# The Effect of a Change in Virtual Learning Environment on Innovative Digital Teaching Practice: A Case Study of Academic Staff in an Irish University

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**Abstract:** This mixed-methods, investigative case study explores the experience of a virtual learning environment (VLE) change and its effect on the use of digital learning tools specifically, and teaching practice more generally, for chemistry lecturers at TU Dublin (Ireland) prior to pandemic of the coronavirus disease COVID-19. Initially, a questionnaire examined the different teaching identities the participating lecturers might have and how they relate to the literature. These identities were examined under the following themes: sense of achievement, motivational factors for innovation, innovation positioning, as well as social and organizational factors influencing the decision making. A visual approach of representing the questionnaire data, termed 'Lecturer Landscapes', was developed which uncovered new trends based on the biographical descriptors of the research population. Subsequent interviews led to a more detailed investigation of the themes noted in the questionnaire and the Lecturer Landscapes to more holistically capture the professional identity of each respondent. The lens of experience during a VLE change was used to frame each respondent's professional identity in context. Overall, a VLE change does not have to effect teaching practice and can be experienced as a positive change in teaching and learning. It was also noted that innovation can only occur when specific, and individual, needs and problems are addressed and when personal development is promoted by intrinsic, rather than extrinsic, motivational factors.

**Keywords:** *Digital learning tool, lecturer landscape, pedagogical innovation, teaching identity, virtual learning environment.*

## Introduction

The context of this investigative case study is set against a backdrop of change: a newly designated university (the first Technological University of Ireland) that was simultaneously harmonizing processes, practices and policies. In the midst of this change, a new Virtual Learning Environment (VLE) was introduced in the campus which comprised this case-study. This research examines the lived experience of chemistry lecturing staff during this period of transition, and specifically their innovation in use of digital learning tools and teaching practice more generally, prior to the pandemic of the coronavirus disease COVID-19. The lead researcher performed this research while on ERASMUS exchange at TU Dublin, from September to December 2019. This research is timely as it offers an updated view on prior, related, research conducted by O'Rourke et al. (2015), where the use of the VLE in higher education in general was examined. O'Rourke et al. (2015) research specifically examined Dublin Institute of Technology (one of the composite campuses that merged to form TU Dublin) after a previous change of VLE (*WebCT* to *Blackboard*) in 2012. During the previous decade, the VLE was seen to have become an integral part of teaching and learning in higher education, however, it was noted primarily as a content repository by most staff with limited innovative use of the technologies available within the VLE (Stiles, 2007). This previous research acted as a catalyst for this study to understand the chemistry lecturers experience of a VLE change from *Blackboard* to *Brightspace* (*D2L*) in Autumn, 2019.

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*Research Goal*

The aim of this research was to explore and understand the experience of a VLE change and how this change effected, if at all, innovative digital learning tool use and teaching practice for chemistry lecturers at TU Dublin prior to COVID-19. To address this aim, two bounding research questions were employed:

- What is the general perception of chemistry lecturers at TU Dublin regarding the use of the integrated digital learning tools within the university endorsed VLE?

- How do chemistry lecturers at TU Dublin describe their experience through a VLE change and how does it affect their innovative teaching practice with respect to digital learning tools?

The research took place between September and December 2019, and thus prior to the COVID-19 pandemic.

## Literature Review

Currently, students who start their studies in higher education do so in a world that is flooded with more information than ever before. Opportunities, as well as challenges, exist in such a vibrant and dynamic learning ecosystem. One of the most tangible challenges is the rapid change from relatively moderate information availability to omnipresent information and, therefore, the ability of learners to process such variety and depth (Weller, 2011). Over ten years ago, Nicholas Carr wondered if *Google* was making us stupid (Carr, 2008). Is the abundance of instantaneous online information resulting in the human brain becoming only a superficial source of information; one that is prone to distraction and mistake? The efficacy and immediacy of online information can result in superficial skimming, rather than deep processing and, ultimately deep learning (Carr, 2008).

Since Carr's seminal theorizing the online space has exploded, spearheaded by social media, and leads to other philosophical questions such as why would we remember something, if we have access to a computer in our pocket, in the form of our mobile phone, that can tell us anything at the touch of a button? At a practical level, have modern-day students, enabled by dated teaching techniques and ever present and easily accessible information, lost the ability to learn deeply? Our current learning environment requires a new approach, or systematic change, to allow learners personalize and adapt their learning to flex to the modern world.

Given that the modern student has evolved, how have academics responded? The pace of academic evolution is slower as compared to the development of the online information age; teaching staff face moral, social and emotional dilemmas as they develop and adapt their practice (Beijaard et al., 2000). A revolution, as opposed to evolution, to align modern student expectations with a modern academic provision could embrace digital learning tools as transformative change agents; creating rich, engaging and inclusive learning environments. However, the role of the academic should not be forgotten; the educator tends to be the primary influence in how technology is used in education. Judicious integration of innovative, but appropriate, technology in teaching and learning can harness the untapped learning potential stored in the modern, information-rich world (Risquez et al., 2012).

To fully realise this potential, academic staff require support and guidance to innovate integrative digital learning tools into their day-to-day practice; however, barriers to innovation remain. These barriers include: additional responsibility, lack of support/professional development, time required and the return on (time) investment (Sutton & DeSantis, 2017). Staff may also be under aware of the underpinning theory and research of discipline-specific teaching and learning; instead, personal experience is referred to when innovating and developing practice (Herrington & Daubenmire, 2016).

These barriers are compounded by the rapid pace of technological development in education and creates a certain level of 'change-blindness' (Sutton & DeSantis, 2017). Humans tend to ignore simple alterations in their environment and can accept these changes more easily. For example, innovative technologies are used only as a replacement of the older one: *PowerPoint* slides instead of overhead projector acetates, *Smartboards* instead of blackboards and chalk. However small the change, only a few will typically engage at first with a new innovation. Even if these few are highly effective in their personal process of change, they tend not to be able to supersede the general consensus of reluctance and, therefore, the pace of pedagogical innovation and adoption is slow (Weller, 2011).

Innovation, by its definition, requires novelty; *somebody* has to be the first to try something new. Academic innovation, including the adoption of technology, mirrors this and is often explored using Rogers' Diffusion Model (Medlin, 2001). The main driver of the Diffusion Model is to identify the users' uncertainty as the key barrier for adoption, itself related to five attributes. The attributes are: (i) Relative advantage (the perception of the innovation being better than the previous one), (ii) Compatibility (the perception of the innovation being in line with existing values, needs and past experiences of the adopter), (iii) Complexity (the perception of the innovation being difficult to understand and use), (iv) Trialability (the possibility to experiment with an innovation) and (v) Observability (the degree to which the results of the innovation are observable to others). Indeed, the more a technology offers these five attributes, the more it is likely to be adopted faster in teaching (Rogers, 2004).

The individuality of an academic also comes into play: each unique social surrounding, personal opinion and formal training influences their decision-making and innovation processes, resulting in the Rogers' Range of Adopters (2004); ranging from laggards, through early adopters, to innovators (see Table 1). These five adopter types were originally determined from farmers' attitudes towards innovating processes, but were found to apply more generally.

*Table 1. The five adopter types of innovation as based on Rogers' Diffusion Model and descriptions amended from (Medlin, 2001).*

| # | Type | Meaning |
|---|------|---------|
| 1 | Laggard | Traditional; Refers to the past for their guidance; Resists new innovations until certain that it will not fail. |
| 2 | Late Majority | Cautious about change; Requires convincing of the economic necessity of a change; Uncomfortable with uncertainty. |
| 3 | Early Majority | Considers all consequences fully; Interacts frequently with their peers; Willing to change to a new way or method but not willing to be a leader in the process. |
| 4 | Early Adopter | Makes judicious innovation decisions; Decreases uncertainty by fully evaluating something new; Uses interpersonal networks within their immediate area to gain more information. |
| 5 | Innovator | Venturesome; Obsessed with trying new things; Seeker of information outside of immediate area. |

Appropriate categorisation can be enhanced by including professional identity to provide a more rounded and holistic view (Griffiths et al., 2014). Professional identity is informed by social surrounding, personal opinions and formal training, as well as personal self-image (Bromme, as cited in Beijaard et al., 2000, p. 751). Indeed, the act of defining who an educator is shapes the discourse of educator development and provides a basis from which the profession can progress. Educators can take many identities over their career including, educator, scholar in education, collaborator, learner and leader (Klecka et al., 2008).

It is through these lenses of change and identity that this investigative case study explores the experience of a cohort of chemistry-focused university lecturers to understand how an enforced change in digital learning tools (the university supported VLE) informed their practice-based innovation specifically, and their approach to teaching and learning more generally.

## Methodology

*Research Design*

The research design comprised a mixed-method, investigative case study. The study focused on the lecturer's experience using the VLE and digital teaching and learning tools in that VLE. Insights into the lecturer's experience, obtained through a questionnaire, were used to generate a visual outcome based on a multi-axial spiderweb graph and termed a 'Lecturer Landscape'. Semi-structured interviews were subsequently used to obtain a deep view of the complexity of each lecturers' experience. These data sets were triangulated against existing scholarly literature to representatively describe each lecturer's experience during the VLE change.

*Research Population*

The research population was as outlined in Table 2. The Academic participants lecture level 6 (Higher Certificate), level 7 (BSc Ordinary), Level 8 (BSc Honours), Level 9 (Taught Masters) and Level 10 (PhD) Chemistry related programmes in the areas of the chemical sciences and food sciences.

*Table 2. Biographical data of the research population detailing age, gender, academic role title (and international equivalent), experience and discipline area.*

| Lecturer | LEC1 | LEC2 | LEC3 | LEC4 | LEC5 | LEC6 |
|----------|------|------|------|------|------|------|
| Age Range | 31-40 | 51-60 | 51-60 | 41-50 | 41-50 | 41-50 |
| Gender | Female | Female | Male | Male | Female | Male |
| Academic Role | Lecturer (Ass. Prof.) | Senior Lecturer (Assoc. Prof) | Lecturer (Ass. Prof.) | Lecturer (Ass. Prof.) | Senior Lecturer (Assoc. Prof) | Lecturer (Ass. Prof.) |
| Experience in Academia (Years) | 7 | 25 | 20 | 20 | 19 | 5 |
| Chemistry Sub-discipline | Biochemistry | Pharmaceutics | Biochemistry | Inorganic | Organic | Physical |

*Questionnaire*

The questionnaire was built as a novel synthesis of several themes previously identified in literature that related to how lecturers describe their career and personal development. A list of themes used can be found in Table 3. The questionnaire structure was literature-based and piloted before use (Cohen et al., 2007; Denscombe, 2014; Fowler, 2014; see Appendix A for the full questionnaire, including underpinning literature). The questionnaire had a potential maximum response population of fourteen staff members, from a purposefully sampled population of academic staff who teach on undergraduate chemistry programmes at the TU Dublin Schools of Science and Environmental Health, and, Chemistry and Pharmaceutical Sciences, of which six responded.

*Table 3: Table outlining the questionnaire composition, per section, including the topics examined within each section and their sources.*

| Section | Topics | References |
|---|---|---|
| Biographical information | Age, gender, campus, academic role, years in role, years in academia and full- time/part-time position. | N/A |
| Perceptions of digital learning tools | Perceived usefulness, perceived ease of use, perceived risks, perceived pedagogical support. | (Beijaard et al., 2000; Klecka et al., 2008; Medlin, 2001; Smith, 2003) |
| Digital learning tool use | Use of digital learning tools and barriers to use. | (O'Rourke et al., 2015; Sutton & DeSantis, 2017) |
| Situational context | Colleagues' influence, social factors influencing digital learning tool use, involvement in institutional decisions about implementing digital learning tools, involvement in encouraging colleagues to use digital learning tools. | (Alsadoon, 2013; Medlin, 2001) |

*Lecturer Landscape*

An adapted version of Wubbels and Brekelman's (2005) spiderweb graph was developed and used to visualize the responses to the questionnaire. This adoption plotted a lecturer's engagement with technology as based on a point system for each theme/question given. This point system permitted a graphical representation to be generated for the questionnaire data, resulting in a visual representation or '*Lecturer Landscape*'. Comparing the graphs for each participant permitted a more direct and visual process as each *Lecturer Landscape* consists of calculated scores per theme and plots these scores on a multi-axis spiderweb graph (see Appendix 2).

*Interviews*

Semi-structured, formal individual interviews with the purposefully sampled lecturers were conducted face-to-face, audio recorded and transcribed *verbatim*. This approach permitted a guided conversation focusing on personal storytelling (i.e., the lived experiences of the participants) around the interviewee's professional opinions of the VLE and digital learning tools in their teaching practice, and on the impact of the recent change of VLE (Creswell, 2014; Denscombe, 2014).

*Data Analysis*

Although data were not anonymously collected, all data were processed and analysed as a blinded data set. A data key was employed so all data could be listed using the same indicator for each lecturer, allowing for comparison at the data-analysis stage, although still blinded.

*Quantitative Data*

A method of data visualization was developed to conceptualise the responses to the questionnaire. This point-based method codified each theme/question permitting a graphical representation to be produced. Subsequent graphical analysis explored the distribution of the visualized personas (referred to as *Lecturer Landscapes*) as a multi-axis spiderweb graph in *Excel*. The conversion of each theme in the questionnaire to a score, and subsequently graphical plotting against an arbitrary ten-point scale, yielded a spiderweb graph comprising twelve axes (see Table 4 and Appendix 2).

*Table 4: Themes noted in the Lecturer Landscapes, with abbreviations and original corresponding questionnaire question(s) and grouped into four over-arching categories.*

| Category | Meaning | Theme | Question | Axis |
|---|---|---|---|---|
| I | How the participating lecturers rate themselves in the aspects of teacher-educator roles (MFE), fields of expertise (EXP) and areas of professional achievement (ACH). | Expertise being a multifaceted lecturer | 11 | MFE |
| | | Perception of expertise | 12 | EXP |
| | | Perception of achievement | 13 | ACH |
| II | The score is indicative of the self-assessed adoption type of innovation the lecturers identify with. | General adopter type | 14 | ADO |
| III | A general overview of a lecturer towards perceived usefulness (PU), ease of use (PEU), risks (PR), pedagogical support (PPS) and the influence of colleagues (PCI). | Perceived usefulness DLTs | 15 &16 | PU |
| | | Perceived ease of use DLTs | 17 &18 | PEU |
| | | Perceived risks of use DLTs | 19 & 20 | PR |
| | | Perceived pedagogical support DLTs | 21 & 22 | PPS |
| | | Colleagues' influence DLTs | 25 & 26 | PCI |
| IV | Provides an overview of how social surroundings in their life influence the participating lecturers use of digital learning tools | General use of DLTs | 23 | DTU |
| | | General social surroundings | 27 | SS |

*Qualitative Data*

Semi-structured, formal individual interviews with purposefully selected lecturers were audio recorded and transcribed *verbatim* by the lead researcher. Following transcription, the interviews were inductively coded and thematically analysed, with indicative supportive quotes extracted to give a more complex picture into the lived experiences of lecturers during a VLE change (Braun & Clarke, 2006; Guest et al., 2012).

*NVivo12* was chosen as the qualitative data analysis software for the deductive coding and thematic analysis of the data. Use of *NVivo12* streamlined the analysis process, provided more transparency and aided the analysis robustness by providing a cohesive evidence and audit trail for the entire analysis process. The iterative coding process was peer-reviewed by the authors of this article. Coding reliability was further ensured by triangulation of the determined deductive themes by triangulation of the literature review, data generated from the questionnaire and the interview responses, The individual steps from the chosen qualitative analysis framework were performed entirely using *NVivo12*.

## Findings / Results

*Synopsised Questionnaire Findings*

Firstly, the questionnaire sought to understand lecturers' perceived proficiency regarding typical teacher-educator roles, their perception of expertise, their perception of achievement and their adopter type. The 'Teacher' was noted clearly as the teacher-educator, and 'subject matter' was the primary field of expertise detailed, reflection was cited as the primary mode of achievement recognition and those surveyed self-identified as early adopters in Rogers' adopter types model (2004; see Table 1). Subsequently, the questionnaire sought to detail the participants' perceived risks in general and also perceived usefulness of digital learning tools. In general, participants had a positive perception towards the usefulness and ease of use of digital learning tools. Time was mentioned by the majority of participants as one of the primary barriers to innovative digital learning tool use. Questionnaire participants noted the influence of the learning environment (e.g., colleagues, institutional norms and physical resources) was superseded by personal interest in areas such as student learning and instructional technology.

*Lecturer Landscapes*

The quantitative questionnaire data was codified and used to generate a visual persona of each participant, in the Lecturer Landscapes (see Appendix 2). These landscapes were ordered by age (see Figure 1) and years of experience in academia (see Figure 2). In Figure 1, ordering the landscapes in the order of increasing age shows a possible correlation to the rise in self-assessed adopter type for digital learning tools. Early-career staff self-assess more as type 3, early majority, where later-career staff members self-assess as type 5, innovator. In Figure 2, it can be seen that ordering the landscapes by years of experience in academia shows an increase in digital tool use and perceived risk (see Figure 2). The trends related to age and experience serve as indications rather than conclusions, given the research design executed, including the participant sample size. Finally, the landscapes were constructed based on the sections of questionnaire (see Table 4).
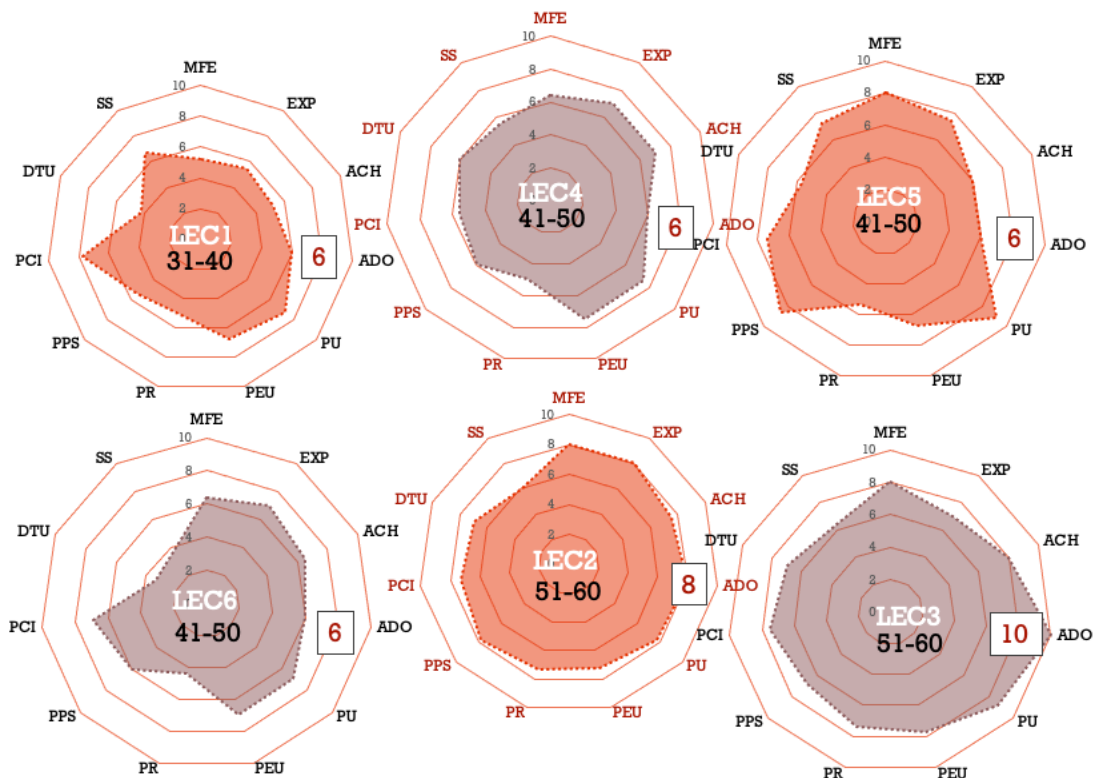
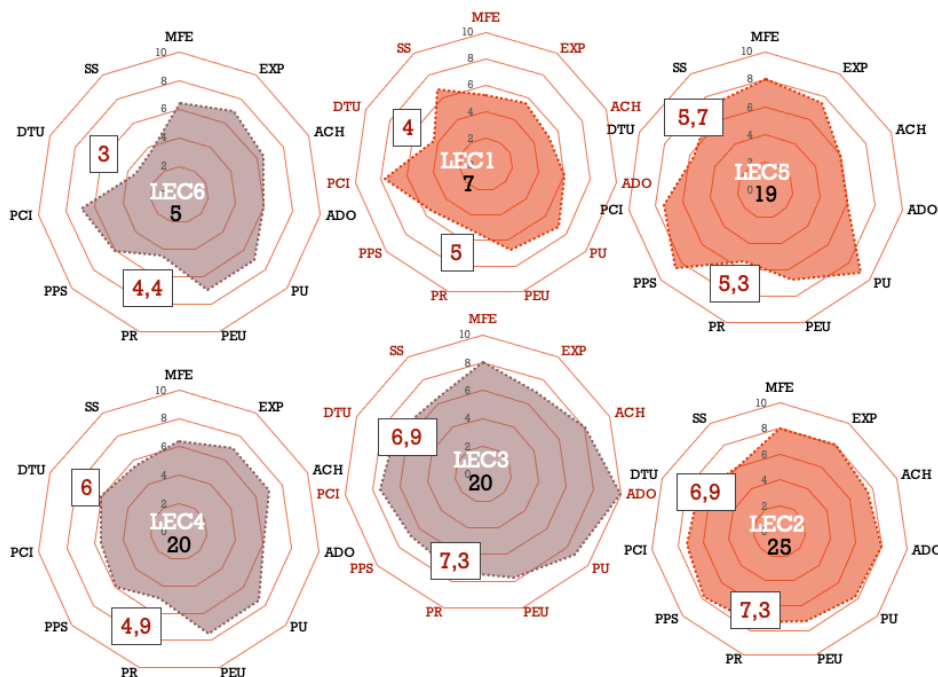*Figure 1: The six landscapes of the participating lecturers in order of age group. The colouring of the landscape differentiates gender; orange for female, grey for male lecturers.*

The score for each participant on the axis of self-identified adopter type (ADO) is indicated. MFE: multifaceted lecturer expertise; EXP: perception of expertise; ACH: perception of achievement; ADO: general adopter type; PU: perceived usefulness of digital learning tools; PEU: perceived ease of use of digital learning tools; PR: perceived risk of digital learning tools; PPS: perceived pedagogical support of digital learning tools; PCI: collegial influence on digital learning tools; DTU: general use of digital learning tools; SS: general social surroundings.



*Figure 2: The six landscapes of the participating lecturers in order of years of experience in academia. The colouring of the landscape differentiates gender, orange for female, grey for male lecturers.*

The score for each participant on the axis of digital tool use (DTU) and perceived risk (PR) is indicated. MFE: multifaceted lecturer expertise; EXP: perception of expertise; ACH: perception of achievement; ADO: general adopter type; PU: perceived usefulness of digital learning tools; PEU: perceived ease of use of digital learning tools; PR: perceived risk of digital learning tools; PPS: perceived pedagogical support of digital learning tools; PCI: collegial influence on digital learning tools; DTU: general use of digital learning tools; SS: general social surroundings.

*Thematic Findings*

Following the mixed method data analysis strategy, seven deductive themes were used to thematically describe the qualitative data. The seven dominant themes that were identified by the researchers from review of the literature were also used in describing the questionnaire findings. The questionnaire inspired the questions for the interview process to allow for elaboration from the lecturers. The seven themes are (1) Perception of self, (2) Perception of professional self, (3) Reflection in, and on, practice, (4) The outsider influence on self-perception, (5) The balance of risk and reward, (6) Digital Learning Tool innovation enacted through a VLE change, and (7) VLE and Digital Learning Tools Innovation. These seven themes led the discussion between the literature reviewed, the questionnaire and the interviews, including quotes from the participants of the interviews. The triangulation of the data through the themes is examined in more detail in the Discussion section.

## Discussion

In triangulating the data set (the qualitative, quantitative and literature data), seven themes were identified by the researchers, and these are used as headings to structure the discussion which explores the synthesised findings in this investigative case study and show how they relate to the existing literature.

*Perception of self*

The participants were asked to reflect on their self-perception in both the questionnaire and interviews. Participants self-reported as aligning most closely with the *Teacher* role within the *Teacher-Educator* role set (Izadinia, 2014; Van Lankveld et al., 2017). All *Teacher-Educator* roles were noted with some variance per individual lecturer. However, the *Teacher* role was consistency highly cited in the questionnaire and it was independent of the range of experience in academia, age and academic role. In the interviews, lecturers also primarily spoke about their role as a teacher compared to the other Teacher-Educator roles, such as *Collaborator* or *Learner*. This echoes previous research that notes although educators enact multi-faceted identities, the most prominent facet of identity was *Teacher* independent of the stage of the participants their professional career (Klecka et al., 2008). Furthermore, the importance of academic freedom in how to teach students emerged as important: '*Well, everybody does not necessarily need to engage with the VLE at the same level, because everybody has a different philosophy. And that's very valuable to teaching*' [LEC 3]. Interestingly, there was no clear trend in relation to differences in self-perception and gender despite reports in the literature that gender can influence confidence in ability; male lecturers are more outspoken about their achievement, accomplishments and general self-perception (Lundeberg et al., 1994).

*Perception of professional self*

Building on the perception of self, the participating lecturers' unique self-identity was forged with their professional identity (Barbarà-i-Molinero et al., 2017; Clarke et al., 2013). Here, *Subject Matter Expertise* was the most highly cited field of expertise. This was cited even more than *Pedagogical Skills* (the methods and practice of teaching), which always scored higher or equal to *Didactic Skills* (the theory of teaching and learning). The interviews supported subject matter expertise as the driver for starting a teaching career, where most lecturers started out following their PhD as the subject matter for their lectureship area. The critical role of professional development in shaping one's professional identify also emerged '*And I suppose, with, you know, the experience with doing the- the diploma* [Higher Education Teaching and Learning Diploma] *then you sort of realise then, what should be more a student-centred approach and the students should be doing a lot more work. And, I suppose, in the classroom as opposed to me doing all the talking, eeh and them just sitting there just listening. It's eeh, it's much more of an active process eehm, for both of them.* [LEC6]. Formal professional development was seen to synergise with more informal approaches '*So, the best bit … was talking to others. And the different approaches they had for the different disciplines. I have really learned more from the coffee break, than I learned from a lot of the modules and the lectures. Seeing different people, and how they did things*' [LEC1].

*Reflection in, and on, practice*

An open and reflective approach to practice mirrors the finding that all participating lecturers could articulate their teaching and learning achievements through reflection, indicating that all participants interpret reflection as something they are capable of and portray, echoing past research of Smith (2003). In the interviews, descriptions and reflections of teaching practice were found where lecturers showed critical reflection on their own practices. Reflection on practice was seen to inform practice in relation to the participants self-assessed adopter type (Al-Mamary, et al., 2016; Medlin, 2001). Based on the *Lecturer Landscapes* the self-assessed adopter type increases with increasing years of academic experience (see Figure 2). In this study, four participating lecturers self-described themselves as type 3, early majority adopters. However, in the subsequent interviews, these four participants self-cited behaviour could be categorized as type 3, type 2 and even type 1 when discussing the likeliness to adopt new technology. For example*: 'I'm definitely not someone that rushes in and uses a new tool first. Because what I've found is, over the years, new tools have come and new tools have gone. And the next new tool is just around the corner, and it's gone after a couple of years. So, until something is actually going to be, that I can judge myself that something is going to be fairly paramount.'* [LEC4,]. And, *'I would say*

*that, you know, it's not that- I probably come across as quite traditional, but I'm not necessarily that traditional. But, as I said it's- it's- it's finding the time and space to- to do it and to do it right.'* [LEC6].

*The outsider influence on self-perception*

Self-assessment does not always accurately reflect the respondents' true nature, particularly in relation to innovation, and can be influenced by interaction with other adopter types (Karpen, 2018; Potočnik & Anderson, 2012). This was also noted in the influence of close colleagues on the subjective norms in relation to perceived usefulness. Colleagues can be instrumental in providing surroundings that motivate other lecturers to start innovating. However, colleagues have to be willing to try and interact: *'So, I would say that I learn a lot of new things that I might, might know from colleagues. But it's not always easy to convince other colleagues to eh, to adopt things and so on.'* [LEC3]. Furthermore, based on the *Lecturer Landscapes*, self-assessed adopter type increases with increasing years of academic experience and is associated with reduced perceived risk and more frequent use of digital tools (see Figure 2). Simply, the years of experience of an individual in academia directly relates to the potential time to integrate and become confident in digital learning technologies. However, increased exposure time can also lead to disillusionment and resistance to new digital tools *'We went through about ten different tools. None of which were easy to learn and after which then we stopped supporting them. So, now I have actually stopped using tools that are supplied by the university'* [LEC2].

*The balance of benefits and barriers*

Perceived usefulness was seen to be informed by the personal intention of teaching staff: those who intend to use technology will perceive technology to be very useful in a classroom setting (Alsadoon, 2013). This was the case for LEC3 who rated digital learning tools as 10 in the questionnaire and further elaborated that their use technology whenever possible in their teaching. A widespread 'early adaptor' use of digital learning tools is strongly influenced by factors beyond personal intention, including perceived risks and barriers. In this study, the use of digital learning tools was also seen to enable diverse learning methods that aid a diverse range of students. However, lecturers needed to see the digital learning tools as innovations to existing tools or practices before they adopted them into their practice (Rogers, 2004). *'Like I said before, I don't just use something for the sake of using it. So, if I can see an advantage, I-I-. If there is something new and a lot of people are talking about it, I will look into it.'* [LEC5]. There was also a need to maintain the student-teacher hierarchy where the students are given more autonomy in their learning, but the academic retains the control of the learning path through content creation *'I present them with the breadcrumb-trail to the information….and they then have to follow that breadcrumb-trail and make that their own in terms of their-their expertise. So, I'm- I'm not your traditional teacher that stands up and just presents the information'* [LEC3]. Using digital learning tools was generally perceived to be low risk to the participants; however, common risks/barriers cited included additional workload/time. These findings echo past research citing the time required to upskill, to innovate and the risk of the little return for the time invested (Alsadoon, 2013; Sutton & DeSantis, 2017). In this study, these risks/barriers were outweighed by the potential benefits such as rapid feedback provision to students and a perceived reduced workload once an optimum use was reached *'I probably had my reservations again, that this was going to cause a lot of work and that. In fairness, when you actually get used to it, and just sit down and do it, it's not that much extra'* [LEC4].

*Digital Learning Tool innovation enacted through a VLE change*

The change in VLE could be viewed as a large-scale digital learning tool innovation, albeit one that was imposed on academic staff within this investigative case study. Overall, three participants in this study had a positive experience of the VLE transition, two were neutral one was particularly negative. Interestingly, this negative experience was noted for LEC2, one of the most experienced lecturers as gauged by the *Lecturer Landscapes* (see Figure 2). This is mirrored in their perception of self, combined with the highest digital learning tool usage and the lowest number of perceived barriers to digital learning tool use. Their negative experience was neither due to technical inability, nor confidence. It was due to the practical, and time-consuming, need to re-build all modules, which was seen as wasted time as opposed to an opportunity to innovate in a new VLE. Those that had positive experience noted that there was minimal change in their teaching practice because of the VLE change, echoing Sutton & DeSantis' (2017) observation that oftentimes replacement is found masquerading as innovation, rather than any real change in practice. *'To be honest, with Brightspace, I've just been using the basic: upload the content and nothing else. But, the intention is there.'* [LEC1]. The use of the *Lecturer Landscapes* also provided further insight into the lecturer experience of the VLE change. The questionnaire visualised through the LEC6 *Lecturer Landscape* demonstrated his low use of digital learning tools and his motivation to innovate comes from shared values within the department and this is reflected in the minimal changes in teaching practice observed by LEC6 following the VLE change.

*VLE and Digital Learning Tools Innovation*

Rogers (2004) defined five attributes for innovation to be perceived positive by the innovator leading to an increase in the likeliness of adoption. The attributes *Relative Advantage, Complexity* and *Compatibility* were named in the

interviews as barriers for innovation. For example, for the attribute *Compatibility*: '*Also we are dealing with people who are actually work in the workforce, who are busy people, who on a daily basis use webinars, use- you know. So, the clunckyness of the tools that we have aren't always suitable for what we're trying to do. So therefore, sometimes we work outside of the platform.*' [LEC2]. Furthermore, for the attribute *Relative Advantage*: '*And then also in terms of Brightspace. One of the reasons why Brightspace is- is so much more attractive is, it- it's very good on the mobile phone. Whereas Blackboard was not. So, that's why, that would be one of the advantages.*' [LEC3]. A large variety of *Digital Learning Tools* was mentioned whether internal to the VLE, like the ePortfolio function and quizzes, or external like *Mentimeter* and *PeerWise*. The biggest barriers for using more tools or innovating stemmed from time commitment and the nature of support available as found in the questionnaire and the interviews. Where the lowest amount of digital tool use (30% of tools questioned) the lecturer explained their barriers to use: '*It probably sounds foolish because if you do something well, if it'll save you time in the long run and- [...] And I know from colleagues' experience that it is a big time commitment to do that. And and I just don't have the time at the moment. So, I'm sort of catch twenty-two.*' [LEC6].

## Conclusion

In this investigative case study, the common perception of self was based on the individuality of the participating lecturers. Although their main teacher-educator facet was clearly *Teacher*, their personal attributes and how their levels of expertise can be aligned to their unique teaching experiences. The personal sense of achievement was articulated through reflection, with a strong perception of engaging as part of the 'early majority innovation adopters' is noted. However, there were some conflicts observed between the declared self- assessment and the self-image, or desired self-image.

The perception of the use of digital learning tools aligns with the normalised use of technology in the modern world and the transferability of technical skills resulting in a strong perception of usefulness and general ease of use of digital learning tools by the participating lecturers. In general, the perceived risks of digital learning tools are low, however, the additional workload and the corresponding time requirement was noted a risk/barrier to the use of digital learning tools.

The use of digital learning tools has increased dramatically since this study was completed due to the global move to remote teaching and learning as a result of the COVID-19 pandemic. However, in this study the teaching and learning environment and the social surroundings were still influential when adopting a new technology. The supporting word of a colleague is still influential when it comes to deciding what to use next if a lecturer is open to digital learning tool innovation. When it comes to other motivational factors, extrinsic factors such as reward systems or formal recognition by the university are not rated as highly influential. Instead, intrinsic factors such as personal interest in teaching and the learning of students' drives are most likely to motivate engagement with new digital learning tools. Finally, the visual representation of the Lecturer Landscape adds to the understanding of how a lecturer could self-identify with certain continuing professional development topics and, in turn, offers great potential for adaption in the wider application of personalised professional development.

## Recommendations

The following recommendations are suggested for consideration when encouraging staff to use a new VLE:

1. University level training on a new VLE needs to be followed up with specific needs training for individuals

Innovations at departmental or university level can be imposed, as in this study due to a University VLE change. However, active participation by each lecturer in the choice of VLE requires an opportunity for each lecturer to be consulted. Also, the impact of the change in VLE for each member needs to be explored in detail, focusing on how the innovation will affect them individually.

2. Additional one-on-one support on VLE to support skills gaps

Following the initial introductory training on a new VLE, time should be allowed for staff to pilot the new system to allow users to identify their knowledge gaps. In this study, lecturers expressed a feeling of needing support beyond the initial start-up, as well as help with specific problems. To support a diverse learning community, diverse approaches to (online) teaching with digital learning tools need to be encouraged including the diverse use of the digital tool/platform.

3. Create opportunities to enable peer sharing of knowledge and experience

Within any faculty there will be members of staff who innovate individually, but this innovation only spreads when other lecturers are open to innovation and receive help to implement their version of the innovation in their practice. Sharing of knowledge and innovations one-on-one, or through local 'champions/ambassadors' should be promoted. The enabling of communities of practice, where lecturers support other lecturers rather than relying entirely on technical support staff can also be an effective way to share experience and mentor new digital learning tool users. The

staff should also be given opportunities to present their innovative use of VLEs and digital tools at national and international pedagogical research conferences.

4.  Acknowledge and value time investment in VLE innovation

The value placed on the time invested in innovation should be explored and made tangible. This may take the form of structured time to explore new innovations, and the sharing/ dissemination of insights with colleagues, both formally and informally.

5.  Build individual professional development profiles as an alternative use of the Lecturer Landscapes

The visual representation method of the Lecturer Landscape was used to identify the experience of the individual staff member to ascertain how this influenced them on using the new VLE. The Lecturer Landscapes add to the understanding of how a lecturer would self-identify under specific topics. This mode of representation could be adapted for wider applications, since data visualisation could be more enlightening than a text description and could be reviewed annually. For example, department leaders could also assess the self-identified strengths and weaknesses of their staff to tailor a continual professional development plan for individual staff. The Lecturer Landscapes could potentially be a powerful tool.

## Limitations

The research population was limited to one case: Chemistry-based lecturers in TU Dublin. The maximum available population was 14; of this population a sample size of six was achieved following an informed consent and voluntary participation process. The limitations of scale are balanced by the research design and methodology followed. A purposeful sampling strategy was followed to achieve a representative range of academic experience and roles held within the university. Gender balance was also achieved using this sampling design.

This research project was performed by an insider researcher, therefore making personal bias a prominent element for consideration. Bias towards the university was minimised as the lead researcher was a visiting research student, this resulted in all respondents being unfamiliar with the researcher from before the project and, therefore, any bias of prior interactions or awareness of certain opinions and/or reputations within the university were reduced.

Other considerations for future research include; measuring the reliance on VLE's in universities and understanding what are the digital tools most favoured in universities to encourage student engagement (e.g., break out rooms, student polling, e-portfolios, quizzes). Furthermore, when educators had to pivot to online teaching, what was the greatest challenge for using the VLE to a greater extent, and, what did educators learn and what will they retain in their future teaching practice? Building on this, what were the main demands on the VLE trainers in the universities? Finally, does the use of the digital tools in the university VLE change with time or training?

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## Authorship Contribution Statement

Kampinga: Concept and design, data acquisition, data analysis / interpretation, critical revision of manuscript, final approval. O'Connor: Concept and design, data analysis / interpretation, critical revision of manuscript, supervision, final approval. Goedhart: Data analysis / interpretation, critical revision of manuscript, supervision. Ryan: Concept and design, data analysis / interpretation, drafting manuscript, critical revision of manuscript, supervision, final approval.

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## Appendices

*Appendix I: Questionnaire regarding use and motivation to engage with Digital Learning Tools*

Questionnaire regarding use and motivation to engage with Digital Learning Tools (2)                    27-11-19 16:44

# Questionnaire regarding use and motivation to engage with Digital Learning Tools (2)

**Research Question**
How do chemistry teaching staff describe their experience during a VLE change and how does it affect their teaching practice?

**Short description**
Phenomenological case study about the experience of chemistry lecturers during a Virtual Learning Environment (VLE) change and how the change affects their teaching practice. A second focus is put on if the new VLE can aid lecturer in supporting students transition during a science study programme.
Link to Extended Description Study
https://docs.google.com/document/d/1qp1t3clMCq3fEY-wkkcpb1RHucC7lOYfmTRN9dQzUFw/edit?usp=sharing

**Who am I?**
Ellen Kampinga is a master student following a 2-year full-time research Master in Chemistry at the University of Groningen. This project serves as 3-4 month 20 ECTS research project that is focused on work placement and/or experience abroad. Ellen will graduate in following May with a Master of Science.

**Irish Supervisors**
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Lecturer Biochemistry, PG Dip in Third Level Learning and Teaching, Msc Applied Learning, Pedagogical expert, Initiator of the CoCREATE project, organizer or MORSE Conference

**Outcome**
The findings originating from this study can possibly aid in the current views on VLE use in academia and shed light on the lecturer's experience in changing to a new VLE. Also the landscape of lecturers can be used a s new framework relating themes from research toward the categorizing of Digital Tool usage among lecturers in general.
The findings can underline for different types of lecturers how much a VLE change has an impact on their teaching practice and if the new VLE can support student transitioning through a study program in the future.

The landscape framework and especially methodology on how the framework was constructed is intended to be published separately in a education practice journal like CERP (Chemistry education research and practice).
The overall phenomenological report is intended to be published separately in a journal focussing on education- or online learning practice.

*Required

1. **Have you been fully informed about this study? ***
   *Mark only one oval.*

   ◯ Yes

   ◯ No      *Skip to "Need more info?."*

## Consent

2. **Have you had an opportunity to ask questions and discuss this study?** *
   *Mark only one oval.*

   ◯ Yes
   ◯ No

3. **Have you received satisfactory answers to all your questions?** *
   *Mark only one oval.*

   ◯ Yes
   ◯ No

4. **Do you understand that you are free to withdraw from this study?** *
   At any time AND/OR without giving a reason for withdrawing AND/OR without affecting your future relationship with the University
   *Mark only one oval.*

   ◯ Yes
   ◯ No

5. **Do you agree to take part in this study the results of which are likely to be published?** *
   *Mark only one oval.*

   ◯ Yes
   ◯ No

6. **Have you been informed that this consent form shall be kept in the confidence of the researcher?** *
   *Mark only one oval.*

   ◯ Yes
   ◯ No

7. **I consent to participate in the following questionnaire.** *
   *Mark only one oval.*

   ◯ Yes
   ◯ No        *Skip to "Thank you."*

## Biographical information [Question 1-8]
It would really assist in data analysis if you could provide context about personal details and your professional background/CV. This allows data to be sorted and will provide context on trends observed during data analysis.

8. **1. What is your current age?** *
*Mark only one oval.*

- ( ) 26-30 years
- ( ) 31-40 years
- ( ) 41-50 years
- ( ) 51-60 years
- ( ) 61-70 years

9. **2. Gender** *
*Mark only one oval.*

- ( ) Female
- ( ) Male
- ( ) Other: _____

10. **3. Which campus do you work for currently?** *
*Mark only one oval.*

- ( ) City Campus/Cathal Brugha St.
- ( ) Blanchards Town Campus
- ( ) Tallaght Campus
- ( ) City Campus/Kevin St.
- ( ) Other: _____

11. **4. What is your current academic role?** *
*Mark only one oval.*

- ( ) Assistent lecturer
- ( ) Senior lecturer II
- ( ) Researcher
- ( ) Senior lecturer I
- ( ) Lecturer
- ( ) Other: _____

12. **5. How long have you been in this role?** *

_____

13. **6. Are you in a full-time position?** *
*Mark only one oval.*

( ) Full-time

( ) Part-time

( ) Other: _____

14. **7. What is the total number of years you have worked in an academic position?** *

_____

15. **8. What is your field of teaching speciality?** *

What field(s) are you currently teaching in? Eg. Organic/Bio/Medicinal/Inorganic Chemist etc.

_____

# Perception of self [Question 9-14]

16. **9. How would you describe your teaching philosophy?**

How would you describe yourself a teacher in words? You may have your teaching philosophy (or similar) documented as part of your continual professional development (e.g. PG Dip/Cert in Third Level Teaching and Learning). Source question: (Medlin, 2001)

_____
_____
_____
_____
_____

17. **10. Development of professional identity. [max. 300 characters]** *

What and/or who have been the main influences and motivating factors in your academic professional development to date? (Original question)

_____
_____
_____
_____
_____

18. **11. Please indicate your perceived proficiency regarding the aspects of teacher-educators roles.** *

Extra comments can be given at the end of this page. Source question: (Klecka, Donovan, Venditti & Short, 2008)
*Mark only one oval per row.*

|  | Minimal | Novice | Proficient | Significant | Expert |
|---|---|---|---|---|---|
| Teacher (Primary role of a lecturer) | ◯ | ◯ | ◯ | ◯ | ◯ |
| Scholar in education (Understanding current research on education and practice) | ◯ | ◯ | ◯ | ◯ | ◯ |
| Collaborator (Shared projects regarding research, publications, community and courses) | ◯ | ◯ | ◯ | ◯ | ◯ |
| Learner (Engagement in conferences, workshops, professional development courses) | ◯ | ◯ | ◯ | ◯ | ◯ |
| Leader (Influence on programs, policy issues, boards and associations, public advocacy) | ◯ | ◯ | ◯ | ◯ | ◯ |

19. **12. Please rank your level of expertise in the following categories.** *

Extra comments can be given at the end of this page. Source question: (Medlin, 2001)
*Mark only one oval per row.*

|  | Minimal | Novice | Proficient | Significant | Expert |
|---|---|---|---|---|---|
| Subject matter expertise | ◯ | ◯ | ◯ | ◯ | ◯ |
| Electronic technology (Use of digital learning tools, VLEs, G-Suite tools) | ◯ | ◯ | ◯ | ◯ | ◯ |
| Didactic skills (Theory of teaching and learning) | ◯ | ◯ | ◯ | ◯ | ◯ |
| Pedagogical skills (Method and practice of teaching) | ◯ | ◯ | ◯ | ◯ | ◯ |

20. **13. Please rate your sense of achievement regarding the following statements.** *

Extra comments can be given at the end of this page. Source question: (Smith, 2003)
*Mark only one oval per row.*

|  | Minimal | Novice | Proficient | Significant | Expert |
|---|---|---|---|---|---|
| Sense of professional vision for personal career development | ◯ | ◯ | ◯ | ◯ | ◯ |
| Level of instruction you give as a lecturer | ◯ | ◯ | ◯ | ◯ | ◯ |
| Publications (Either from yourself or that you contribute too) | ◯ | ◯ | ◯ | ◯ | ◯ |
| Reflection on feedback received | ◯ | ◯ | ◯ | ◯ | ◯ |

21. **14. Please select which of the following labels best describes your disposition towards the adoption of change: ***

Extra comments can be given at the end of this page. Source question: (Medlin, 2001)

**Type 1** (traditional, refer to past for your guidance, resist new innovations until certain that it will not fail).

**Type 2** (cautious about change, require convincing of the economic necessity of a change, uncomfortable with uncertainty).

**Type 3** (consider fully all consequences, interact frequently with your peers, willing to change to a new way or method but not willing to be a leader in the process).

**Type 4** (make judicious innovation decisions, decrease uncertainty by fully evaluating something new, use interpersonal networks within your immediate area to gain more information).

**Type 5** (venturesome, obsessed with trying new things, seeker of information outside of immediate area).

*Mark only one oval.*

○ Type 1

○ Type 2

○ Type 3

○ Type 4

○ Type 5

22. **Comments**

Extra explanation, comments, complaints, missing categories that need discussion

_____

_____

_____

_____

# Perceptions when using Digital Learning Tools [Question 15-22]

Digital learning tools are defined as follows:
- Any G-suite apps (Youtube, Google Drive, Forms, Docs, Presentations, etc.)
- Virtual learning environments (Blackboard, Webcourses, Brightspace, MOODLE, etc)
- Any popular online tool (Perusal, Wikis, Blogs, Twitter, Peerwise, etc.)
- Any tools used in groups (Clickers, Kahoot!, Socrative, Mentimeter etc.)

23. **15. Please rate your perception of the Usefulness of Digital learning tools in education.** *

*Mark only one oval.*

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Not useful | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Extremely useful |

Questionnaire regarding use and motivation to engage with Digital Learning Tools (2)                 27-11-19 16:44

24. **16. I believe using Digital learning tools in my classroom will..** *
Extra comments can be given at the end of this page. Source question: (Alsadoon, 2013)
*Mark only one oval per row.*

|  | Str. Disagree | Disagree | Agree | Str. Agree |
|---|---|---|---|---|
| Enhance my students' learning. | ◯ | ◯ | ◯ | ◯ |
| Help me improve my technical skills. | ◯ | ◯ | ◯ | ◯ |
| Be useful for my students. | ◯ | ◯ | ◯ | ◯ |
| Be useful for me. | ◯ | ◯ | ◯ | ◯ |

25. **17. Please rate your perception of the Ease of Use of Digital learning tools in education.**
*
*Mark only one oval.*

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Not easy to use | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Extremely easy to use |

26. **18. I believe that..** *
Extra comments can be given at the end of this page. Source question: (Alsadoon, 2013)
*Mark only one oval per row.*

|  | Str. Disagree | Disagree | Agree | Str. Agree |
|---|---|---|---|---|
| I can easily use Digital Learning Tools in my classroom. | ◯ | ◯ | ◯ | ◯ |
| My students can easily use Digital Learning Tools in my classroom. | ◯ | ◯ | ◯ | ◯ |
| I need training on using Digital Learning Tools in my classroom. | ◯ | ◯ | ◯ | ◯ |
| I can easily implement Digital Learning Tools in my classroom in a pedagogical manner. | ◯ | ◯ | ◯ | ◯ |

27. **19. Please rate your perception of the risks of using Digital learning tools in education.**
*
*Mark only one oval.*

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No risks | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Lot of risks |

28. **20. I believe using Digital learning tools in my classroom.. ***

Extra comments can be given at the end of this page. Source question: (Alsadoon, 2013)
*Mark only one oval per row.*

|  | Str. Disagree | Disagree | Agree | Str. Agree |
|---|---|---|---|---|
| For assignments might lead students to misuse their peers' contributions. | ◯ | ◯ | ◯ | ◯ |
| Will increase my workload. | ◯ | ◯ | ◯ | ◯ |
| Makes it difficult to assess students' learning. | ◯ | ◯ | ◯ | ◯ |

29. **21. Please rate your perception of support in pedagogical outcomes of your teaching by using Digital learning tools in education. ***

NOTE: Not the amount of support there is available when using digital learning tools. Pedagogical support is percieved as how the use of Digital learning tools can help and give support in the method and practice of teaching.
*Mark only one oval.*

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No support | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | A lot of support |

30. **22. I believe that the use of Digital learning tools in my classroom will.. ***

Extra comments can be given at the end of this page. Source question: (Alsadoon, 2013)
*Mark only one oval per row.*

|  | Str. Disagree | Disagree | Agree | Str. Agree |
|---|---|---|---|---|
| Help my students to construct their learning. | ◯ | ◯ | ◯ | ◯ |
| Help me to apply collaborative learning. | ◯ | ◯ | ◯ | ◯ |
| Allow students to create the content of their learning. | ◯ | ◯ | ◯ | ◯ |

31. **Comments**

Extra explanation, comments, complaints, missing categories that need discussion

_____

_____

_____

_____

_____

# Digital Learning Tool Usage [Question 23+24]

32. **23. Please rate the frequency that you use(d) the following Digital Learning Tools.** *
Including tool usage across Moodle, previous Blackboard/WebCourses and/or the new Brightspace. Inspiration question: (O'Rourke, Rooney, Boylan, 2015)
*Mark only one oval per row.*

|  | Never | Rarely | Often | Very frequently |
|---|---|---|---|---|
| Announcements | ◯ | ◯ | ◯ | ◯ |
| Learning Modules | ◯ | ◯ | ◯ | ◯ |
| Plagiarism tool | ◯ | ◯ | ◯ | ◯ |
| GradeCenter | ◯ | ◯ | ◯ | ◯ |
| Messaging Tool | ◯ | ◯ | ◯ | ◯ |
| Discussion Board | ◯ | ◯ | ◯ | ◯ |
| Assignment Dropbox | ◯ | ◯ | ◯ | ◯ |
| Youtube/other video | ◯ | ◯ | ◯ | ◯ |
| Surveys/polls (incl. online Q6) | ◯ | ◯ | ◯ | ◯ |
| Quizzes | ◯ | ◯ | ◯ | ◯ |
| Slideshare | ◯ | ◯ | ◯ | ◯ |
| Screencasts | ◯ | ◯ | ◯ | ◯ |
| Smart Board | ◯ | ◯ | ◯ | ◯ |
| Google Tools (Docs, Presentations etc.) | ◯ | ◯ | ◯ | ◯ |
| Private journals/Blogs | ◯ | ◯ | ◯ | ◯ |
| Personal Website | ◯ | ◯ | ◯ | ◯ |
| ePortfolios | ◯ | ◯ | ◯ | ◯ |
| Social Bookmarking | ◯ | ◯ | ◯ | ◯ |
| Wikis | ◯ | ◯ | ◯ | ◯ |
| Webinars | ◯ | ◯ | ◯ | ◯ |
| MOOCS | ◯ | ◯ | ◯ | ◯ |
| Ebooks | ◯ | ◯ | ◯ | ◯ |
| Skype | ◯ | ◯ | ◯ | ◯ |
| Twitter | ◯ | ◯ | ◯ | ◯ |
| Mobile Apps | ◯ | ◯ | ◯ | ◯ |
| Online Games | ◯ | ◯ | ◯ | ◯ |
| Clickers | ◯ | ◯ | ◯ | ◯ |
| PeerWise | ◯ | ◯ | ◯ | ◯ |

33. **24. What barriers do you experience surrounding online teaching? [Max. 300 characters]** *
Suggestions: Too many responsibilities already, perceive ICT as a threat to my job, lack of knowhow, time constraints, lack of institutional recognition/reward, lack of technical support etc. Inspired by (Sutton & DeSantis, 2017)

_____

_____

_____

_____

_____

34. **Comments**

Extra explanation, comments, complaints, missing categories that need discussion

_____

_____

_____

_____

_____

# Environment [Question 25-29]

The following questions ask you to reflect on your own context using your personal views on your social environment.

35. **25. Please rate your perception of colleagues' influence when using Web applications in education.** *

_Mark only one oval._

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |  |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No influence | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | ◯ | Lot of influence |

36. **26. I believe that my colleagues..** *

Extra comments can be given at the end of this page. Source question: (Alsadoon, 2013)
_Mark only one oval per row._

|  | Str. Disagree | Disagree | Agree | Str. Agree |
|---|---|---|---|---|
| Are using Digital learning tools in their teaching. | ◯ | ◯ | ◯ | ◯ |
| Are skilled in using Digital learning tools. | ◯ | ◯ | ◯ | ◯ |
| Expect me to use Web applications in my classroom. | ◯ | ◯ | ◯ | ◯ |
| Would think that using Web applications in my classroom is useful. | ◯ | ◯ | ◯ | ◯ |

37. **27. How important have the following factors been in your decision to adopt electronic technologies for education?** *
Source question: (Medlin, 2001)
*Mark only one oval per row.*

| | Not Important | Somewhat important | Important | Very Important |
|---|---|---|---|---|
| Peer Support | ◯ | ◯ | ◯ | ◯ |
| Peer Pressure | ◯ | ◯ | ◯ | ◯ |
| Mentors | ◯ | ◯ | ◯ | ◯ |
| Shared values in my department | ◯ | ◯ | ◯ | ◯ |
| Friends | ◯ | ◯ | ◯ | ◯ |
| Students | ◯ | ◯ | ◯ | ◯ |
| Mandate from the University | ◯ | ◯ | ◯ | ◯ |
| Institutional Reward System | ◯ | ◯ | ◯ | ◯ |
| Formal Recognition on a Department, College, University level | ◯ | ◯ | ◯ | ◯ |
| Physical Resources (Equipment, Hardware, Software) | ◯ | ◯ | ◯ | ◯ |
| Personal interest in instructional technology | ◯ | ◯ | ◯ | ◯ |
| Personal interest in improvement in my teaching | ◯ | ◯ | ◯ | ◯ |
| Personal interest in enhancing student learning | ◯ | ◯ | ◯ | ◯ |

38. **28. Are you involved in institutional decisions about the implementation of using Digital learning tools?** *
Original question
*Mark only one oval.*

◯ Yes

◯ No

39. **29. Are you involved in emphasizing the possibility of lecturers using Digital learning tools?** *
Original question
*Mark only one oval.*

◯ Yes

◯ No

40. **Comments**

Extra explanation, comments, complaints, missing categories that need discussion

_____

_____

_____

_____

_____

## Thank you for your participation

Thanks for participating in this study. Your data will be stored anonymously and all data will be treated in line with TU Dublin policy.

41. **If you wish to participate in a follow-up interview regarding the change to Brightspace and the following effects on your teaching practice, please provide your e-mail address below.**

We will discuss your unique lecturer landscape during this interview as well, generated from the answers you gave above. If you wish the lecturer landscape can be send out to you after data analysis of the questionnaire. Please provide your e-mail address here.

_____

_Stop filling out this form._

## Need more info?

Sorry to hear that not all necessary information was communicated to you. Please contact me at ellen.kampinga@tudublin.ie for further inquiries. Thanks in advance

_Stop filling out this form._

## Thank you

Sorry to hear that you did not give consent for participation. You will not be contacted further in the future. Thank you for your time.

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Google Forms

*Appendix II: Construction of Spider web Graphs 'Lecturer Landscapes', from questionnaire data*

*Table A1: Themes noted in the Lecturer Landscapes, with abbreviations and original corresponding questionnaire question(s) and grouped into four over-arching categories.*

| Category | Meaning | Theme | Question | Axis |
|---|---|---|---|---|
| I | How the participating lecturers rate themselves in the aspects of teacher-educator roles (MFE), fields of expertise (EXP) and areas of professional achievement (ACH). | Expertise being a multifaceted lecturer | 11 | MFE |
| | | Perception of expertise | 12 | EXP |
| | | Perception of achievement | 13 | ACH |
| II | The score is indicative of the self-assessed adoption type of innovation the lecturers identify with. | General adopter type | 14 | ADO |
| III | A general overview of a lecturer towards perceived usefulness (PU), ease of use (PEU), risks (PR), pedagogical support (PPS) and the influence of colleagues (PCI). | Perceived usefulness DLTs | 15 &16 | PU |
| | | Perceived ease of use DLTs | 17 &18 | PEU |
| | | Perceived risks of use DLTs | 19 & 20 | PR |
| | | Perceived pedagogical support DLTs | 21 & 22 | PPS |
| | | Colleagues' influence DLTs | 25 & 26 | PCI |
| IV | Provides an overview of how social surroundings in their life influence the participating lecturers use of digital learning tools | General use of DLTs | 23 | DTU |
| | | General social surroundings | 27 | SS |

*Category 1: MFE, EXP & ACH*

How the participating lecturers rate themselves in the aspects of teacher-educator roles (MFE), fields of expertise (EXP) and areas of professional achievement (ACH).

*Table A2: Questions 11, 12 and 13 from the questionnaire relating tot he themes in Category 1. Questions show full statements as displayed in the questionnaire, including the five-point answer scale.*

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Q11. Please indicate your perceived proficiency regarding the aspects of teacher-educators' roles. (Klecka, Donovan, Venditti & Short, 2008)

Answer 5-point scale: Minimal – Novice – Proficient – Significant – Expert
Statements:
- – Teacher (Primary role of a lecturer)
- – Scholar in education (Understanding current research on education and practice)
- – Collaborator (Shared projects regarding research, publications, community and courses)
- – Learner (Engagement in conferences, workshops, professional development courses)
- – Leader (Influence on programs, policy issues, boards and associations, public advocacy)

Q12. Please rank your level of expertise in the following categories. (Beijaard et al., 2000)

Answer 5-point scale: Minimal – Novice – Proficient – Significant – Expert
Statements:
- – Subject matter expertise
- – Electronic technology (Use of digital learning tools, VLEs, G-Suite tools)
- – Didactic skills (Theory of teaching and learning)
- – Pedagogical skills (Method and practice of teaching)

Q13. Please rate your sense of achievement regarding the following statements. (Smith, 2003)

Answer 5-point scale: Minimal – Novice – Proficient – Significant – Expert
Statements:
- – Sense of professional vision for personal career development
- – Level of instruction you give as a lecturer
- – Publications (Either from yourself or that you contribute to)
- – Reflection of feedback received

---

Each score is calculated as a fraction of maximum score possible per lecturer. The maximum score is calculated by multiplying the number of statements with the highest score available. The highest answer awards five points since there was a five-point scale of answers. The score of the lecturers was achieved by converting their answer to a numerical value on the five-point scale.

The equation used is shown below as Equation 1. The resulting score expresses how the lecturers rate themselves in the features of teacher-educator roles **MFE**, fields of expertise **EXP**; and areas of professional achievement **ACH.**

$$Score = \frac{Lecturer\ score}{\max\ score} * 10 \qquad \text{Eq. (1.)}$$

*Category 2: ADO*

The score is indicative of the self-assessed adoption type of innovation the lecturers identify with.

*Table A3: Question 14 from the questionnaire relating to the themes in Category 2. Question shows full statement as displayed in the questionnaire, including the five-point answer scale.*

| |
|---|
| Q14. Please select which of the following labels best describes your disposition towards the adoption of change. (Medlin, 2001) |
| Options: <br> – Type 1 (Laggard) <br> – Type 2 (Late majority) <br> – Type 3 (Early majority) <br> – Type 4 (Early adopter) <br> – Type 5 (Innovator) |

The fourth theme is the general adopter type, or ***ADO***. This score is directly related to one of the five adopter types answered and is converted to a ten-point scale for plotting on the spiderweb graph, shown as Equation 2. The score is indicative of the self-assessed adoption type of innovation the lecturers identify with.

$$Score = Lecturer\ option * 2 \qquad \text{Eq. (2.)}$$

*Category 3: PU, PEU, PR, PPS & PCI*

A general overview of a lecturer towards perceived usefulness (PU), ease of use (PEU), risks (PR), pedagogical support (PPS) and the influence of colleagues (PCI).

*Table A4: Questions 15 - 22 and 25 and 26 from the questionnaire relating tot he themes in Category 3. Questions show full statements as displayed in the questionnaire, including the answer scales.*

| |
|---|
| Q15. Please rate your perception of the usefulness of Digital learning tools in education. (Alsadoon, 2013) |
| Scale of 1-10: Not useful - Extremely useful |
| Q16. Please indicate your opinion regarding the following statements related to your perceived usefulness of digital learning tools. (Alsadoon, 2013) |
| Answer 4-point scale: Strongly Disagree – Disagree – Agree – Strongly Agree <br> Statements: *I believe using Digital Learning tools in my classroom will..* <br> – Enhance my students' learning <br> – Help me improve my technical skills <br> – Be useful for my students <br> – Be useful for me |
| Q17. Please rate your perception of the ease of use of Digital learning tools in education. (Alsadoon, 2013) |
| Scale of 1-10: Not easy to use – Extremely easy to use |
| Q18. Please indicate your opinion regarding the following statements related to your perceived ease of use of digital learning tools. (Alsadoon, 2013) |
| Answer 4-point scale: Strongly Disagree – Disagree – Agree – Strongly Agree <br> Statements: *I believe that..* <br> – I can easily use Digital Learning tools in my classroom <br> – My students can easily use Digital Learning tools on my classroom <br> – I need training on using Digital Learning tools in my classroom <br> – I can easily implement Digital Learning tools in my classroom in a pedagogical manner |
| Q19. Please rate your perception of the risks of using Digital learning tools in education. (Alsadoon, 2013) |
| Scale of 1-10: No risks – Lot of risks |
| Q20. Please indicate your opinion regarding the following statements related to your perceived risks of digital learning tools. (Alsadoon, 2013) |
| Answer 4-point scale: Strongly Disagree – Disagree – Agree – Strongly Agree <br> Statements: *I believe using Digital Learning tools in my classroom..* <br> – For my assignments might leas students to misuse their peers' contributions <br> – Will increase my workload <br> – Makes it difficult to assess students' learning |

| Q21. Please rate your perception of support in pedagogy by using Digital learning tools in education. (Alsadoon, 2013) |
| --- |
| Scale of 1-10: No support – A lot of support |
| Q22. Please indicate your opinion regarding the following statements related to your perceived pedagogical support of digital learning tools. (Alsadoon, 2013) |
| Answer 4-point scale: Strongly Disagree – Disagree – Agree – Strongly Agree<br>Statements: *I believe that the use of Digital Learning tools in my classroom will..*<br>  – Help my students to construct their learning<br>  – Help me to apply collaborative learning<br>  – Allow students to create the content of their learning |
| Q25. Please rate your perception of colleagues' influence when using Digital learning tools in education. (Alsadoon, 2013) |
| Scale of 1-10: No influence – Lot of influence |
| Q26. Please indicate your opinion regarding the following statements related to your perceived colleagues' influence in using digital learning tools. (Alsadoon, 2013) |
| Answer 4-point scale: Strongly Disagree – Disagree – Agree – Strongly Agree<br>Statements: *I believe that my colleagues..*<br>  – Are using Digital Learning tools in their teaching<br>  – Are skilled in using Digital Learning tools.<br>  – Expect me to use Digital Learning tools in my classroom<br>  – Would think that using Digital Learning tools in my classroom is useful |

The scores are an indication of how the participants rate the themes on a scale, plus how participants react to three/four statements related to these themes. The five questions combined gives a way to compare the general feeling of a lecturer towards perceived usefulness *PU*, ease of use *PEU*, risks *PR*, pedagogical support *PPS* and the influence of colleagues *PCI*. The calculation for this is similar as with Type 2 questions, only there is now a combination of two scores who are averaged, as can be seen in Equation 3.

$$Score = \frac{\left(\frac{Lecturer\ score}{\max\ score} * 10\right) + rating}{2}$$  Eq. (3.)

*Type 4: DTU & SS*

Provides an overview of how social surroundings in their life influence the participating lecturers use of digital learning tools

*Table A5: Questions 23 and 27 from the questionnaire relating to the themes in Category 4. Questions show full statements as displayed in the questionnaire, including the four-point answer scale.*

| Q23. Do you use the following Digital Learning Tools? (O'Rourke, Rooney, Boylan, 2015) |
| --- |
| Answer 4-point scale: Never – Rarely – Often – Very Frequently<br>Statements: |

| | | |
| --- | --- | --- |
| 1. Announcements | 10. Quizzes | 19. Wikis |
| 2. Learning Modules | 11. Slideshare | 20. Webinars |
| 3. Plagiarism Tool | 12. Screencasts | 21. MOOCs |
| 4. GradeCenter | 13. Smart Board | 22. Ebooks |
| 5. Messaging Tool | 14. Google Tools | 23. Skype |
| 6. Discussion Board | 15. Private Journals/Blogs | 24. Twitter |
| 7. Assignment Dropbox | 16. Personal Website | 25. Mobile Apps |
| 8. Youtube/Other video | 17. ePortfolios | 26. Online games |
| 9. Survey/Polls | 18. Social Bookmarking | 27. Clickers |
| | | 28. PeerWise |

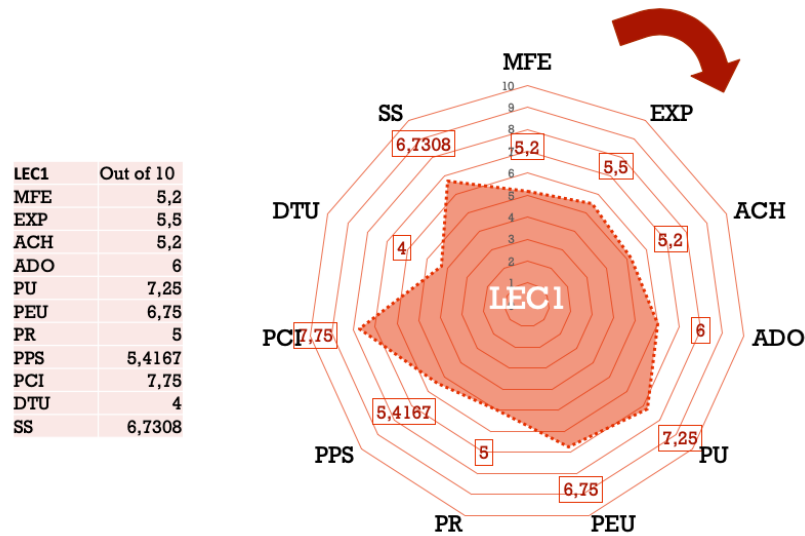| Q27. How important have the following factors been in your decision to adopt electronic technologies for education? (Medlin, 2001) |
| --- |
| Answer 4-point scale: Not important – Somewhat important – Important – Very important<br>Statements: |

| | |
| --- | --- |
| 1. Peer Support | 9. Formal Recognition |
| 2. Peer Pressure | 10. Physical Resources |
| 3. Mentors | 11. Personal interest in instructional technology |
| 4. Shared values in my department | 12. Personal interest in improvement in my teaching |
| 5. Friends | 13. Personal interest in enhancing student learning |
| 6. Students | |
| 7. Mandate from the University | |
| 8. Institutional Reward System | |

The scores are based on the amount of DLTs that are used in frequency and how much social surroundings in one's life influence the use of DLTs. The score is directly calculated as a fraction of the maximum score possible, similar to Equation 1. Here accounting for larger number statements: twenty-eight statements for digital tool use **DTU** and thirteen for social surroundings **SS**.

$$Score = \frac{Lecturer\ score}{\max score} * 10 \qquad \text{Eq. (4.)}$$

*Resulting Landscape*

Each participant has twelve scores on a ten-point scale relating to the four categories from the questionnaire. Plotting all twelve themes yields a spiderweb graph like shown in Figure 1. The landscapes are to be read from the top starting with the first theme **MFE**, going clockwise to the right.



| LEC1 | Out of 10 |
|------|-----------|
| MFE | 5,2 |
| EXP | 5,5 |
| ACH | 5,2 |
| ADO | 6 |
| PU | 7,25 |
| PEU | 6,75 |
| PR | 5 |
| PPS | 5,4167 |
| PCI | 7,75 |
| DTU | 4 |
| SS | 6,7308 |

MFE: multifaceted lecturer expertise; EXP: perception of expertise; ACH: perception of achievement; ADO: general adopter type; PU: perceived usefulness of digital learning tools; PEU: perceived ease of use of digital learning tools; PR: perceived risk of digital learning tools; PPS: perceived pedagogical support of digital learning tools; PCI: collegial influence on digital learning tools; DTU: general use of digital learning tools; SS: general social surroundings.

*Figure A1: Spiderweb graph comprising twelve axes relating to the themes from the questionnaire. On the left the scores for one participant is shown with the corresponding graph on the right.*