to our planning of educational futures. This supports the exercise undertaken in this paper, of developing scenarios which provide specific context and content to which readers can react.

It is helpful to develop some knowledge-building principles (Scardamalia, 2002) to guide discussion on how knowledge in teacher education may be developed. Some principles indicated by MacKinnon and Aylward (2009) include skills to deal with authentic problems, solving ill-defined problems, working on shared understandings and participation in the knowledge building process. In teacher education, changing requirements for content knowledge, pedagogical knowledge and pedagogical content knowledge are areas that need analysis. The definition of what constitutes knowledge is central to any teacher education system: the selection that constitutes the curriculum, areas for assessment and the construction of examinations calls on a version of knowledge which has to be 'agreed' for such links to be made (Aubusson and Schuck, 2013).

In a prescient paper in the *JET* special issue of 2005, Newby suggests a vision for 2020 which indicates that subject content knowledge will be in a constant state of flux, with new subject content and new alliances between disciplines being formed. He suggests that learners will need to "acquire qualities of thought and action which will suit them to succeed in a world with fewer certainties and greater risks", (Newby, 2005c, p. 299). He suggests that epistemologies will be the focus of teaching and students will need to synthesise, analyse and interpret. These forecasts have implications for teacher education in 2020 and beyond.

Alongside this debate about knowledge, there is another dimension that must be considered. This is the place of technologies and their impact on teacher education futures. Much has been written on the interaction between technology and the new knowledge demands that student teachers will need preparation for. The ability to interact with a global audience, create knowledge and interact and learn beyond the confines of the teacher education programme suggest that perhaps new ways of preparing student teachers for the future are called for (Jacobsen & Lock, 2004).

Royle, Stager and Traxler (2014) challenge the relevance of existing teacher education programmes that do not consider major adaptations as a result of emerging technologies and in particular, increased mobility arising from learning with mobile technologies. These authors raise the dilemmas and tensions that arise between current standardisation of teacher education programmes and the creation of knowledge by users, made possible through the technologies and practices of mobile learning. The emergence of learning technologies and technologies for social use require us to re-assess their impact on teacher education (Royle et al., 2014). They challenge

us to envisage how teacher education might need to change in a future where these technologies are ubiquitous and have affordances and features that empower the learner to construct rather than simply consume knowledge. Such a future, it could be argued, is not far away (perhaps, already with us).

For those who present the case for an incontestable and statutory form of teacher knowledge we raise this pivotal role and potential impact of digital technologies in shaping the knowledge base and in asking fundamental questions about the future of teacher education, and indeed higher education itself. Current trends indicate that technology will continue to shrink in both size and cost whilst expanding exponentially in terms of computational power, reach and ownership (Johnson, Levine and Smith, 2009). These trends suggest a gestalt shift from the corporate 'one size fits all' mentality of technology deployment which has dominated education since the advent of the personal computer (PC) towards a more sensitive post-PC era (Murphy, 2011) which is altogether more customised and customisable, focusing on the individual at an holistic level (Royle et al., 2014). These trends indicate a future which focuses on the individual at the centre of a learning ecosystem, informed and individualised by the power and potential of data analytics and big data (Buckingham Shum, 2012; Long and Siemens, 2011). The trend towards miniaturization is already instantiated in education through the global phenomenon of m-learning which challenges existing conceptualisations of how, where and when learning occurs (Traxler, 2009). The full impact and significance of 'big data' and data analytics is yet to be fully recognised at the practice level in education, although their broader implications and importance have been the focus of intense academic and theoretical speculation for some considerable time (Buckingham Shum, 2012; Johnson, Becker, Cummins, Estrada, Freeman, and Ludgate 2013).

What is beyond question, however, is the global impact of these technological changes which are set to confront many of the fundamental assumptions and tenets upon which teacher education is constructed.

Three areas in which these changes are likely to be manifest for teacher education include the knowledge base referred to in the previous section, alongside the spaces (not just places) and temporal frames within which these activities are enacted. As learners gain more ubiquitous, pervasive and personal access to networked digital technologies so they gain greater agency to navigate and construct their own individualised knowledge base which is no longer solely dependent on the expertise or memory of the teacher or lecturer (Kearney, Aubusson, Schuck and Burden, 2012; Royle, Stager and Traxler, 2014; Scadamalia and Bereiter, 1994; Traxler, 2007). This challenges the primacy of a transmission or banking model of learning (Freire, 2000) but, more significantly for teacher educators, it also questions the traditional authority and power nexus which has characterised education for so long. If learners can use technology to query or challenge the epistemic authority of the expert in an instance, what is the place and value of a pre-defined, fixed knowledge base which has traditionally underpinned most models of teacher education?

Significantly, as technology loosens the bindings which have previously constricted teacher education to specific spaces and times (e.g. the university campus or virtual learning environment), a reconceptualisation of who the ‘expert’ is and where the ‘expertise' resides becomes paramount. With social media and other collaborative real time technologies starting to replace the monolithic software solutions of the past, it is increasingly possible that learners will seek advice and guidance from outsiders, beyond the physical confines of the classroom, again

challenging the current hegemony of schools and universities. Although a shift from authoritative bounded knowledge (Nagy and Bigum, 2007) may be relatively uncommon in the present risk-averse culture and mindset of the early twenty-first century (Kearney, Burden and Rai, 2015) there is no reason to believe such hegemonic practices will always be the case and there are already many instances where students are learning across national boundaries from other learners and experts who are not formally acknowledged or accredited as teachers (Dolan, et al., 2013).

This in turn relates to the temporal frames within which teacher education is currently located. In the twentieth century the predominant model of teacher education was based upon the twin assumptions that teaching/learning would be located in one place and undertaken synchronously, usually at one time. Technology has undermined these traditional certainties enabling learning to be undertaken across a range of temporal frames. These include synchronous experience, asynchronous modes of study (e.g. Chiero and Beare, 2010; Olson and Werhan, 2005) and indeed, a blurring of current binaries of synchronicity and asynchronicity, such that traditional notions and understanding of 'time' become redundant (Dalgarno, 2014; Oztok, et al., 2014). These variants are likely to proliferate in the future as learners demand a more customised form of higher education.

The discussion above indicates the implications of changing knowledges and technologies for teacher education futures. It is essential to investigate and analyse the ways in which current models of teacher education might need to change in a context where the nature and ownership of the knowledge is contested and where emerging technologies are impacting on teacher education.

Given this context, the research question we address in this paper is: *What are the teacher education futures that emerge from a consideration of the changing knowledge demands, changing technologies and the interactions between these two?*

DESIGNING THE STUDY

Futures studies draw on methods to systematically inquire about alternative futures (Bell, 2003; Lloyd and Wallace, 2004; Slaughter, 2002). Methods employed in this study can be described as participatory, where input and advice on futures is sought from stakeholders and experts in the field (Iverson, 2006). Future studies often seek to achieve consensus vision of a future (Gordon 1994; Iverson, 2006). However, in this study the aim was to gather participant views and use an amalgam of these views to construct divergent scenarios and to ensure that each of the divergent scenarios was plausible in the context of current trends.

This study used scenario creation (Iverson, 2006). The scenario building was exploratory, as described by Iverson, in that it was not based on a vision of teacher education in the future or of the direction it ought to take, as might be the case in a normative study where a clear policy is in place or sought. The design is consistent with Newby's (2005b) assertion that the future is unknowable in that you cannot give precise reference to events that have not yet happened but you can imagine futures by considering trends of the present.

The scenario creation proceeded through a series of iterations with progressive modification in response to feedback from many teacher educators and teacher education researchers. The scenario construction drew on work by Linde (2003) and Snoek (2003). Specifically, two dimensions were established i.e., knowledge and technology. The dimensions guided the construction of four divergent and plausible future scenarios (see figure 1). The scenarios were produced with the intention as described by Snoek (2005)

> Proposing several alternative scenarios underlines that there is not one pathway into the future and that it should not be expected that a scenario will emerge in a ´pure´ form. Most scenarios are described in their extremes, thus underlining the different variables and their relation. Reality is more blurred and probably elements of different alternative scenarios can be found in reality. However, reducing the complexity of reality into a limited number of polar types stimulates sensitivity to the strategic choices to be confronted (p.10).

The details of the conduct of the study based on this methodology are now outlined below.

DATA COLLECTION AND ANALYSIS

The scenario creation process proceeded in two stages. First views of a group of teacher education professors (referred to as an 'expert panel') were sought. Second, the views of a broad teacher education research community were sought through a conference session and a seminar presentation.

A panel of experts was invited to guide the development of alternative views of the future of teacher education. The panel consisted of eight professors of education, four from Australia and four from the UK, selected because of their extensive track record of research in teacher education.

This provided a particular perspective from one group of leaders in teacher education. Obtaining views from all stakeholders in teacher education was beyond the scope of this paper. The sample was a combination of a purposive and convenience sample. It was purposive in that panels from two very different teacher education environments were sought but convenient in that the sample was accessible to the researchers. Four participants were selected because of their research in technology enhanced learning. The others were selected because they had written about or given keynotes about current trends in, or future directions for, teacher education. The research was overseen by a university ethics committee and participants were provided with approved information prior to their involvement in the study.

In semi-structured interviews experts were asked think about fifteen to twenty years from the present day, to describe their views of the future of teacher education, to highlight what they perceived to be desirable and undesirable elements and to indicate inhibitors and promoters of alternate futures. Prior to the interviews, panel members were provided with an outline of the purpose of the study and the interview protocol, including questions exploring implications related to changes in the nature of knowledge and educational technologies.

Interviews were transcribed and subjected to thematic analysis. Major categories were highlighted and coded using constant comparison (Bogdan and Biklen, 1997; Gall, Borg and Gall, 1996). Themes were identified in a thorough reading of the data by the four member research team. These were discussed and consensus on the themes was achieved among the research team. Where there were disagreements these were resolved in discussion with reference to data. Given the nature of the study, it is unsurprising that main themes, with important implications for the

future, emerged around changes in knowledge demands, the production of teacher education knowledge, what counts as knowledge of worth in teacher education and the control of knowledge. Although experts were asked to elaborate on the implications of developments in technology, the information elicited was less detailed. Nevertheless, distinctive technological potentials were identified. These pertained to access to information, presentation and production of information and using technologies for generative and inquisitive rather than acquisitive learning.

The data were then synthesised to provide narratives that formed the scenarios. They include comments on changes to knowledge that might arise as a result of emerging technologies e.g. the ways in which data sharing would allow communication of ideas as noted in scenario C; the ways data management and analytics will aggregate large volumes of data to support knowledge production as shown in scenario B; and the ways in which technology can enable students to understand the ways in which experts in disciplines, such as mathematics, generate knowledge as shown in scenario D.

The conversations with experts elicited detailed advice on futures, including in assessment, curriculum, pedagogy, course design, teacher educator characteristics, locus of control, professional learning, professional experience and the politics of teacher education. Scenarios were built on the dimensions shown in figure 1 and were designed to ensure that manifestations of all the themes were evenly distributed across the scenarios e.g. to ensure that assessment was represented in every scenario. The scenarios did not seek to identify the relative worthiness of particular characteristics of teacher education futures. They were constructed to present coherent narratives combining different elements of the future identified by experts, without seeking to

imply that some elements or some scenarios were better than others. For example, a panel member might imagine a future where teacher education knowledge is limited to that which is relevant to a prescribed school curriculum but state that this is damaging and unproductive. The scenario including this view would include the imagined future of knowledge but not include the comment on its perceived merit. The team has endeavoured to represent views that were consistently proposed as well as elements on which those consulted diverged strongly. The scenario creation, as recommended by Iverson (2006) sought to create alternative futures that were “plausible”, “challenging”, “relevant” and “divergent”.

The nascent scenarios were then presented at an Association for Teacher Education in Europe (ATEE) conference in 2014 where conference delegates from a number of European countries provided feedback. The amended scenarios were also presented at a university research seminar in Australia. Each phase of feedback resulted in changes to the scenarios but, once the scenarios were constructed, suggestions for changes were relatively minor. They typically were changes to ensure internal consistency with a particular scenario or modifications to terms to ensure greater clarity. There was no feedback that suggested major changes to scenarios or that any scenario was unrecognisable. They were consistently claimed to provide logical, recognisable and relevant extrapolations of current trends in one country or another. Following feedback the scenarios were revised for clarity and consistency. The final scenarios derived from this extensive feedback and advice are presented in this article.

The scenarios provoked debate with some teacher educators stating that elements or even whole scenarios were unappealing but there was no universal agreement on a single scenario being the most desirable.

SCENARIOS

The scenarios are now presented below.

FIGURE 1 ABOUT HERE.

Scenario A

Content knowledge of teacher education is the canonical core discipline knowledge as prescribed in a national curriculum. Extensive time is required for the development of required canonical knowledge. Pedagogical knowledge prescribes models of teaching and practices that are to be employed to achieve predetermined learning outcomes for the majority. A relatively short time is required to acquire pedagogical knowledge. Technology is used to access specialised sites loaded with curriculum content, to provide downloadable lessons that facilitate high fidelity treatment of the curriculum, to manage and share teaching/learning resources. Secondary school teacher preparation requires at least the equivalent to an undergraduate degree in the discipline to be taught and focuses on subject knowledge. Primary teacher preparation requires extensive study of all

curriculum subjects to be taught with an emphasis on mathematics, literacy and the official national language(s). Teacher education knowledge and pedagogical inputs are highly regulated and controlled by government instrumentalities. National boards of study or equivalent government quangos manage knowledge input in teacher education. Quality is assured against centralised standards.

Scenario B

Teacher education content knowledge is clearly defined and prescribed in terms of large key ideas that everyone should know. Pedagogical knowledge is moderated by technology-enhanced learning approaches. Valued knowledge is the understanding of how technology interacts with pedagogy to deliver prescribed outcomes. Technology allows discipline knowledge to be communicated by teacher education programmes, with individualised pathways to curriculum-prescribed knowledge outcomes. Secondary and primary teacher preparation both require a long time to develop teachers' technological pedagogical design capabilities. Teacher education candidates learn to use technologies to assess pupils' learning using data analytics, and learn to develop targeted computer-based personalised learning programs for their pupils. Teacher education aims to produce teachers as designers, overseers and managers of technology-embedded learning by their students. Vocational education plays a key role. Governments concentrate on reliable measures of teacher education output to quality assure teacher education. Consequently, on-going employment is subject to satisfactory performance on national tests of teacher education graduates' knowledge. There is considerable diversity regarding pedagogy which is determined by initial teacher education providers.

Scenario C

The nature of teacher education content knowledge is determined by and valued in the local community based partnerships. Teacher education draws heavily on local philosophies or traditions of education that inform judgements teachers will make about what curriculum counts in the different school contexts in which they may operate. The curriculum is determined locally but is influenced by global trends and perspectives. These trends are explored through networked technologies. Teacher education explores a diverse range of pedagogical models and student teachers are expected to make judgements about when and where different models may be employed. Technology is primarily used to communicate and exchange ideas as well as to access information. Secondary and primary teacher preparation involve learning on the job, in the school context, from teacher mentors, over relatively short periods of time. Teacher education is the responsibility of the community and is driven by perceived local needs. Teacher education equips candidates to design learning outcomes and curriculum appropriate to students in contexts in which they will teach. Teacher education develops teachers' skills in encouraging students to curate knowledge appropriate to the community. Teacher education emphasises the need to judge the veracity and applicability to relevant contexts of information accessed through the internet and other sources. Government intervention is minimal, and quality assurance is determined by the community. Assessment products are typically text based analyses of and reflections on local teaching experiences, productions of teaching materials, essays and reports.

Scenario D

The ambiguity and changing nature of content knowledge is emphasised in teacher education. Teacher education students are required to develop a deep understanding of the ways in which people within their main discipline work with and produce knowledge. Valued knowledge is collaboratively constructed and provisional. It provides a frame for engaging with diverse perspectives. Teacher education equips teachers with curiosity-driven pedagogies relying on collaborative problem-based learning approaches. Technology provides a portal to global understandings, critiques and diverse discourses. Teacher education prepares and supports teachers in the use of creative, social and interactive technologies to capture events and create digitally rich products that raise awareness and communicate ideas to authentic audiences. Secondary and primary teacher preparation are post-graduate and involve analysis of current trends, big ideas in education, societal issues and critique of practice. Teacher education preparation encourages the critique of knowledge and its production. The philosophy of education is important as, too, is the philosophy underpinning relevant discipline specialisations. Teacher education assessment is of portfolios presented in varied forms that draw on diverse pedagogical and technological artefacts. Government influence and control of teacher education as the solution to societal and economic problems has waned. Universities and their partner schools drive the assessment and quality control of teacher education instrumentalities. National boards of study or equivalent government quangos manage knowledge input in teacher education. Quality is assured against centralised standards.

DISCUSSION AND IMPLICATIONS

No description of a teacher education future can ever be perfect. The scenarios are artificial. They take complex uncertainty and render possibilities more visible to the mind's eye. Their advantage over reality is that the imagined scenarios make the complex simpler. This too is their weakness. However, 'reducing the complexity of reality into a limited number of polar types stimulates sensitivity to the strategic choices to be confronted' (Snoek, 2005, pp. 9-10).

The implications for teacher education are manifold. In the four scenarios we use, we play out how and why changing versions of knowledge and their interactions with technology impact on teacher education. It is interesting to note that in these scenarios, generated from our data, technology is primarily referred to in terms of its relationship to knowledge building and acquisition. The lack of adaptation to future uses of emerging technologies in teacher education places teacher education at risk of being perceived as irrelevant by future generations, as suggested by Royle et al. (2014).

The scenarios we have presented thus offer a dialectic between the influence of knowledge and that of technology. It is clear that in each scenario, neither is independent but that they are interdependent and the role of each is affected by the other.

The use of scenarios such as those we discuss in this paper present a strategy for enabling discussion among teacher education stakeholders. Understanding the nature of teacher education in possible futures is essential if teacher education, whether university or school based, is to explore a version of teaching which articulates with future needs of both the individual and the

wider society. The purpose of scenarios is thus to have a practical value in offering alternatives, encouraging debate. No one scenario is more desirable than another, all have elements seen as desirable by different stakeholders. There are points of agreement and disagreement that provide a framework for dialogue amongst policy makers, professionals and communities. There is no universal agreement or single scenario. The four scenarios arose out of the data from our expert panels and subsequent discussions with teacher educators. Elements of the scenarios match features of teacher education in different countries. While this suggests a degree of authenticity in these scenarios the primary outcome here is a manifestation of possible futures where no one scenario is ideal. Rather, the future is likely to be an integration of different elements. The purpose here is to generate dialogue and future research to come to a well informed consensus.

The need is to design a teacher education that prioritises learning for coming generations of school students. The proposed futures highlight alternative pathways for teacher education. Among these, one pathway leads to a world of school education where knowledge is tightly managed and controlled. It is identified *a priori* for delivery. An alternative pathway leads to use of knowledge in situ; drawn on, developed and created through need. The first emphasises technology as a tool for the acquisition or transmission of existing knowledge and practices. The second positions technology as a tool for the creation and exchange of ideas and practices.

CONCLUSION

> Scenarios are instruments to learn about the presumptions that are used by decision makers. This insight can be used to create consensus in the decision making process (Snoek, 2005, 10).

In arguing for the need to design a future rather than merely allow it to emerge, these scenarios inform a conceptualisation of possible futures and raise questions about how to achieve that. That the process ought to involve thorough and extensive conversation among stakeholders is surely axiomatic. There is a need to strive for a consensual future where agreement rather than argument is possible. Stakeholders need to scrutinise thoroughly elements on which there is disagreement, to subject these elements to research and analysis and critique to ensure that the directions taken, although contested, are grounded in evidence, skepticism and reason. The key question is, 'How do we best shape teacher education so that we make the strategic choices that will be sensitive to the needs of prospective students in a changing and uncertain world?'

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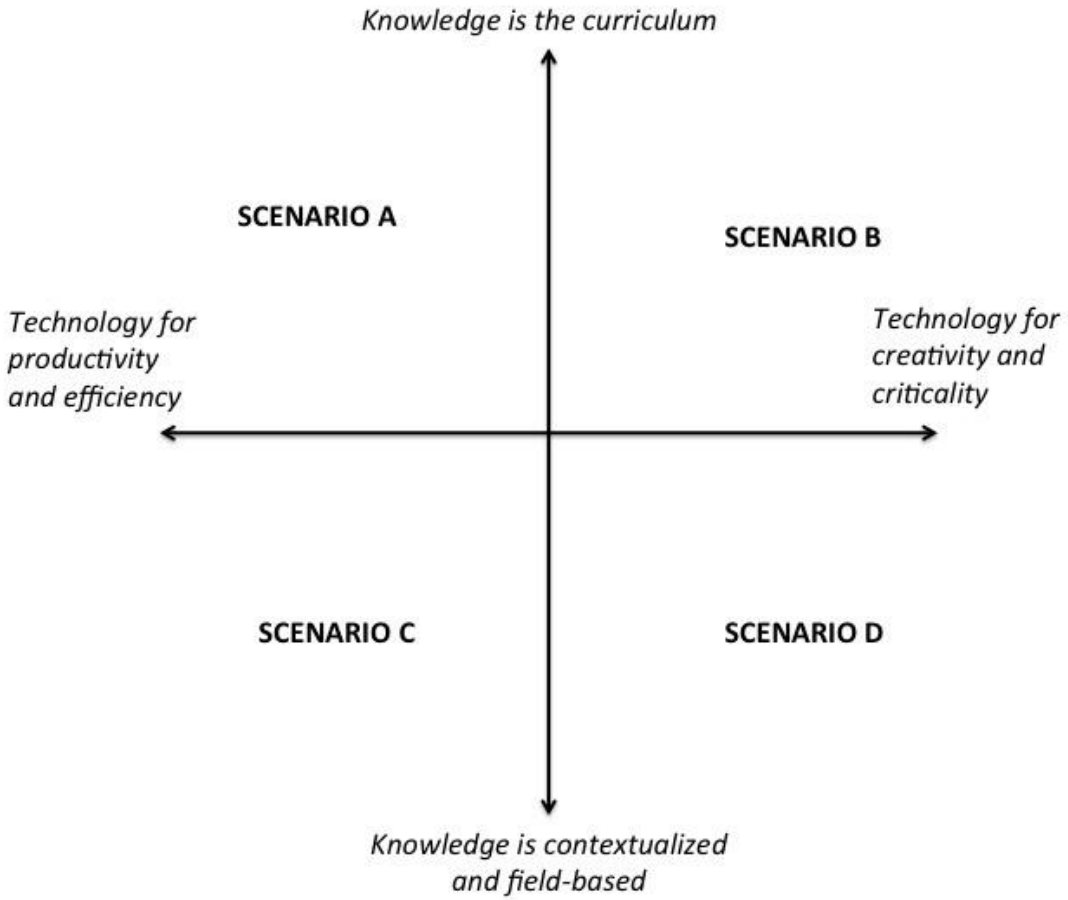
Figure 1

Teacher Education Futures Scenarios


Knowledge is the curriculum
SCENARIO A
SCENARIO B
Technology for productivity and efficiency
Technology for creativity and criticality
SCENARIO C
SCENARIO D
Knowledge is contextualized and field-based