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What's an innovation? Capitalising on disruptive innovation in higher education

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ABSTRACT

This article conceptualises how disruptions to conventional teaching models may lead to innovative practice. We have identified a gap in current knowledge around how innovations in higher education teaching and learning are initiated in times of crises. Disruptive Innovation Theory and Roger's Diffusion of Innovation Theory are used as lenses to understand how academics' epistemic positioning impacts the implementation of educational innovations, and how such innovations fundamentally change practice. We use COVID-19 restrictions as an illustrative example to deconstruct the catalysts for academics' experimentation with new digital tools, new ways to connect with their students, and novel means of facilitating collaborative learning strategies in the online space. This study makes a distinctive and original contribution by revealing three characteristics of disruptive tools, practices, and mindsets in Initial Teacher Education that differ from the typical efficiencies in other markets.

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Introduction

Crisis, suggests García-Morales et al. (2021) 'requires society to renew itself' (p. 1). This was plainly evident during COVID-19 times when teachers at all levels of education had to find new ways of connecting with their students to ensure that learning continued effectively (Oliveira et al., 2021; Phillips et al., 2021). The consequences of these unanticipated disruptions continue to impact teaching and learning today, through the adaptation of innovative practices motivated by campus closures and distancing requirements. Innovations often spur fundamental changes to practice, but what is innovative is subjective, disparate, and dependent on individual contexts, experience, and epistemological mindsets.

Innovations in educational contexts usually come from teachers' motivations to work for change. Typically, these develop over time, within a climate of innovation and with support from leadership and colleagues (Kunnari & Ilomäki, 2016). However, innovation

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can also arise as a response to a challenging situation or unexpected need in what can be termed 'disruptive innovation' (Christensen, 1997). Disruptive innovation occurs when previously used products or services become more accessible to a broader population (McMaster et al., 2020) with users' needs providing a catalyst for uptake. The spread and sustainability of innovations is then dependent on several factors, including the epistemic positioning of users (Essmiller, 2021).

COVID-19 restrictions provide a vibrant example of these theories in practice. Prior to campus closures and distancing restrictions, most higher education institutions had already adopted flexible online delivery options or blended environments with strategic use of innovative digital technologies to enhance student learning. However, academics had to find or create educational alternatives to respond to unexpected institutional closures and the swift move to remote learning. Ellis et al. (2020) questioned if the forced changes to ways of teaching and learning during this period could be considered 'innovative'. Using Bruno Latour's (2020) conceptualisation as a basis, that innovation is 'intentional creative change that adds value' (Ellis et al., 2020, p. 561), their investigation affirmed that the changes necessitated during COVID-19 times were indeed innovative.

At this time, the landscape of innovation changed from a process cultivated over time and with nuanced support, to a reflexive response with unknown outcomes. McDonald et al. (2022) refer to this time as one of *speculation* ('situated in a space between knowing and not knowing') (p. 46) and *slippage* ('how we attend to teacher professional learning in times of ongoing global upheaval') (p. 46). This time of 'not knowing' resulted in a loss of footing in one world (old ways of knowing, doing, being, and becoming) and necessitated a move to another world (new ways of knowing, doing, being, and becoming). Many academics were unprepared to make such changes. Some rose to the challenge and others were unwilling to embrace what was required.

Academics' adoption of innovations and the sustainability of these innovations relies heavily on how they align with their professional identities and beliefs about what constitutes 'good' education. This article highlights higher education academics' experiences of disruptive innovation when most countries closed physical places of learning during the COVID-19 outbreak. It is part of a larger study (Phillips et al., 2021) which heeds Flavin's (2021) call to examine how disruptive events such as the COVID-19 pandemic can accelerate innovation by 'exposing pedagogical insufficiencies in existing practices of learning and teaching' (p. 164). This study focuses on the implementation of self-identified innovations, urgently necessitated, and which contributed to fundamental shifts in practice. Reported innovations include the use of unfamiliar digital technologies and applications, but also novel teaching strategies, re-examined mindsets, and new understandings about professional identities that will contribute to improved educational practices. This article also responds to Cai's (2017) identified 'urgent need' (p. 587) to illuminate issues related to innovation in higher education and connect these to the innovation studies literature. In particular, to examine 'how a learning curve in the innovation process takes place' (p. 592). As such, this research focuses on answering the following questions:

(1) In what ways do disruptive events foster innovation in higher education teaching and learning?

(2) How do academics categorise self-identified innovative practices and epistemic positioning towards implementing and sustaining these novel practices?

Theoretical framework

When seeking to better understand how disruptive events influence innovations in teaching and learning and to answer the research questions, it is important to consider relevant theories and concepts that can assist with interpreting the data. In addition to innovation in educational contexts, these include Disruptive Innovation Theory (Christensen & Raynor, 2003) which is a lens for examining technological advances, Diffusion of Innovation theory (Rogers, 2003), a theory that concentrates on the perceptions and use of innovations, and teachers' adaptive epistemic cognition (Lunn Brownlee et al., 2017) regarding in-person and online learning.

Innovation in educational contexts

The term 'innovation' suggests Carvalho et al. (2021) means to create something new which might be an 'idea, method or object that is created and based on previous standards' (p. 199). Innovation can refer to processes, actions, products, and ideologies, but mostly refers to ideas and inventions. The term 'innovation' has positive connotations, and the introduction of something new or novel is often viewed as worthy, modern, and aligned with progress (Perren & Sapsed, 2013). Historically, however, innovation 'was opposed to custom and order, was disruptive by definition' (Flavin, 2020, p. 1) and revolutionary by nature.

While there is an assumed understanding that innovations are good practice and add value (von Hippel, 2005), this is not always the case. For example, 'open concept' schools were a popular yet short-lived innovation through the 1970s. Their advancement was based on cost-effectiveness and the expectation of greater inclusivity, collaboration, and student freedom through innovative architectural design. Those who inhabited these new spaces, however, had little agency in the changes imposed upon them. Teachers experienced a loss of personal control over teaching space and intrusive noise and loss of structure did not promote inclusivity for many students with disability (Stobart & Hunter, 2023). Gardner (1991) states that 'It is not easy to effect an educational revolution; there will be setbacks, and certain kinds of misconceptions, rigidities, and biases may prove particularly difficult to dislodge' (p. 248). The 'open concept' innovation failed at that time because the changes 'were not grounded in education, environmental, or developmental psychology research or theory' (Lippman & Matthews, 2018, p. 62) and may have also been too large a departure from the traditional model. In essence, the changes were new and creative but did not add value for users.

Disruptive innovation theory and diffusion of innovation theory

Disruptive Innovation Theory is typically applied to goods and services. Behara and Davis (2015) describe disruptive innovation as a process by which a product or service gains a foothold in the lower end of a market and displaces established competitors or conventions, thus causing disruption. Within this theory, Christensen (1997)

distinguishes between 'sustaining' and 'disruptive' innovations. Sustaining innovations create gradual improvements to existing technologies and practices but which may not serve stakeholders' immediate needs. With disruptive innovation, however, the disruption emerges through the purpose of processes and strategies as determined by users' practice, more than by the original design. Most importantly, disruptive innovation *changes* practice (Flavin, 2021). For example, in its first 15 years of operation, producers of the fax machine experienced poor sales figures and limited usage. However, during the Great Postal Strike of New York in 1970, the usage of fax machines greatly increased, and the innovation took hold throughout the United States (Flavin, 2020). This example demonstrates that as disruptive innovations become consolidated and build on traditional processes, they in turn become sustainable innovations.

Diffusion of Innovation Theory can be used to analyse the communication and adoption of innovations throughout a system (Essmiller, 2021). The diffusion of an innovation is dependent on the type and attributes of an innovation, as well as the social system and communication channels. Adoption is contingent on several factors, including the relevant advantage of the innovation, the degree to which the innovation is compatible with existing values (e.g. users' epistemic positioning), and the complexity of potential adoption (Menzli et al., 2022). Rogers (2003) classifies five adopter categories including 'innovators' (those interested in new ideas and willing to take risks), 'early adopters' (those judicious about adoption but keen to gain an edge over competitors), 'early majority' (those who require evidence of the effectiveness of innovation before taking a risk), 'late majority' (those who approach adoption innovation with considerable scepticism), and 'laggards' (those who are averse to change, value tradition, and may block any innovation).

The study of innovation in higher education is an emerging field. Ellis et al. (2020) note nebulous conceptualisations of what constitutes innovation in the literature, with most definitions taking into consideration only the characteristic of novelty or the assumption by authors that a commonly agree upon definition exists globally and does not require explanation. Carvalho et al. (2021) and García-Morales et al. (2021) suggest that innovation requires the disruption of established educational models. Al-Imarah and Shields (2019) examined how innovations might redefine existing higher education models. Referring to the work of C. M. Christensen (1997), the authors posited that three characteristics must be present for innovation to be considered as disruptive—'performance' (innovations initially underperform current products or practices before improving over time), 'benefits' (innovations make the delivery of higher education more simplified, cheaper, and more convenient) and 'markets' (innovations have value for both producers and consumers).

Ellis et al. (2023) describe innovation in education as a process, stressing the important elements of human creativity and practitioner agency in seeking to improve the conditions in which they work. Despite teachers being flexible, agentic, and creative, teacher education has demonstrated little interest in and resistance to innovation (Ellis et al., 2020, 2023), thus impacting diffusion of innovations throughout education systems. Ellis and colleagues' research suggests scant mention of innovation in teacher education in

peer-reviewed sources prior to 2004 (with the 1970s a notable exception), but a steady increase in interest in this topic since, particularly in countries in the Global North such as the USA and Australia.

Impacts of academics' epistemic cognition during a disruptive event

Reflections from academics following disruptions from COVID-19 restrictions suggest five categories of impact to the delivery of higher education; the forced modification of teaching strategies, new ways of building connection and community in the online space, innovation in Initial Teacher Education including simulated placements, the uptake of unfamiliar digital tools such as multimodal assessments, and new ways of looking at critical issues of equity such as access and engagement with education (Baumgartner et al., 2022). Progress in all areas was contingent on academics' epistemic cognition.

In education, epistemic cognition relates to personal epistemology, facilitating how teachers conceive of and engage in their teaching; their teaching approach, teaching strategies, expectations for students, and the types of knowledge which are valued. It includes the activation of higher order thinking processes such as reflection and critical thinking and acknowledges that changes in epistemic cognition occur through interventions and interactions with one's sociocultural context and situational demands (Bråten, 2016). In addition, epistemic world views may impact the dissemination of interventions (or innovations). We refer to Green et al. (2016) definition of epistemic cognition as how people 'acquire, understand, justify, change, and use knowledge in formal and informal contexts' (p. 1). Cain et al. (2022) highlight the view that academics often see themselves 'as proficient in either face-to-face or online delivery as a component of their professional identity' (p. 4). The connection between a teacher's epistemic beliefs and values and the ways they relate to their students is paramount to their practice. A change in methods of teaching and delivery of content, therefore, can 'disrupt these deep and personal connections giving rise to an emotional response' (Naylor & Nyanjom, 2021, p. 1). Downing and Dyment (2013) note that an unexpected need to move from in-person to online delivery has the potential to unsettle experienced teachers. This may cause them to feel 'deskilled, vulnerable, or isolated' (Cain et al., 2022, p. 4).

Online delivery in higher education has been expanding steadily (Dodd, 2021; Morris et al., 2020). However, the abrupt and unexpected disruptions to teaching and learning caused by COVID-19 restrictions left many teachers and students feeling concerned and distressed (Kim & Asbury, 2020; Oliveira et al., 2021). In the first weeks of remote learning in March and April of 2020, it may have been assumed that with an already steady increase in online delivery in higher education globally (Downing & Dyment, 2013), teachers could make the move without too much difficulty. Academics did not begin from the same starting position, both in terms of experience and facilitation skills with digital technologies, but also with beliefs and values embedded in their concept of professional self (El-Soussi, 2022; Tualaulelei et al., 2022). The reality was that the immediacy of the switch presented genuine struggles for which some found solutions (albeit haphazardly), and for others presented no option but to leave the profession (Cain & Phillips, 2020, 2021; Phillips et al., 2021). A significant reason for this has been teachers' anxiety about losing established connections with their students and a feeling that their teaching is, therefore, less effective (Flack et al., 2020).

For academics without past online teaching experience and without a toolkit of suitable pedagogical strategies, this presented a dramatic shift in practice, as they scrambled to identify suitable apps, become familiar with online platforms, and rework active learning strategies for the online space. Digital technology, noted by Naylor and Nyanjom (2020), is constantly progressive and tends to 'place educators in a position of perpetual novice' (p. 2). As some universities provided only one- or two-days' notice of closure, it was impossible for all academics to be on top of the most efficient and effective ways of teaching online. Baumgartner et al. (2022) emphasise that while the use of digital tools is not new, the nature of teaching during the pandemic 'helped to increase the appreciation for and use of digital tools' (p. 10). Watermeyer et al. (2021) also highlight that COVID-19 disruptions may indeed have been an essential impetus for making higher education more 'modern' and 'innovative', pushing some teachers into an uncomfortable but necessary new digital world.

Ellis et al. (2020) research on educational innovations during COVID-19 times reveals some important results relevant to this study. Firstly, those changes deemed to be innovations emphasised the newness or novelty aspect of ideas and that they added value or improved what had come before. The abruptness of closures to educational campuses and move to online learning did not, however, allow the deliberation and experimentation usually required for innovations to evolve. Perhaps their most important observation was that participants possessed an innovative *stance* or mindset during this time. In this way, in addition to aforementioned characteristics of novelty, creativity, and value, innovative stance should be considered.

Methods

A team of 10 education researchers from higher education institutions in Australia, New Zealand, Singapore, and the US designed an open-ended qualitative survey with 16 questions (Phillips et al., 2021). The survey opened in May 2020 and closed in November 2020. To assess the validity of the survey, the questions were reviewed by the team, and then the survey was piloted with a small group of educators in Australia known to the project team. Responses demonstrated that the questions were crafted in a way that promoted clarity and avoided ambiguity, so the survey was then sent to a much larger group of educators internationally. The survey covered the social, emotional, and educational impacts of various restrictions and remote learning. The three questions relevant for this study were:

> What have you changed regarding your teaching to support students?
>
> What are the strategies that your students are using to study online?
>
> What innovations have you forged or experimented with?

Human ethics approval was provided by each of the team's universities prior to data being collected. Qualtrics, an online survey platform, was used for data collection with the participant information letter and consent form embedded within the survey. Purposive sampling was utilised, with the research team distributing the survey link through their education networks. Overall, the study gained responses from 624 teachers from higher education, secondary, primary, and early childhood educational contexts.

Table 1. Age and experience of participants.

Age of participants	65 years and over	55–64 years	45–54 years	35–44 years	25–34 years
	20%	26%	40%	10%	4%
Higher education teaching experience	More than 21 years	16–20 years	11–15 years	6–10 years	1–5 years
	53%	21%	11%	9%	6%

From the higher education data, there were 105 responses with 42 from the USA, 40 coming from Australia and three from both Canada and Singapore. There were two each from Fiji, New Zealand, and Japan and then one participant from 11 other countries: Argentina, Columbia, India, Ireland, Nauru, the Netherlands, Nigeria, the Philippines, the Solomon Islands, South Africa, and Swaziland. Table 1 details the age and teaching experience of the participants.

The participants were experienced academics, with approximately 85% having taught in higher education for 10 years or more. However, only 10% of the participants were already teaching online prior to the pandemic beginning.

Data analysis

The authors met to discuss and interrogate the data using inductive reasoning (Mayring, 2000). Inductive reasoning has been widely used by educational researchers as a methodological approach to analyse qualitative data as it enables 'research findings to emerge from the frequent and important themes from the data' (Liu, 2016, p. 130). The responses received in the survey were downloaded in Excel format and independently coded by two researchers which involved creating tentative themes. The researchers then reviewed the themes to establish the final categories as a summative check for reliability (Mayring, 2000). In line with Ellis et al. (2020) observations, the term innovation was understood by participants to mean something new or novel. As such, the final themes which frame the results section are: the use of 'innovative' technologies and online tools, 'innovation' in teaching strategies, and new epistemic beliefs about teaching and learning online. Quotes have been included to illustrate each theme. These are accompanied by a numeric code for each participant along with the participants' country of residence.

Results

The use of 'innovative' technologies and online tools

Almost half (42%) of our participants indicated that they had engaged with new digital tools during COVID-19 restrictions, with online video conferencing tools being the most popular 'innovation' employed. Respondents used words such as 'experimenting', 'playing' and 'trying' to indicate that they were utilising remote learning as a process to investigate what tools might suit their new circumstances: for most, online learning was *definitely a work in progress* (#79, USA).

Positively, respondents noted skills they did not know they had, or probably would not have developed if the COVID-19 restrictions had not come into play: *I am capable of managing a level of technology that I wouldn't have chosen to do or believed*

that I could do (#92, India). Most participants indicated that they had enjoyed experimenting with digital tools during the pandemic (#67, Canada; #71, Japan; #80 USA; #101 Singapore). *With so many ongoing innovations, there is something new to learn almost every day about improving online teaching and learning* (#79, USA), whilst others reported that there was not enough time or emotional space to invest in innovative practices (#76, USA).

Whilst these tools were described as 'novel' or 'innovative' for some academics, for others these would have been a sustained part of their day-to-day practice, hence underscoring how past experience and personal context affect perceptions of what is innovative. For example, one teacher tried multiple videoconferencing facilities, such as *Collaborate, Zoom, Teams, and Google Meets* to communicate with different students (#64, Argentina). *Using Zoom was innovative in my context* (#55, USA) and *Padlet—not necessarily an innovation, but a platform I hadn't worked with before* (#57, USA). Examples of more 'innovative' tools included programmes such as *Adobe Spark* (now called Adobe Express), *Screencast-o-matic* (now called ScreenPal), and *Voice Thread* as well as online collaborative tools such as *YuJa* and *Edpuzzle* along with *Flipgrid*, *Padlet, Kahoot*, and *Mentimeter* to increase online student engagement. These respondents indicated that COVID-19 restrictions forced them to explore new tools to add value to their online teaching. There was awareness that the use of some teaching tools was standard practice for other educators who had the time and support to experiment with these as sustaining technologies. As such, the 'learning curve' in the innovation process was steeper for some than for others (Cai, 2017).

A literacy teacher from the USA made the most of their changed circumstances to experiment with new tools: [I've been] *playing with Camtasia and Snagit [video editing and screen capture software]. I am using D2L's new lessons format. I've been investigating different apps for creating infographics and storying experience* (#80, USA). Other academics used online tools to re-design content and processes to suit online learning. This included using video functions to upload short micro lectures, videos of guest speakers, and 360-degree videos to create 'virtual' laboratories. Respondents' facility with video conferencing tools ranged from *just getting Zoom down is my priority* (#15, Australia), to the use of *slide annotations for collaborative learning* (#36, Australia). Participants' experience with digital tools and general technological 'know-how' was a factor in how creatively they ventured into new territory during COVID-19 restrictions.

A drama teacher described a specific use of the whiteboard function to assist with a particularly difficult task of creating the Drama element of 'space', when not in a physical space.

> I found some new uses for 'Whiteboard' for a workshop, entitled 'Boy, Wolf, Sheep'. To begin, a group of students drew a village on the 'Whiteboard' where this boy would live. As we were co-constructing the village, students were encouraged to think who would be in this village. Although this activity is not new in process drama teaching, it was new to do it through Zoom and it made a difference to how the students engaged with the story (#41, Australia).

As more disciplines are being taught online, teachers (particularly in the fine and performing Arts) have been encouraged to embrace creative ways to replicate and enhance the 'in-person' experience (Davis & Phillips, 2020). While developing a fictional drama context by drawing on a large physical whiteboard is a sustaining

practice regularly used in drama education, the use of online whiteboards is an example of how teachers can creatively extend the parameters of sustaining technologies to effectively bring their discipline into the online space.

'Innovations' in teaching strategies

Most participants (78%) reported that they had developed innovative teaching practices during COVID-19 disruptions, such as exploring how to group students for collaborative work, thus enhancing their practice: '*the most innovative thing I did was use breakout rooms to put students into groups*' (#52, USA). Despite breakout rooms being a sustaining innovation for most academics, they were simultaneously identified by 13 academics (12%) as an 'innovative' or disruptive teaching strategy.

A teacher of visual art experimented with ways for students to demonstrate micro-teaching as they would normally do in face-to-face learning environments:

> Students record movies of their lessons at home and share them with class members to deepen their learning about the qualities, abilities, and skills needed to become an art teacher. I have a lot to learn about their skills in virtual space, so there is the possibility of new [forms of] art education. (#95, Nauru).

Davis and Phillips' (2020) research with Arts teachers during COVID-19 times also suggests that recorded instructional videos of Arts practice were new and creative strategies born out of need during COVID-19 restrictions. They added value during this time and have been incorporated into future practice.

Finding new ways of building relationships in the virtual space was identified as a significant challenge for some participants: *I am so used to providing support in person that it's been a challenge for me to learn new ways to remotely support students* (#88, Canada). One participant explored teaching via social media apps to assist with the cohort to connect: *I'm finding new ways to maintain interaction—remote platforms can be didactic and linear, so I'm using social media platforms to support debate mainly Instagram and WhatsApp. This has been successful.* (#106, UK).

For some, well-honed teaching styles were tested: *This has been a period of growth as I have had to learn how to teach differently and learn new skills* (#37, Australia), and some respondents identified teaching practices they would like to continue after restrictions were eased. These included *shorter classes and more discussion* (#11, Australia), *different ways to group students* (#51, USA) and new *opportunities for student engagement* (#99, the Philippines). In fact, some teaching strategies were noted to be best suited to the online environment: *Some insightful discussions have been had and we were able to invite global experts to participate in lessons. This would not have been otherwise possible* (#96, Nauru). Connecting with international experts as mentioned in this example demonstrates an unrecognised need that was only highlighted through forced changes during COVID-19 restrictions.

An often-mentioned priority was ensuring students connected on a more personal level to support each other in uncertain times. One participant prioritised a new strategy—sending an online survey to students that focused on their *unique skills and abilities and getting them to talk and bond prior to any teaching* (#18, Australia). Online video conferencing facilities enabled synchronous learning during the

pandemic, but these also became a key focus for teachers to support students. One academic used storytelling within the video conferencing environment to help them build a sense of class cohesiveness (#86, USA). Noting the hardships some students experienced during the pandemic, an academic from Singapore suggested that online learning has spurred *a kinder, more empathetic working relationship with my student cohort*. (#20, Singapore). A new focus on getting to know students as individuals and acknowledging the personal circumstances and challenges they bring to the learning space has been reported in the COVID-19 literature (c.f. Cain et al., 2022; Kim & Asbury, 2020; Watermeyer et al., 2021). The innovations noted by participants in our study were not necessarily related to efficiency or productivity but were essentially socially advantageous, and thus of value. As teaching is inherently a human endeavour, the impact of an innovative stance towards social cohesion and a pedagogy of care may be the most important innovation needed to sustain the trend towards online delivery of initial teacher education (ITE).

New epistemic beliefs about teaching and learning online

It was clear from some responses that a 'refresh' in professional identity was required to move effectively to remote teaching, but that for many this was considered a 'painful' experience:

> All courses were moved online with two-day notice. Not only had I very little experience with distance learning, but also little interest. The chief impact was fear of a platform I dreaded and losing treasured rituals in the classroom (#56, USA).

In response to the question 'What innovations have you forged or experimented with?', some participants expressed their exasperation at the assumption that innovation would be expected in a time of crisis and disruption: *Are you kidding? Right now, we're just holding it together as best we can* (#75, USA), and others were cautious: *I did not think it was a good idea to burden either the students or me with learning new apps* (#76, USA). What was clear was that respondents may not have engaged with these new tools had they not been required to make the shift to remote learning during COVID-19, and that this opportunity provided *much greater clarity about the strengths and weaknesses about teaching in an online world* (#35, USA). Through their comment, this participant has highlighted that innovation may be accelerated in times of crisis, exposing insufficiencies in traditional teaching tools, as Flavin (2021) suggests.

Academics who identified as 'in person' teachers grappled with the online environment: *I miss the interaction with students. I am less motivated and enjoy my teaching less. I have become a curator and creator of learning resources rather than an educator* (#33, Australia). This led some to make a complex reassessment of who they are as teachers: *Teaching through an online interface has encouraged me to deeply examine my underlying theoretical understandings regarding teaching and learning. I teach through a relational lens, and so have explored ways to build relationships with students in online environment* (#41, Australia). Teaching online with little notice and preparation was daunting for many respondents, but their resilience and creativity as teachers served them well: *I have learned that teaching online isn't that scary, but that I really do miss the face-to-face interaction* (#20, Singapore). Although teacher education has a reputation for being

resistant to change, participants in this study demonstrated an innovative stance towards innovation (Ellis et al., 2020). Resultant changes were not related to efficiency or productivity but were socially advantageous and thus of value. As teaching is inherently a human endeavour, the impact of an innovative stance towards social cohesion and a pedagogy of care may be the most important innovation to sustain a move towards online delivery of ITE.

Academics expressed that the ultimate price for dealing with the uncertainty of the move to remote teaching was 'losing' students in the learning process: *Some students told me right away that online classes were too difficult, and it was not the way they learn* (#82, USA). As mentioned, for some respondents the pressure to engage in new tools and novel practices was beyond their ability, and reformation in their professional identity was not possible: *I tried to teach online as I'd always taught, and it just didn't work. It was frustrating for the students and demoralizing for me. I'm a good teacher and still have much to share with young people. I sadly and reluctantly resigned at the end of the semester because I found my online teaching to be artificial, ineffective, and very unsatisfying.* (#57, USA). Flavin (2021) submits that technological disruptions may be 'threatening', 'producing change on the fundamental level of practice' (p. 125). For participants who did not have an innovative stance towards disruption nor the experience and support to make required changes to their practice, adjustments during COVID-19 proved to be an insurmountable hurdle.

Discussion

Disruptive Innovation Theory and Diffusion of Innovation Theory are valuable tools for understanding the perceived significance of reported 'innovations' prompted by a disruptive event such as COVID-19, and as a framework for answering the research questions. These theories are also useful for interpreting how participants responded during this time of speculation and slippage (McDonald et al., 2022) and how they negotiated 'unknowing' as they moved between the familiar and new worlds. Participants' comments shone a light on the ways in which COVID-19 restrictions 'invited a reassessment of the practices of teaching and teacher education' (Ellis et al., 2020, p. 562).

With a focus on the use of digital tools, applying Disruptive Innovation Theory demonstrates that participants' engagement with 'sustaining' technologies such as use of video conferencing or breakout rooms, was instantaneously superseded by 'disruptive' technologies needed to solve time-sensitive educational challenges (e.g. *360-degree videos to create 'virtual' laboratories*). The disruptive innovations that occurred by necessity ultimately *changed* the practice of those moving from the old world to the new. This aligns with Baumgartner et al. (2022) observation that the changes to teaching and learning during COVID-19 restrictions promoted 'the appreciation for and use of digital tools' (p. 10). The data revealed that an unexpectedly small number of academics (10%) had been teaching online prior to COVID-19. As such, this time did not allow participants, a 'conscious and deliberate decision to use [technology] . . . with the explicit goal of extending their knowledge' (Orlando et al., 2018, p. 45) as there was little-to-no foretelling, professional development, or training to prepare for the pivot to online learning. Not all academics believed they had the tools or the competence to engage effectively. For

some it was because their access to online tools was insufficient, or they did not feel prepared to trial innovations as they were conscious of their limited skills.

The principles of Diffusion of Innovation Theory (Rogers, 2003) are evident in the data analysis. Participants considered the advantages of engaging with new technologies and new ways of teaching and assessed these against their existing epistemic positions on what constitutes a 'good' education. The 'adopter categories' in this theory aligned with how differently participants approached innovation needed to move to the 'new world' (McDonald et al., 2022):

Innovators (those interested in new ideas and willing to take risks): [I've been] *playing with Camtasia and Snagit. I am using D2L's new lessons format. I've been investigating different apps for creating infographics and storying experience* (#80, USA).

Early adopters (those who are judicious about innovation adoption): *I found some new uses for 'Whiteboard' for a workshop. Although this activity is not new in process drama teaching, it was new to do it through Zoom and it made a difference to how the students engaged with the story* (#41, Australia).

Early majority (those who deliberate before taking risks): *This has been a period of growth as I have had to learn how to teach differently and learn new skills* (#37, Australia)

Late majority (those who are initially sceptic of innovation): *I am capable of managing a level of technology that I wouldn't have chosen to do or believed that I could do* (#92, India).

Laggards (those adverse to change and who value tradition): *Not only had I very little experience with distance learning, but also little interest. The chief impact was fear of a platform I dreaded and losing treasured rituals in the classroom* (#56, USA).

Respondents offered us rich and detailed accounts. Whilst engaging with the data, it struck the authors that most participants had experienced a kind of grief. Grieving for well-honed and comfortable ways of teaching with favourite tools and fearing that the old ways may never return (Carvalho et al., 2021). Indeed, narratives revealed the evolving of participants' epistemic positioning to the sudden change as somewhat akin to the stages of loss; denial, anger, bargaining, and acceptance (Kübler-Ross & Kessler, 2005). This, combined with social isolation from work, family, and friends made the switch to remote teaching and learning a particularly trying time. Participants were willing to reveal and embrace their own flaws, as compassion came from a supportive community of teachers who understood their experiences and empowered their resilience and restoration. Academics expressed their imperfect engagement with innovations through their language: *adapting, adopting, experimented, trialing, in process, learning, playing, updated, tried, working on*. These reflections underscore C. M. Christensen's (1997) original argument that disruption innovation is a *process*, not an event.

Aligning with Ellis et al. (2020) research, our participants understood the essence of innovation to be something new or novel. There was some mention of value (e.g. finding improved uses for social media platforms) and creativity (e.g. recorded instructional videos), but the data did not suggest that participants considered value or creativity as characteristics when describing innovations. As Olivares et al. (2021) suggest, different levels of readiness impact teachers' competence with trialling innovations online. Their study demonstrated that those most confident were supported by workshops from the university in the early stages of the pandemic. Naylor and Nyanjom's (2021) research also suggests that teachers with positive emotions towards online learning perceived they had

a high level of institutional support at this time. Our survey results identified the same, with a foundation of technological and leadership support enabling an innovative stance.

An interesting and somewhat disappointing finding was that despite academics' commitment to including students in online learning, there was not one mention of experimentation with assistive technologies, necessary for many students with disability with alternative access preferences. This aligns with Cain and colleagues' (2024) research findings which indicate that despite assistive technologies being innovations which developed in response to the needs of one sector of the education market (students with disability), and despite the clear benefits to all learners to engage more efficiently and equitably in the online space (e.g. the use of screen readers), the disruption of COVID-19 restrictions did not lead to these technologies displacing traditional technologies (Behara & Davis, 2015). We might assume that COVID-19 disruptions would have been a catalyst for previously used tools to become more accessible to a broader population (McMaster et al., 2020) and providing new ways to address the stark realities of inequity in education (Baumgartner et al., 2022). Perhaps the most logical explanation was that time is needed for disruptive technologies to make an impact (C. Christensen et al., 2015) and that universities are designed to sustain innovation and thus vulnerable to disruptive innovation (Flavin, 2020).

Our findings align with the work of Ellis et al. (2020) who observed the persistence of an innovative stance during the challenges of COVID-19 times, but also that changes made could be classed as innovative as 'they added value to previous historical practices rather than just offering an emergency "sticking plaster" to a sudden "hole"' (p. 569). Examples include incorporating international experts through online presentations and the use of social media tools as more suitable and up-to-date ways to connect students. Whilst changes may have been made in haste and reactionary, they also improved upon previous practice and outcomes for end-users. Christensen's (1997) and Christensen and Raynor's (2003) research has suggested that for disrupting technologies to be successful, the whole organisation must support their adoption. If this is not the case, disruptive innovations may result in casualties, particularly when uptake is limited by 'conventions, professional attitudes, a lack of imagination and resistance to change' (Newton et al., 2020, p. 74). This was illustrated in our study through the comments of the academic who felt there was no choice but to resign from her position due to a lack of support and opportunities to upskill.

Conclusions and implications for practice

This investigation was prompted by the United Nations Educational, Scientific, and Cultural Organization's (UNESCO, 2022) call for educational systems to become 'more resilient, equitable and inclusive. . .leveraging technology to benefit all learners and building on the innovations and partnerships catalyzed throughout this crisis'. In response, this research underscores the necessity to be prepared for future crises that necessitate remote teaching and learning or other fundamental shifts in practice due to crisis-driven changes. Our study reveals that COVID-19 restrictions and the abrupt uptake of remote learning necessitated 'disruptive innovation', such as the use of new digital tools and novel teaching strategies best suited to the online space. This research also highlights the importance of acknowledging the place of academics' epistemic beliefs about quality

teaching and learning practices in the motivation to engage with such tools and practices, and the will to move forward in times of crisis. This supports Ellis et al. (2020) analysis of the disruptions during COVID-19 times as constituting an 'innovative stance'.

As such, there is an important role for explicit reflection in the process of resolving cognitive dissonance to support academics' changing epistemic beliefs (Lunn Brownlee et al., 2017). Our research provided a way for participants to process disruptive innovation through reflective practice. Adding to our current understanding, the application of Disruptive Innovation Theory and Roger's Diffusion of Innovation Theory demonstrates that in times of educational upheaval academics must address immediate needs through innovative means and be aware that such innovation will *change* their practice going forwards. There will be no going back to the 'old world'. Being conscious of the 'adopter categories' gives academics and leaders an appreciation of how and when changes might occur according to epistemic positions and teaching mindsets.

This article makes an original and distinctive contribution through the identification of three new characteristics of disruptive innovation in higher education: 1. Times of crisis such as COVID-19 restrictions expand the boundaries of sustaining technologies and practices to incorporate creative new uses that may not have taken root in regular practice without disruption as a catalyst. 2. Innovations in times of educational interruption involve new tools, strategies, and mindsets. These may be an extension of sustaining innovations for some but may constitute disruptive innovations for others depending on their experience and support from their institutions, thus exposing pedagogical inefficiencies and inconsistencies (Flavin, 2021). 3. In the context of ITE, the value of disruptive innovations may not lie in their convenience and cost effectiveness as it would for most markets, but in their ability to create ways to maintain and enhance the relational aspects of teaching when participants are not in the same physical space.

For a qualitative study, the size of responses may be seen to be sufficient; however, this study is limited by the fact that most participants reside in developed nations, with the majority in the USA and Australia. As such, the results are not transferable. Further research with teachers in developing nations with unreliable or absent internet and limited access to digital technologies is needed. Innovations in such countries will undoubtedly be different and bespoke, such as the use of radio programmes and learning packs to reach students dispersed over large geographical areas, particularly in island nations. In addition, future research should look to defining and promoting inclusive innovation in teacher education to ensure that novel tools and strategies are accessible and equitable. Likewise, ITE should look to capitalise on underperforming sustaining innovations (Al-Imarah & Shields, 2019) that are currently used by one sector of the education market that can be expanded upon to add value for everyone in higher education.

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