30-3-2020

A Case Study on The Experience of Lecturers in Higher Education During a VLE Change

Second Research Project

Dublin, Ireland

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Abstract

This study describes the experience of a VLE change and its effect on teaching practice for chemistry lecturers at TU Dublin in a period prior to Covid-19. The study comprises of a questionnaire to study the different identity a lecturer might have and how that is displayed in themes taken from literature like sense of achievement and motivational factors for innovation, driven by general stance on innovation to social and organizational factors influencing the decision to motivate. The data from the questionnaire is also shaped into a visual representation, called lecturer landscapes, which uncovers additional trends based on biographical descriptors of the respondent pool. Next, the interviews were used to provide explanatory quotes to support the trends found in the questionnaire and the landscapes to conclude trends in the professional identity of each respondent. When looking at the description of the experience during a VLE change, the experiences could be set into context to each respondent's professional identity which led to conclude that overall a VLE change does not have to affect teaching practice and can be experienced by the majority as a change of learning platform. It was found that innovation can only occur when specific needs and problems per lecturer are taken care of by responsible staff and when personal development by the lecturer is wanted or needed by motivational factors important to that person.

1. Introduction

The second research project is part of the Chemistry research masters and is offered next to the main thesis. This second project gives the student an opportunity to go abroad and/or to go to a company. The topic can be defined by the student in discussion with the supervising professor.

I arrived at my topic of choice through my desire to combine my interest for education at university with chemistry. This desire came from an interest in education I wanted to explore after finishing my main chemistry thesis. During this 45 ECTS research project I felt that the lab and the classroom were competing for my interest and that I was primarily focusing on the university as an institution providing education rather than providing research.

In discussion with the general supervisor of the second research project Prof. W. R. Browne, we arrived at a connection that he could introduce me to Prof. Christine O'Connor. She is currently working at the school of Food Science and Environmental Health at the Technological University of Dublin, with a background in Chemistry. She is interested in education at a high level as Assistant-Head of School and has previously completed a Masters in Applied eLearning. After a short introduction, an initial sketch of project options was laid out. A true feeling of confirmation for my enthusiasm for the topic led me to apply to the board of examiners for permission to do the project.

Prior to the start of the project, I attended the Irish Variety Chemistry Education Conference on April 26th 2019, organized by TU Dublin. This gave me a great opportunity to meet Christine in person and explore the city. I made a valuable connection in Dr. Barry Ryan, who later would sign on to become my co-supervisor.

1.1. Education in Ireland

A general consideration is that students in Ireland don't necessarily have to take sciences in high school to get into the TU. Therefore, students do a general first year in science, meaning that only after finishing the first year, the students of a technological institute will roughly match the students at the start of first-year HBO/ University students in the Netherlands (HBO standing for Higher Vocational Education, sometimes referred to as an Applied University).

The Irish educational system refers to university-level education as Third Level education. This is then split up in different levels as well, relating to difficulty. Table 1 gives an overview of how these NFQ levels (National Framework of Qualifications) in Irish Third Level education relate to the Dutch educational system at a theoretical university using EHEA levels (European Higher Education Area).

NFQ level	EHEA level
Level 6	Does not exist
Level 7	University Bachelor's Degree
Level 8	Honours Bachelor Degree
Level 9	University Master's Degree
Level 10	University PhD (Doctorate)

Table 1: Table elaborating the corresponding NFQ levels of third-level education in Ireland vs. the EHEA levels at university in the Netherlands.^{*i*}

The average student population at TU Dublin also has a different socio-economic nature compared to other universities in the greater Dublin area. More well-known universities as Trinity College and UCD (University College Dublin) will tend to attract more wealthy or privileged students whose economic circumstances allow them to fully focus on their studies. In contrast, the majority of students that attend TU Dublin either work part-time or full-time next to their courses, or are mature students who have a need or desire to upskill.

Course programmes at TU Dublin are generally built-up in four years, starting with the general first year, followed by specific courses in the second year. The third year is about work-placement, followed by a final fourth year to graduate.

1.2. Current situation at TU Dublin

TU Dublin was established on the 1st of January 2019, originating from a merge between three different technological institutes; Dublin Institute of technology (DIT), Tallaght Institute of Technology (ITT) and Institute for Technology Blanchardstown (ITB). The university campus is based over the three different sites of the previous technological institutes: The City-, Tallaght- and Blanchardstown campus.

Since the merge is still so recent, the respective mentalities of the Institutes of Technology are still very strong behind the scenes at the time of this study. People working in the different departments and campuses need to get to know each other and official decisions are still being made in the process towards a complete merge such as development of a new strategic plan and a new curriculum framework. A sense of unity is slowly starting to spread within the new university at the time of this project.

Current considerations still under development are among others; that there are similar programmes being taught across the different former ITs. Now being one university, students have a choice to take any degree at Tallaght, Blanchardstown or City Campus as there is not a general combined course programme yet.

However, since originating from ITs that were very locally oriented towards the population in Tallaght and Blanchardstown, the TU serves a very diverse student population. Serving big groups of students from a specific ethnicity and/or cultural backgrounds, which occasionally dominate to influence general student behaviour. The TU and its lecturers deal with cultural differences with respect to Irish culture and in between the different ethnicities present in the student cohorts on a daily basis. Which can be daunting and/or beautiful in its own way.

1.3. Recent changes

The focus of this study will be the staff experience during the change in the Virtual Learning Environment that occurred in September 2019. To set the situation for staff at the time of this study and so recently after the merge, this section gives more context on the recent changes simultaneously and/or as a result of the merge.

1.3.1. Change of VLE

The existing virtual learning environment (VLE) lease at DIT was coming to end, prompting to a research project into new VLE options and offers currently available in the last year. Following this research project, a decision was made and the VLE switched from Blackboard-operated Webcourses to Brightspace in August 2019. The tender process and implementation of the new VLE was carried out by the LTTC, or Learning, teaching and training centre. This is a centre, previously part of DIT (now City

Campus), consisting of 9 staff-members who focus on areas such as Academic Development, Learning Transformation and Implementing eLearning.ⁱⁱ

1.3.2. The new campus

There is a new campus being built to house the majority of the city campus' schools (previously the DIT schools) at one location at the north-west of the city: The Grangegorman Campus. Some schools situated in the city will move in May of this year. Meaning that preparations for the move are also adding pressure to staff in the semester during which this research project was held.



Figure 1:Map of the new GrangeGroman campus in the North-west of Dublin, courtesy from the GrangeGorman Development Agency.ⁱⁱⁱ

1.3.3. Change of e-mail provider

The email platform was changed from Google to Microsoft in September 2019, (at least for the former DIT and ITB campuses as a result of the merge). Email services as well as supporting services such as cloud storage, drives, calendars and log-in details were changed for staff. This meant that all existing internal and external communication had to alter to the new email address along with log-in details for university-related services.

1.4. Theoretical background

In 2013, Boylan et al, investigated the use of a VLE in higher education and then specifically at TU Dublin after the change of the VLE from WebCT to Blackboard in September 2012. ^{iv} It was recognised even then that the VLE had become an integral part of teaching in higher education, although still mainly being used as a repository by most staff. This article served as an inspiration for my study conducted at TU Dublin, right after the event of changing the VLE to Brightspace in 2019.

1.4.1. New generation of students

A theme that emerged when preparing this new study was dealing with a new generation of students. Students who start their studies in the modern environment of abundant information. As Martin Weller describes in his book The Digital Scholar (2011): '*This abundance of content is unprecedented.* Many of our approaches to teaching and learning were developed in a different age, and this basic shift from moderate scarcity to excessive abundance constitutes a challenge to higher education and to

individual information processing abilities. ' ^v Clearly concluding that a new environment calls for a new approach or a change in the system that is in place in order to fit the modern environment.

More than ten years ago, in 2008, Nicholas Carr wrote a highly controversial blogpost, asking if Google was making us stupid. Carr claimed that the abundance of information online is making our brains only a superficial source of information and lets us fall into distractions more often. Additionally, Maryanne Wolf, author and developmental psychologist at Tufts University explains in Carr's blog post: '*We are prioritizing efficiency and immediacy above all else. We are how we read, and reading online might make us mere decoders of information rather that deeply processing it.*' While praising Google and the Internet for making a literature-search a process of mere minutes, Carr concludes that skimming internet pages inhibits the ability of deep reading and so, deep learning.^{vi}

Carr's blog post was written ten years after the birth of Google, and four years after the start of Facebook. I am sure many students today, another twelve years later, think of Google-ing something before even reasoning an answer to a random question. Why would we remember something, if we have a supercomputer in our back pocket that can tell us anything? When in the practice of teaching these modern-day students, it is worth wondering how superficial our brains have gotten in the meantime. Are we losing the ability to deep learn at all, if the teaching techniques are not designed for our brains?

1.4.2. Revolutionizing education

If students have changed, what is it like to teach as a lecturer nowadays? Beijaard et. al. made an analysis in 2000, but these dilemmas still seem to be accurate now. Namely; 'In our post- modern societies, teachers increasingly face moral, social, and emotional dilemmas, such as: Coping with consequences of a society in which social control has been replaced by strong processes of individualization, and judging and discussing other sources of information and technologies that are available to students now.^{vii}

A solution is to revolutionize the way we teach, stepping away from the traditional lectures and tutorials in medieval style towards high-tech platforms with engaging websites, ePortfolios and learning tools. As EduCause summarizes it: 'Embracing digital transformation is about building on the core values of higher education and developing new and significantly more effective ways to enrich and expand higher education's mission.'viii

Of course, these innovations alone are not going to revolutionize teaching. And who is to say that traditional teaching has lost its efficiency all together? The lecturer is still the main influence in how technology is used in education. As Risquez (2012) states: 'Online and face to face teaching do not exclude each other, on the contrary, they could enhance each other mutually in many creative and powerful ways.' A teacher, for most students, is the guide to learning and the deliverer of new information, but how do the lecturers cope with learning new teaching techniques themselves?^{ix}

1.4.3. Modern-day educators

Regarding chemistry education, it was found that by Herrington et al. in 2016 that: 'Many teachers are unaware of chemistry education research. Instead, teachers rely on personal experiences to make decisions about good teaching.' × Sutton et al. (2017) add a nice observation from psychologists, that the fast pace that technological development is happening in education creates a certain level of change-blindness in teachers.^{xi} Humans tend to ignore simple alterations in the environment, reminiscent of tricks done by magicians. 'In a situation where a subject is assisted by person A, a

distraction is staged where meanwhile person A is switched out for person B, and after gaining focus again the subject will not even notice the change of people and continues the conversation.' Sutton states that professors find themselves in a similar situation, where new technologies are still only being used as a replacement of the older one; PowerPoint instead of overhead projectors; and Smartboards instead of blackboards and chalk. Students expect more engagement in classrooms and online and there is more data available about students' performance than ever before yet many educators still continue as if nothing has changed at all.

On the topic of adoption of technology Martin Weller (2011) stated that: 'Individual scholars are being highly innovative and yet the overall picture is one of reluctance; technology is creating new opportunities while simultaneously generating new concerns and problems.' Describing the effect that with new innovations, only a few will engage at first. Even if these few are being highly effective in the process of change, they are not able to supersede the general consensus of reluctance and the invention of new problems.

The main barriers for teachers nowadays to engage with new teaching technology are defined by Sutton et al. as: (1) the responsibility, often lies on individual educators to teach themselves about using and applying new methods in their teaching; (2) The lack of available support and professional development for these activities; (3) The time required to innovate, and finally; (4) the little financial return for time and effort spent on innovation. These barriers lead most educators to keep working with the tools they have the most experience with, and can we blame them?^{xii}

Taking in the change-blindness and main barriers that teachers can experience lead to the fact that most educators will not innovate at first. So, what is the exact process that leads teachers to innovate?

1.4.4. Studying innovation

In general, innovation is a well-studied topic. One model for technology adoption that is used is Rogers' (1962) diffusion model. Based on a study focused on the rate of diffusion of hybrid corn seed in two lowa farming communities in the late 1920s, Rogers built on the concepts in this study and looked at innovation in the whole agricultural sector and discovered a more uniform model of adoption. He states it as: '*The main elements in the diffusion of new ideas are: (1) an innovation (2) that is communicated through certain channels (3) over time (4) among the members of a social system.*', highlighting that this is rather a process of social change.^{xiii} The general diffusion model that came from this even seemed applicable to other fields, even to the adoption of technology in higher education as done by Medlin (2001).

The main driver of the diffusion model is to identify the users' uncertainty as the key barrier for adoption. The five main attributes that can increase or decrease a person's uncertainty are identified as: (1) Relative advantage; '*The degree to which an innovation is perceived as being better than the idea it supersedes'*, (2) Compatibility; '*The degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters'*, (3) Complexity; '*The degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters'*, (3) Complexity; '*The degree to which an innovation is perceived as relatively difficult to understand and use'*, (4) Trialability; '*The degree to which an innovation may be experimented with on a limited basis'*, and (5) Observability; '*The degree to which the results of the innovation are observable to others'*. It has been proven that if a technology offers more of any of these 5 attributes than others, it is likely to be adopted faster in teaching by educators.^{xiv} But still there is also an individual part, because per educator you have his/her

unique social surrounding, personal opinions and formal training influencing his/her decision-making process.

This leads to the categorization of five types of adopters, based on the standard deviation of the normal distribution of adoption over time, using standard deviation from the average time of adoption as can be seen in Figure 2.



Figure 2: The innovativeness dimension, as measured by the time at which an individual adopts an innovation is continuous. The innovativeness variable is partitioned into five adopter categories by laying off standard deviations (sd) from the average time of adoption (x). Taken from Rogers, E. M. (2003). Diffusion of innovations (5th ed.). New York, NY: Free Press.

Labelled as: (1) Innovators, the top 2,5%, the most venturesome, (2) Early adopters, next 13,5%, who respect new technology, (3) Early majority, the next 34% up to the average, who are deliberate in their decision, (4) Late majority, the next 34% down from the average, who tend to be skeptical of innovation and (5) the Laggards, the lower 16%, who are very traditional in their practices. These five types of adopters can be used to describe the personality traits per adopter type and give a rough indication of how their social interaction, personal views and formal training are situated and how it motivates their decision to innovate.

[Although noting here that any classification is a simplification as stated by Rogers himself: 'Classification is a simplification that aids the understanding of human behavior, although it loses some information as a result of grouping individuals. The five categories set are ideal types, concepts based on observations of reality that are designed to make comparisons possible.' xiv]

So, what makes an educator a certain adopter type? The individual part per educator was stated briefly above as including unique social surrounding, personal opinions and formal training influencing his/her decision-making process. A theme in educational research that encompasses this is professional identity.

1.4.5. Professional identity

A lot of research has been done on the theme of professional identity in educators. Like a quote that I found very insightful: 'Identity of a teacher also depends on their previous transition and training as well as the part that they are in now, if it includes research or just teaching.' ^{xv} As a person we are products of our education and of course as a teacher you are also a product of your training. Although that is also influenced by your image of self as Beijaard says: 'Professional identity can be linked to images of self, and these strongly determine the way teachers teach, the way they develop as teachers,

and their attitudes toward educational changes. Professional identity is not something teachers have, but something they use in order to make sense of themselves as teachers.' ^{xvi} And to put that in categories, Bromme suggests: 'Teachers derive their professional identity from (mostly combinations of) the ways they see themselves as subject matter experts, pedagogical experts, and didactical experts.' ^{xvii}

Klecka et al. studied teacher educators, or teachers of teachers and their use of ePortfolios. The enactment of identity was focused on and specifically the enactment within the discourses of the socio-political context in which the identity is nested. The act of defining who a teacher educator is shapes the discourse of teacher education and provides a basis from which to move the profession forwards. They conclude that teacher educators studied have multiple identities and that they enact multi-faceted identities through their e-Portfolio use. Categories of enactment were made in facets of identity: teacher, scholar in teaching, collaborator, learner and leader. The five facets were not equally represented in the data obtained from focus groups. '*Five facets of a teacher educator's identity are defined as; Teacher, Scholar, Collaborator, Learner and Leader. These facets are not separate from each other, they interrelate in complex and important ways rather than discrete categories. They are ways to focus our attention on different aspects of how identities are formed and sustained.'^{xviii}*

And professional quality is defined in categories by Smith: *'Evidence of their professional quality by teachers can be defined as; Professional vision, Instruction, Publications and Evidence of reflection on feedback on teaching.'* xix

1.5. Research questions

Now we have covered what possibly motivates lecturers to innovate and how professional identity of lecturers can be measured, we can formulate the research questions. These are based on the proposed research methods: a questionnaire and supporting interviews. The questionnaire will focus on the identity of the lecturers, these data will then inform a visual representation called a lecturer landscape. The interviews focus on experiences as training as a lecturer and motivations to start teaching to the experience of a VLE change and the effect on teaching practice. It is suggested that combining factual data as obtained by the questionnaire, together with the visual representation of it will help a sketch of the personality of the lecturer professionally and how that describes itself on different fronts, then the experiences gathered by the interviews are hopefully informed by the personality sketch to gain a full description of the lecturers identity and how that related to an event like a VLE change.

The research questions are phrased as:

- What is the general perception of current chemistry lecturers at TU Dublin on using the VLE and Digital learning tools in education?
- How do chemistry lecturers at TU Dublin describe their experience through a VLE change and how does it affect their teaching practice?
 - Does their experience relate to the type of lecturer they are based on themes found in literature?
- Does the construct of having a questionnaire and a visual form of that help find trends in the study on VLE change at TU Dublin?
 - Does triangulation of an interview, a visual form and interviews give more coherent data to formulate conclusions on how chemistry lecturers at TU Dublin experienced a VLE change?

2. Methods

2.1. Research Design

This study focuses on the lecturer experience using the virtual learning environment and teaching with digital learning tools. Insights into the lecturer experience were obtained by using a questionnaire which was used to generated a visual outcome in the shape of a multi-axial spiderweb graph, called a landscape. To be able to describe the lecturer's experience during the VLE change last semester, interviews were used as they served the goal of obtaining a view into the complexity of each lecturers' experience. These three methods of collecting data will be further explained below in the same order.

2.1.1. Questionnaire

The questionnaire included several themes found in literature relating to how lecturers describe the development of their career and their personal identity as described in the theoretical background. A list of themes used can be found in Table 2 below. More elaborate tables below give the questions and answer-options according with the precise source used to inspire the question.

Section	Topic of questions	Sources
Biographical information Question 1-8	Age, gender, campus, academic role, years in role, years in academia and full- time/part-time position.	
Perception of Self Question 9-14	Teaching philosophy, professional identity (motivational factors), teacher educator roles (5 facets), Levels of expertise, sense of achievement (Quality of teaching), Rogers' innovation adopter types.	(Medlin, 2001), (Klecka, Donovan, Venditti & Short, 2008), (Bromme, 1991), (Smith, 2003)
Perceptions when using Digital Learning tools Question 15-22	Perceived usefulness, perceived ease of use, perceived risks, perceived pedagogical support.	(Alsadoon, 2013)
Digital Learning tool usage Question 23-24	Use of Digital Learning tools and Barriers to use more.	(O'Rourke, Rooney, Boylan, 2015) (Sutton & deSantis, 2017)
Environment Question 25-29	Colleagues' influence, social factors influencing DLT use, involvement in institutional decisions about implementing DLTs, involvement in encouraging colleagues to use DLTs.	(Medlin, 2001), (Alsadoon, 2013)

Table 2: Table listing questions per section, the topic of the questions and their respective sources as were described in the theoretical background.

The questionnaire consisted of 29 questions, divided into 5 parts which all included space for open comments if needed. The questionnaire structure was informed by literature (Floyd & Fowler, 2014), (Cohen, 2007) and (Denscombe, 2014) and was piloted by supervisors before use. The questionnaire was send out in a second iteration after no responses to a pool of to 14 members of staff, generating 6 responses, or 43% response rate.

The respondents were located in two campuses of the formerly DIT campuses in the city center. It can be argued that a response of a total of 6 lecturers could be less reliable to assume trends for a wider group of lecturers, however lecturing staff at these campuses lies around 25-30 members, from which 6 members is still roughly 20%. Also the range in age, gender and academic experience gives a representative population for chemistry staff at TU Dublin. Chemistry staff outside TU Dublin might not be concerned with smaller trends found, but suggestions could be made as to how their indentity and teaching style might be similar.

The questions are listed in Tables below, together with the source if necessary and the answer options. Note that when no options are given, it means it was an open question.

Biographi	Biographical Information [Question1-8]						
1.	What is your current age?						
	Options: - 26-30 years - 51-60 years - 31-40 years - 61-70 years - 41-50 years - -						
2.	What is your gender?						
	Options: - Female - Male - Other:						
3.	Which campus do you work for currently?						
	Options: - City Campus/Cathal Brugha St. - City Campus/Kevin St. - Blanchardstown Campus - Other: - Tallaght Campus - Other:						
4.	What is your current academic role?						
	 Assistant lecturer Senior lecturer I Senior lecturer II Other: 						
5.	How long have you been in this role?						
6.	Are you in a full-time position?						
	Options: - Full-time - Part-time - Other:						
7.	What is the total number of years you have worked in an academic position?						
8.	What is your field of teaching speciality?						

Table 3: Questions of the section Biographical information, question 1-8, including answer options.

Table 4: Questions of the section Perception of Self, question 9-14, including source and answer options.

Perception of Self [Question 9-14]				
9.	How would you describe your teaching philosophy?	(Medlin, 2001)		
10.	How would you describe your professional identity?	(Original)		
11.	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 ar Collaborator (Shared projects regarding research, publications, comm Learner (Engagement in conferences, workshops, professional develo Leader (Influence on programs, policy issues, boards and associations, 	nd practice) unity and courses) pment courses) , public advocacy)		
12.	Please rank your level of expertise in the following categories.	(Bromme <i>,</i> 1991)		
	 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) 	;)		
13.	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 			
14.	Please select which of the following labels best describes your disposition towards the adoption of change.	(Medlin, 2001)		
	Options: - Type 1 (Laggard) - Type 2 (Late majority) - Type 3 (Early majority) - Type 4 (Early adopter) - Type 5 (Innovator)			

Tahle 5.	Ouestions of the sect	ion Percention whe	n usina DLTs, auestia	n 15-22 including source	and answer ontions
rubic 5.	Questions of the seet	ion i ciccption whe	n asing DETS, gaestio	1 13 22, melaung source	una answer options.

Perceptio	Perceptions when using Digital Learning Tools [Question 15-22]				
15.	Please rate your perception of the usefulness of Digital learning tools in education.	(Alsadoon, 2013)			
	Scale of 1-10 1: Not useful 10: Extremenly useful				
16.	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 Statements: I believe using Digital Learning tools in my classroom will Enhance my students' learning Help me improve my technical skills Be useful for my students Be useful for me 				
17.	Please rate your perception of the ease of use of Digital learning tools in education.	(Alsadoon, 2013)			
	Scale of 1-10 1: Not easy to use 10: Extremely easy to use				
18.	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 Statements: <i>I believe that</i> I can easily use Digital Learning tools in my classroom My students can easily use Digital Learning tools on 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 peda 	agogical manner			
19.	Please rate your perception of the risks of using Digital learning tools	(Alsadoon,			
	Scale of 1-10 1: No risks 10: Lot of risks	2013)			
20.	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 Statements: I believe using Digital Learning tools in my classroom For my assignments might leas students to misuse their peers' contrib Will increase my workload Makes it difficult to assess students' learning 	utions			
21.	Please rate your perception of support in pedagogy by using Digital learning tools in education.	(Alsadoon, 2013)			
	Scale of 1-10 1: No support 10: A lot of support				
22.	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 Statements: I believe that the use of Digital Learning tools in my classroom will. Help my students to construct their learning Help me to apply collaborative learning Allow students to create the content of their learning 				

Table 6: Questions of the sect	on Digital learning to	ool usage, guestion 23 & 24	including source and answer options.
- ,	5	3,1	5 1

Digital Lea	Digital Learning Tool Usage [Question 23-24]					
23.	Do you use the following Digital	Learning Tools?	(O'Rourke, Rooney, Boylan, 2015)			
	Answer 4-point scale: Never – Rarel Statements: 1. Announcements 2. Learning Modules 3. Plagiarism Tool 4. GradeCenter 5. Messaging Tool 6. Discussion Board 7. Assignment Dropbox 8. Youtube/Other video 9. Survey/Polls	 y – Often – Very Frequently 10. Quizzes 11. Slideshare 12. Screencasts 13. Smart Board 14. Google Tools 15. Private Journals/Blogs 16. Personal Website 17. ePortfolios 18. Social Bookmarking 	 19. Wikis 20. Webinars 21. MOOCs 22. Ebooks 23. Skype 24. Twitter 25. Mobile Apps 26. Online games 27. Clickers 28. PeerWise 			
24.	What barriers do you experience	e surrounding online teaching?	(Sutton & deSantis, 2017)			

Table 7: Questions of the section Environment, question 25-29, including source and answer options.

Environment [Question 25-29]					
25.	Please rate your perception of colleagues' in	fluence when using	(Alsadoon, 2013)		
	- Scale of 1-10 1: No influence 10: Lot	of influence	20137		
26.	Please indicate your opinion regarding the for related to your perceived colleagues' influer learning tools.	ollowing statements nce in using digital	(Alsadoon, 2013)		
	 Answer 4-point scale: Strongly Disagree – Disagree – Agree – Strongly Agree Statements: <i>I believe that my colleagues</i> Are using Digital Learning tools in their teaching Are skilled in using Digital Learning tools. Expect me to use Digital Learning tools in my classroom Would think that using Digital Learning tools in my classroom is useful 				
27.	How important have the following factors be adopt electronic technologies for education	een in your decision to ?	(Medlin, 2001)		
	Answer 4-point scale: Not important – Somewhat important – Important – Very important Statements:				
	1. Peer Support	9. Formal Recognitio	n		
	2. Peer Pressure	10. Physical Resources	S		
	3. Mentors	11. Personal interest	in instructional		
	4. Shared values in my department	technology			
	5. Friends	12. Personal interest i	n improvement		
	 o. Students 7 Mandate from the University 	13 Personal interest	in enhancing		
	8. Institutional Reward System	student learning			

28.	Are you involved in institutional decisions about the implementation of using Digital learning tools?	(Original)
	Yes or No question	
29.	Are you involved in emphasizing the possibility of lecturers using Digital learning tools?	(Original)
	Yes or No question	

The dissertations of Medlin^{xx} and Alsadoon^{xxi} included work on the influence of Digital Learning tools In higher education based on Rogers' model of innovation diffusion using questionnaires, which served as inspiration for the questionnaire in this study. Medlin's work on the personal motivational factors was used, along with asking the lecturers about their general teaching philosophy and letting educators determine their own adopter type by self-assignment. Inspiration from Alsadoon involved the questionnaire items including perceived usefulness, perceived risk and colleagues' influence.

Medlin ^{xx} focused on: 'Factors that may influence a faculty member's decision to adopt electronic technologies in instruction.' She states to be mainly driven by unravelling the complex processes that underlie the adoption and diffusion of electronic technology into higher education. The goal of this dissertation is: 'To hopefully assist the creation of environments that enhance and establish appropriate settings and goals for incorporating instructional technology.' The study uses Rogers' model to relate social (eg. Peer pressure and Friends, organizational (eg. Reward system and Physical resources) and personal motivational variables to relate them to the adopter types. Personal motivational factors which were discussed in this study include personal interest in instructional technology, personal interest in improvement in teaching, and personal interest in enhancing student learning.

The numbered questionnaires in Medlins work were sent to participants over the mail, including a selfaddressed cover letter. To ensure a higher response rate, follow-up telephone survey method was used for respondents that had not answered within two weeks. The researcher studied 12 of the 16 public 4-year institutions of higher education within North Carolina that have an accredited School or College of Business, focusing on the accounting major. A pilot study with 24 participants was performed to improve content validity. The final survey was mailed to 80 respondents, resulting in a sample size of 44, with an overall response rate of 55%.

Results concluded that social variables were found to significantly influence the educators' decision to adopt technology into the classroom, next to organizational variables and physical resource support and mandate from the university. Plus, all three personal motivational variables emerged as important in the decision to adopt instructional technologies. Highlighting more factors involved in the decision educators make with regard to using instructional technologies in the classroom.

Also inspiring was the work of Alsadoon ^{xxi}, where the topic was: *Factors Influencing Faculty to Adopt Web Applications in their Teaching*, similar to Medlin. However, focusing more on factors like the perceived usefulness and the perceived risks influence the educator's decision to adopt new technology into his/her teaching. The goal is to study how Web applications would need to be seeded into the learning environment and how to make them effective educational tools for teachers.

Focusing mainly on the factors of perceived usefulness (PU), perceived ease-of use (PE), perceived pedagogical support (PPS), perceived risk (PR), and colleagues' influence (CI) to be significant predictors of the faculty's intention to use Web applications in teaching, A 4-point Likert scale was piloted and worked well for all the constructs in this study. A pilot study was performed with 23 participants to increase validity. A sample containing all universities in the United States that had colleges of education. After two weeks of data collection, the number of participants was 249, with a response rate of 12%. This satisfies the minimum number (200) required to run a multiple regression that was calculated using the PEAR method.

Results concluded that the faculty questioned was in fact knowledgeable and experienced with using some form of web application in their teaching and intends to use them more in the future. The significant predictors of faculty's intention to adopt web applications were indeed knowledge and experience but also the perception of usefulness of such applications. Relating this to Rogers' model, perceived usefulness is a factor that proves to be one of the main factors, which can be explained to encompass all five attributes of uncertainty about an adopter's decision as described in the theoretical background discussed earlier.

2.1.2. Landscapes

To visualize the answers to the questionnaire, a method was developed by making a point system for each theme/question given, this point system allows for a graphical representation to be made and for the questionnaire data. After consideration of spreads or generating categories or personas, it was decided that the best way to compare scores per theme and per lecturer was to plot the scores on a multi-axis spiderweb graph. Comparing the different lecturers' identity and VLE use therefore becomes a more direct and visual process once some instructions are learned on how to read these graphs.

Converting each theme covered in the questionnaire to a score and plotting them on a 10-point scale, yielded a spiderweb graph comprising 12 axes. Color coded based on gender, and specified to the responses of each lecturer.

2.1.3. Interviews

Semi-structured formal individual interviews with the selected lecturers will be audio recorded and transcribed *verbatim*, allowing for a guided conversation that will include stories of experiences together with professional opinions of VLE use in teaching practice. Based on basic qualitative research techniques focussing on interviews from (Denscombe, 2013) and (Creswell, 1998). The interviews were used to get supporting quotes with the questionnaire data and to give a more complex picture into the lived experiences of lecturers during a VLE change.

3. Results

In the results section we will discuss the main findings of the questionnaire and the landscapes. The interviews will serve to provide context and explanation to some of the findings.

3.1. Questionnaire

As already mentioned in the methods section, the questionnaire consisted of 29 questions, divided into 5 parts which all included space for open comments if needed. The answers from respondents are listed in Tables below, summarizing the main findings per section.

3.1.1. Section I: Biographical Information

Lecturer #	LEC 1	LEC 2	LEC 3	LEC 4	LEC 5	LEC 6
Age range	31-40	51-60	51-60	41-50	41-50	41-50
Gender	Female	Female	Male	Male	Female	Male
Campus	CBS	CBS	CBS	CBS	Kevin Street	Kevin Street
Current Academic Role	Lecturer	Senior Lecturer II	Lecturer	Lecturer	Senior Lecturer II	Lecturer
Years in current role	5	22	9	15	3	5
Years worked in academic position	7	25	20	20	19	5
Field	Biochemistry Medicinal	Pharmaceutical technology	Biochemistry	Inorganic Chemistry	Organic/ medicinal	Physical Chemistry

Table 8: Summary of results Biographical Information [Question1-8] per lecturer.

All information is listed here for completeness. When discussing the trends seen when comparing different lecturers this table is used to describe the information we have about a lecturer.

3.1.2. Section II: Perception of Self

The first section of questions contains 3 questions where the lecturers are asked to rate their perceived proficiency regarding teacher-educator roles, perception of expertise and perception of achievement. Also, in this section is a description of the 5 different adopter types by Rogers, where the lecturers were asked which type they identified with. Trends are noted per lecturer first and in general in the last row of Table 9.

Table 9: Summary of results of main questions from the section Perception of Self per lecturer and in general.

	Q. 11 Teacher- educator roles	Q. 12 Fields of expertise	Q. 13 Feeling of achievement	Q. 14 Adopter type
LEC 1	Lowest score	Lowest score		3
LEC 2	Constant score of Significant	Highest score Constant score of <i>Significant</i>		4
LEC 3	Highest score		Highest score	Highest score. 5
LEC 4				3
LEC 5	Constant score of Significant		Lowest score Constant score of Proficient	3
LEC 6	Gives Proficient for all roles and only scores Teacher higher.		Very high confidence in <i>Instruction</i> compared to other statements.	3

GEN	Teacher was	Score for <i>Subject</i>	Reflection is scored as	The lowest
	never scored	Matter Expertise is	Significant every time.	score is <i>Type 3,</i>
	lower than the	scored highest overall.	Publications has the	Early majority.
	other roles.	Pedagogy is either	highest range from	<i>Types 1 & 2</i>
		scored higher or equal	<i>Novice</i> (LEC6) to	were not
		to Didactics every time.	Expert (LEC3).	chosen.
		•	• • •	

3.1.3. Section III: Perceptions when using Digital Learning Tools

This section consists of four questions inspired by the work of Alsadoon focussing on themes in perception, ranging from perceived risks to perceived usefulness of Digital Learning tools. All themes are a combination of a 10-point scale rating question and answers to a couple of statements regarding the same theme. This can also be seen in

Table 5 above. Just as before, the trends per lecturer are listed first, followed by some general remarks in the final row.

Table 10: Summary of results of main questions from the section Perceptions when using Digital Learning tools per lecturer and in general.

	Q. 15+16 Perceived Usefulness	Q. 17+18 Perceived Ease of Use	Q. 19+20 Perceived Risks	Q. 21+22 Perceived Pedagogical Support
LEC 1	Lowest rating Constant score of <i>Agree</i>	Lowest score	Constant score of Disagree	Lowest score
LEC 2	Constant score of Agree		Highest score	Constant score of Agree
LEC 3	Highest rating Constant score of <i>Agree</i>	Highest score		
LEC 4		Highest score		
LEC 5	Highest score Scores only the statement <i>Enhance</i> <i>learning</i> lower than <i>Strongly Agree</i> .	Lowest score	Strongly agrees with Increase of workload.	Highest score
LEC 6	Lowest score	Answers Disagree on the statement Need training.	Lowest score	
GEN	All average scores are positive. LEC 4 & 6 both state to disagree with the <i>Technical skills</i> statement.	All average scores are positive. All Lecturers except LEC 6, rate all statements with Agree.	5/6 Lecturers Disagree with Difficult to assess students.	Answers on statements vary greatly.

3.1.4. Section IV: Digital Learning Tool Usage

The fourth section was a combination of determining the use of 29 different Digital Learning tools and determining the main barriers to increase the use of (more) tools. The question on barriers was open.

Table 11: Summary of results main question from the section Digital Learning tool usage per lecturer and in general.

	Q. 23 Digital Learning Tool Use	Q. 24 Perceived Barriers
LEC 1	Never scores above <i>Often</i> , scores 13/28 tools with <i>Never</i> .	Finding time to experiment.
LEC 2	Highest score	Support.
LEC 3	Highest score Scores <i>Very Frequently</i> most, 9 times.	IT facilities.
LEC 4		Lack of connectivity.
LEC 5		Time.
LEC 6	Lowest score Never scores above <i>Often,</i> scores 22/28 tools with <i>Never</i> .	Less time to learn due to heavy workload.
GEN	The tool that scores highest is <i>Learning</i> <i>Modules</i> , followed by <i>Quizzes</i> and <i>Assignment Dropbox</i> . Tools that score lowest on average are: <i>Smart Board, Social Bookmarking, Online</i> <i>games, Personal website and PeerWise.</i>	A version of time constraints in mentioned by 3/6 lecturers.

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3.1.5. Section V: Environment

The final section focuses on the social environment influencing Digital Learning tool use. Consisting of one last rating and statement question as in section three, focusing this time on the influence of colleagues. Another big question in this section is question 27, examining the importance of social factors in the use of Digital Learning tools. Important trends are noted per lecturer and in general in Table 12.

Table 12: Summary of results of main question from the section Environment per lecturer and in general.

LEC 1	Highest score Constant score of <i>Agree</i>	Does not score above Important
LEC 2	Constant score of Agree	Does not score above Important
LEC 3	Highest rating Lowest statement score Constant score of <i>Disagree</i>	Rates 5 statements as Very Important and also 5 statements as Not Important
LEC 4	Lowest rating Highest statement score	
LEC 5	Only Disagrees with Colleagues expect me to use DLTs.	Highest score
LEC 6	Only <i>Disagrees</i> with <i>Colleagues expect me</i> to use <i>DLTs</i> .	Lowest score Rates 9/13 statements as Not Important.

Q. 25+26 Perceived Colleagues' Influence Q. 27 Social Surroundings

GEN	5/6 Lecturers are positive overall, except	Highest score of importance was scored
	LEC3.	by Interest in student learning, followed
	LEC 3 and LEC 4 have opposite rating and	by the two other personal interest
	statement scores.	statements and Physical Resources.
	5/6 Lecturers Agreed with Colleagues are	The lowest score is for Institutional
	skilled with DLTs.	Reward. Closely followed by Peer Pressure
		and Formal Recognition.

3.2. Landscapes

The landscapes were constructed as a means of creating a visual representation of the lecturers' answers to the questionnaire. All of the closed questions comprising a score are linked to a theme, see Table 13 below. Where the abbreviations are used to label the axes in the corresponding landscapes.

	Theme	Abbreviation	Question
1.	Expertise being a multifaceted lecturer	MFE	11
2.	Perception of expertise	EXP	12
3.	Perception of achievement	ACH	13
4.	General adopter type	ADO	14
5.	Perceived usefulness DLTs	PU	15+16
6.	Perceived ease of use DLTs	PEU	17+18
7.	Perceived risks of use DLTs	PR	19+20
8.	Perceived pedagogical support DLTs	PPS	21+22
9.	Colleagues' influence DLTs	PCI	25+26
10.	General use of DLTs	DTU	23
11.	General social surroundings	SS	27

Table 13: Themes in landscapes with abbreviations used and original corresponding questionnaire question(s).

It should be noted here, that compared to the order of questions as listed in the section before this; colleagues' influence is moved up to fit along with the questions of a similar structure, namely perceived usefulness, ease of use, risks and pedagogical support.

3.2.1. How to read the landscapes

The landscapes are best to be read from the top starting with the first theme *MFE*, going clockwise to the right. There are four types of questions.



Figure 3: A lecturer landscape as an example to indicate how to read them.

Type 1: MFE, EXP & ACH

The first three themes to be interpreted are of similar type; each score is calculated as a fraction of total score possible per lecturer. The maximum score is calculated by multiplying the number of statements with the highest answer available (*Expert*). The highest answer awards five points since there was a five-point scale of answers. The score of the lecturers was calculated similarly, by converting their answers to a numerical value depending on the five-point scale. The equation used is shown below as Equation 1. The score obtained then expresses how the lecturers rate themselves in the features of teacher-educator roles *MFE*, fields of expertise *EXP*; and areas of professional achievement *ACH*.

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

Type 2: ADO

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 comparison (essentially a multiply by two). The score is indicative of the self-assessed adoption type of innovation the lecturers identify with.

Type 3: PU, PEU, PR, PPS & PCI

Themes five to nine, are related to the questions from Alsadoon's dissertation on perceived qualities of DLTs and colleagues' influence. The scores are an indication of how the lecturers on a rated scale perceive these qualities, plus how they react to three/four statements related to these qualities. These 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 2.

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

Type 4: DTU & SS

Finally, theme ten and eleven are scored based on the amount of DLTs that are used in frequency and how much social surroundings in their life influence their use of DLTs. Score is again directly calculated as a fraction of the maximum score possible, using Equation 1. Only the range of statements is here is bigger; twenty-nine statements for digital tool use *DTU* and thirteen for social surroundings *SS*.

3.2.2. The landscapes

Figure 4 shows the six landscapes of all participants color-coded based on gender, where orange stands for female, and grey stands for male.

The data in Table 8 (reprinted here below), helps to intercompare the landscapes. Trends can be found depending on all factors of a lecturer's identity and their corresponding landscape scores. The visual tool of the landscape allows for recognition of the difference in scores a certain lecturer might have, but by comparing between lecturers which can almost be done at a glance.

Lecturer #	LEC 1	LEC 2	LEC 3	LEC 4	LEC 5	LEC 6
Age range	31-40	51-60	51-60	41-50	41-50	41-50
Gender	Female	Female	Male	Male	Female	Male
Campus	CBS	CBS	CBS	CBS	Kevin Street	Kevin Street
Current Academic Role	Lecturer	Senior Lecturer II	Lecturer	Lecturer	Senior Lecturer II	Lecturer
Years in current role	5	22	9	15	3	5
Years worked in academic position	7	25	20	20	19	5
Field	Biochemistry Medicinal	Pharmaceutical technology	Biochemistry	Inorganic Chemistry	Organic/ medicinal	Physical Chemistry

Reprint of Table 8: Summary of results Biographical Information [Question1-8] per lecturer.



Figure 4: The six landscapes of the participating lecturers, arranged based on assigned lecturer number starting in the top-left corner. The coloring of the landscape differentiates gender, orange for female, grey for male lecturers.

At first glance the differences in shape and size of the landscapes between lecturers are noticeable. The landscapes of lecturer 1 and lecturer 6 are quite small. In contrast the landscape of lecturer 2 is almost round looking and rather filled, meaning high overall scores. The only score of 10 is in the landscape of lecturer 3, at the category of *ADO*.



The landscapes are reoriented based on gender in Figure 5, age in Figure 6 and years in Academia in Figure 7. Some general trends observed based on these reorientations are listed in Table 14.

Figure 5: Landscapes reorganized based on gender starting top left corner. The coloring of the landscape differentiates gender, orange for female, grey for male lecturers.



Figure 6: Landscapes reorganized based on age starting top left corner. Printed are the scores for ADO per lecturer. The coloring of the landscape differentiates gender, orange for female, grey for male lecturers.



Figure 7: Landscapes reorganized based on years in academia starting top left corner. Printed are the scores for PR and DTU per landscape. The coloring of the landscape differentiates gender, orange for female, grey for male lecturers.

Table 14: General observations belonging to Figure 5, 6 and 7, where the lecturer landscapes are reoriented based on gender, age and years' experience in academia.

	Gender	Age	Years in Academia
GEN	There doesn't seem to be a clear dependence in scores based on gender that can be concluded from these six landscapes.	ADO score seems to increase with age. The two oldest lecturers also have the fullest landscapes. Meaning overall high scores.	PR seems to increase with more years in academia. DTU seems also to increase with more years in academia.

3.3. Interviews

The interviews were semi-structured and focussed on getting a more detailed description of themes that emerged from the questionnaire as well as the lecturers' experiences during the VLE change and the possible effect the change had on their teaching practice. Transcriptions of each lecturer can be found in Appendix 3, quotes used in the discussion can be traced by line number per interview.

Table 15 below contains the cut answers of each lecturer specific to experience during the VLE change, since this topic was solely discussed in the interviews.

Table 15: Quotes from interviews on the topics of the VLE change and their experience during the change and the resulting effect on the teaching practice per lecturer.

	Change to Brightspace	Effect on teaching practice
LEC 1	Ehm, to be honest, I didn't like Blackspace- Blackboard to begin with. I'd prefer Moodle.	I guess there's still- we still have a little bit of work to do, to eeh- to tidy some of them up. Ehm but yeah. Look, you know, with anything new, it takes a little bit of time to learn how to use it, but it's fine.
LEC 2	Extremely complex, very difficult. I had to rebuild all my modules. We've spent a lot more time trying to learn to use the tool that we would normally be able to do supporting the students and teaching the students. So, you know. Whether it's a valued advantage longer term not necessarily.	Oh absolutely, one-hundred percent, without the shadow of a doubt. The students know that we can't actually keep up with half the stuff. So, we don't have time to do any of the things that we would do because we're trying to actually, literally, get the material up and running for next week's class.
LEC 3	Well it's like everything else. Well it's different schemes, and-eeh bit of a steep learning curve. I was one of the pioneers of it. So, it's come in since September, but I've been using it since last January.	No, No. I think the difficulty with that was, there was a lot of confusion. Not just among staff but also among the- the, eeh, Teaching and Learning personnel, exactly what Brightspace was.
LEC 4	Ooeh. It actually hasn't been as bad as I probably had been expecting it to be. I may have had to do a little bit of tidying up and just making it look- But, most of the material has come across and is there.	Eeh It hasn't really affected it in any way. At the moment, I suppose, I-I early doors, I suppose, just setting it up, I suppose, that for a quiz or two, that took a little bit of time to get right. But, after that it was all okay.
LEC 5	I didn't have any huge issues. I think it was managed very well. I think there was a lot of communication about it. Eehm, and it was a very gradual process.	Mmm, no. Not really. I mean only in the respect that I had to figure out how to use the functionalities that I used on Webcourses, but no.
LEC 6	Haven't engaged with it much. Got the quiz up and running but haven't figured it all out yet outside of that, in terms of marking and Gradecenter.	Not really, only had to figure out the new version of the functionalities also used on Webcourses
GEN	LEC 2 seems to have the most difficult experience with the change. Most other lecturers experienced the change as normal or less disrupting as expected.	5/6 lecturers say that the change to BS has not affected their teaching practice

4. Discussion

Now we will proceed to discuss the results gathered during this project. The data obtained from the questionnaire and interview will be compared to the literature to come to possible conclusions to the research questions. Transcriptions of each lecturer can be found in Appendix 3, quotes used in the discussion can be traced by line number per interview.

Correlation between questionnaire and interview and literature per theme

Perception of Self

In the first section of the questionnaire, four questions were discussed all relating to how lecturers view themselves in different aspects of being an educator. An overview of the answers was listed in Table 9 and a more elaborate bar chart was included in Appendix 2, Figures A1-A3.

In **<u>question 11</u>**, the different teacher-educator roles of *Teacher, Scholar in teaching, Collaborator, Learner and Leader* are to be rated according to proficiency. It was found that the role *Teacher* is always scored highest by lecturers as can be seen in Figure A1. This correlates to the article the question was inspired by, as *Teacher* is found to be the most prominent facet of teacher-educator identity.

Klecka et al. conclude that teacher educators enact multi-faceted identities through their e-Portfolio use. the most prominent facet of identity was enacted as *teacher*, no matter the stage of the participants their professional career. This can be seen in the questionnaire answers as well, since the other facets have a greater variance per lecturer, this relates to the fact that each respondent has a different set of experiences as can be seen in the range of experience in academia, age and academic role. Also, one lecturer refers to the importance of individuality in how to teach students in their interview as: *'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.'* [LEC3, 185]

So, in conclusion, lecturers show a unique identity that shows as different portrayal of facets of teacher-educator roles where the major facet is always teacher first.

In **<u>question 12</u>** we explored another aspect of lecturer's professional identity, namely their perception of expertise in fields relating to teaching, as shown in Table 9 and Figure A2. *Subject matter expertise* scored the highest with 3/6 lecturers or it scored highest a lecturer would give. And notable is that *Pedagogical skills (method and practice of teaching)* is always scored higher or equal to *Didactic skills (Theory of teaching and learning)*. This last point was supported by question 10 in the questionnaire as well, an open question regarding influences and motivation for academic professional development. One lecturer stated that: *'Initially my major influences would have stemmed from my previous experience as a student which would could reasonably have been described as didactic in approach. After studying for my postgraduate diploma in teaching and learning, my approach to practice altered to take account of the literature.'* [LEC6, Q10]

The interviews also explored motivation to start teaching, where lecturers who had taken a teaching degree did also learn valuable lessons from sharing experiences with colleagues. One lecturer even commented: 'So, the best bit about our course was talking to others. And the different approaches they had for the different disciplines. So, you know, it was kind of the coffee break. 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, 97] Noting that in some occasions coffee breaks are even more valuable than pre-set modules.

Or another lecturer that did not take a teaching degree but learned mainly from teaching experience: 'My own teaching philosophy would've been developed from my own experience from teachers, good and bad, whether that was in secondary school of lecturing. And, the experience I would have got- The feedback I would have got from students to different things that I would have tried at the time.' [LEC4, 83] That teaching and learning what works with students is another dominant way of developing teaching skills.

All of this data points in the direction that *Subject matter expertise* is high as most lecturers come from higher education in the topic that they are teaching. Their confidence levels and ability in their subject seem to be high. The trend of higher pedagogical skills that didactic skills can be a direct product of the fact that the practice of teaching is much involved with learning from your own students what works so pedagogy will be encountered more in the practice resulting in no difference between lecturers with and without a teaching degree to show higher confidence in pedagogical skills than didactical skills.

Question 13: Based on Smiths work as discussed in Klecka et al. this section links to a classification made in a German article stating areas of personal achievement as valued by lecturers: *Sense of professional vision for personal career development, Level of instruction you give as a lecturer, Publications and Reflection on feedback received.* The goal was to see if lecturers would indicate a sense of achievement similar to other attributes which could then relate the feeling of achievement with confidence in one self in broader lines, helping to identify the different traits of personality related to different lecturers.

As a question by itself there is no clear trend in personal sense of achievement. For example, the indication of all lecturers that their achievement in *reflection* was significant could indicate that they all interpret reflection as something they are capable of and portray but also it could indicate that it is just not that important for these lecturers. Also, achievement in *Publication* fluctuates from *Novice* with LEC6, to *Expert* with LEC3. Which does relate to a more general trends that showed that LEC3 in a majority answers questions with higher confidence than LEC6, so just supporting a general trend found and no specific one for sensing achievement.

This question could be supported more if it was discussed specifically in the supporting interview and more relevant literature was used to quantify the fields of the teaching practice that lecturers find a sense of achievement nowadays and that research was expanded further.

<u>In question 14</u> respondents were asked to self-assess their adopter type with innovation based on a short description as described by Rogers. The description of the types used in the question can be found in Appendix 1.

Medlin studied self-assigned adopter types versus a-priori determined adopter types which already indicated that lecturers on average indicate themselves higher. In her study the group of respondents determined themselves always type two (late majority) or higher, although a statement related section which correlated to the description of the adopter types could categorize them as type one (traditional) for example. This proved the point that insecurity in an area can show with a form of denial. In this group of six lecturer all but two scored themselves as type three and as expected type one was not self-indicated. However, some interviews did show degrees in behaviour that could be categorized as type three, two and even one when discussing the likeliness to adopt new technology. Some lecturers stated they had used newer tools in the past but when discussing using them now, or in the future their statements could be described as traditional, not likely to want to try something new at all for reasons as, *I have already tried enough new tools to I rather wait an extended amount of time before I know something works*.

LEC3 however being the more confident respondent claimed himself to be type five adopter, innovative, and this was supported by his interview as he stated that he regularly used and tries new tools as he sees the benefits and then goes on to suggest it to other people.

So, several adopter types were included in this study, and as already proven self-assessment is not always accurate to the respondents' real nature when it comes to handling innovation. This can be remedied by developing a new way of performing a-priori determination. Self-awareness of a determined adopter type could be insightful for respondents who face innovation, or a surrounding with other adopter types.

Perceptions when using DLTs

In the second part of the questionnaire, heavy inspiration was taken from Alsadoon's thesis as mentioned before, focussing on statements regarding the themes: perceived usefulness, ease of use, risks and perceived pedagogical support by lecturers. An overview of the questionnaire data can be seen in Table 10 and supporting bar charts in Appendix 2, Figure A4-A7. A comparison with the findings from Alsadoon will be made, along with links to the interviews if they help to further explain answers form lecturers or themes found.

This section involves the factors relating to attitude that in turn influences behavioural intention as explained in the thesis of Alsadoon. The second influence comes from subjective norm as will be discussed later under question 25+26: colleague's influence.

Question 15+16: The first factor was perceived usefulness. The more extended representation of the data can be found also in Figure A4 in Appendix 2.

Comparing the data to Alsadoon's original work the data are similar where all respondents agree with all statements on average. What is striking is that two lecturers disagree with the statement *Using DLTs will improve my technical skills*. This was not further explored in the interviews but since the original statement comes from 2013, which is seven years ago, it might relate to the general development of technical skills nowadays.

Also remarkable is that LEC3 rates the perceived usefulness with a ten, the highest rating possible. This links to his interview where he elaborated that he uses DLTs in his teaching if possible. Alsadoon concluded that perceived usefulness coincides highly with the intention of lecturers to use DLTs in teaching, which agrees with the behaviour of LEC3.

Question 17+18: The next factor in attitude was determined as perceived ease of use of DLTs. An elaborated chart containing answers to the statements per lecturer are added in Figure A5 in Appendix 2.

Where perceived usefulness can be linked to intention to use DLTs, perceived ease of use can be linked to the actual use of DLTs by lecturers as claimed by Alsadoon. The statements used resonated with respondents well and all statements gained around 70% agreement percentage in Alsadoon except for *I need training on using DLTs* where 72% of respondents disagreed. When comparing that to the current data, all lecturers agreed with all statements, only LEC6 disagreed with the statement to need training. This result could be followed up by a larger group of respondents to see if more lecturers feels they could use training, although it might indicate that technical skills have developed in general as mentioned before.

Question 19+20: The third factor was perceived risks, see also Figure A6 in Appendix 2. This factor is linked to the safety and privacy of using digital tools and according to Alsadoon is one of the bigger issues in doing online assessment. In general, it is desirable to perceive less risks with online teaching. The general rating of this question resulted in an average score of 5, which is nice and low, although LEC 2 rated perceived risks with an eight out of ten

The statements related to areas of perceived risk in relation to using digital learning tools in teaching; *Misuse of peer students' contribution, Increase of workload and Difficulty in assessing students' learning.* The lecturers disagreed strongly with the first and last statement, which also showed in the work of Alsadoon. So, lecturers on average see less risk of students misusing peer contribution and possibly assistance in student assessment through online platforms.

The advantage of online assessment also came up in the interviews where LEC 4 states: 'But I definitely, with the first-year classes, what I find most beneficial is that online assessment and being able to get that quick feedback that they're getting it, they're not getting it. And that the student can get the same type of feedback themselves. [LEC4, 263]

There was a strong sense by two out of six lecturers that online teaching involves an increase in workload. This was also explored in the interviews, where when spoken about any possible development of online teaching was met with resistance since it would increase the workload for lecturers.

To the question if the lecturer could go back to not using a VLE anymore they responded they could go back to not using it, but possibly it would make their life more difficult to not use a VLE anymore. 'I definitely have an awareness that if I would explore it more, it probably would lead to eehm, a reduction of my workload eventually. But the sort of, the activation energy to reach that stage eehm, I just haven't reached it yet. Because, you know, I just don't have the time. [LEC6, 121] LEC6 actually also refers to the reduction of workload when optimally using and or learning how to use a digital learning tool.

So, in general perceived risks of online teaching are perceived as low on average, factors as misuse of a peers' contribution is perceived low and it even helps assessment of students learning. Only downside is that there is still a strong increase in a lecturers' workload.

Question 21+22: The last factor related to attitude is perceived pedagogical support, the support felt by use of DLTs and how they can make teaching easier. According to Alsadoon perceived pedagogical support is linked to developing teaching more towards letting students construct their learning and for a lecturer to facilitate diverse learning methods that aid the growth of the diverse groups of students they teach. However, these tools need to be seen as innovation to existing tools or practices before lecturers tend to use them.

Respondents in Alsadoon's study agreed strongly with all three statements, with a $\pm 80\%$ agreement percentage among respondents. When comparing this to the data found in the questionnaire it can be seen that four out of six lecturers agree with the first two statements, see in Figure A7 of Appendix 2. Also, the average rating of perceived pedagogical support was seven out of ten.

The only statement that got a neutral response was Allow students to create the content of their *learning*. This can be interpreted as the sense that a lecturer is still creating the content of learning in most cases during teaching, but one lecturer commented on his teaching style like: 'I would see myself as- very much now as a facilitator. And that's difficult at times, because I don't just present students

with the information. I present them with the breadcrumb-trail to the information. Eehm, 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, 147] This lecturer does allow for students to follow their own discovery of the material but still creates the content of learning himself.

So perceived pedagogical support of DLTs can be concluded to be present, however on the basis of content creation of students' learning lecturers are still somewhat in control.

Digital Learning Tool use

The third section of the questionnaire focused on the actual use of digital learning tools. This data can be analysed based on the lecturer or general use of the tools. Both will be correlated with the interviews and relevant literature here.

Question 23: DLT use

- Tools used

A summary of the data can be found in Table 11, and a supporting bar chart of the average tool use over all lecturers can be found in Appendix 2, Figure A8.

Lowest use is for *Smart board, social bookmarking, online games, personal website* and *Peerwise,* all with a score of 1,5, meaning between never and rarely used. Highest score is for *learning modules* at a score of 3,5, meaning in the middle of often and very frequently used. Followed by *quizzes* (3,2), *assignment dropbox* (3) and *Gradecenter* and *videos* at 2,8.

Direct comparison to Boylan is difficult because of different pool of respondents; namely 200 lecturers and different shape of question; question focusing on use of tools with *yes, no* and *not aware* answeroptions. Ultimately giving a percentage of tool usage among respondents and a sense for the general awareness of the existence of these tools. Our study uses a 4 point scale style question focussing on the frequency of use of digital learning tools, although the tools chosen were strongly inspired by Boylan et al.

When converting the average scores over all the lecturers to a percentage by dividing all scores by the maximum score of four, the percentage can be roughly compared to the percentage respondents that used a certain tool from Boylan. All tools show an increase in use, except for *announcements*. This could be of course by how the percentages are calculated to match the study of Boylan, but what is certainly notable that thirteen tools increase the 'use-percentage' with over 40%. That must mean that lecturers are more aware of these tools nowadays and on average interact with them more. The tools that show a strong increase are: *messaging Tool, Discussion Board, Assignment Dropbox, Quizzes, Screencasts, Private journal/blogs, ePortfolios, Wikis, Webinars, MOOCs, Ebooks, Skype, Twitter* and *Mobile Apps*. This could be attributed to a development of these tools and general internet use in the last seven years.

- Per lecturer

Table 11 gives a summary overview of the tool use per lecturer. More detailed bar charts of digital tool use per lecturer of Digital Learning Tools can be found in Appendix 2 in Figures A9-A14.

The highest scores are from LEC2 and LEC3. When looking at their individual charts in the appendix it can be seen that they both score all tools either two or above, meaning they are familiar with all tools. LEC2 states to use seven tools very frequently, while LEC3 states to use nine tools very frequently, among which 3 of the same tools were listed. Namely *Messaging Tool, Assignment Dropbox* and *Ebooks.* Their scores are the same since LEC2 list more tools with a score of three, *used often*. We already established earlier that LEC3 is an innovative user of new tools and LEC2 has had a longer academic career to be experienced with more tools.

The lowest score is by LEC6. When looking at their chart in the appendix, it can be seen that twentytwo out of twenty-nine tools are stated to be used never. Only four tools are stated to be used often: *Learning modules, Gradecenter, Quizzes* and *Slideshare.* LEC6 was quoted before as understanding the value of online learning tools, but lacking enough time to engage with it more.

Question 24: barriers

Table 11, shows main barriers as described by lecturers in the questionnaire. *Listing items as Time constraint, Support, IT facilities* and *lack of connectivity.* Time constraint is mentioned by three out of six lecturers and can be seen as a more significant barrier. This is explained by lecturers in the sense that they need more time to experiment, or more time in a day next to an already heavy workload, or needing more time in the shape of shortcuts to teach you to efficiently use tools.

These barriers are supported by findings in literature as discussed before for example by Sutton et al. the responsibility, often lies on individual educators to teach themselves about using and applying new methods in their teaching; The lack of available support and professional development for these activities; The time required to innovate, and finally; the little financial return for time and effort spent on innovation are all trends that are still found to be present. Also, Alsadoon states: lack of motivation, time to learn, ethical or technical preventions as commonly found barriers for lecturers to engage more with digital learning tools.

The same lecturers also elaborate on the specific need for time. 'There is something of a time quantum of time required to get it up and running. You know, to set up rubrics and-and to do everything that needs to be done. And I know from colleagues' experience that it is a large time commitment to do that. And I just don't have the time at the moment. So, I'm sort of catch twenty-two.' [LEC6, 131] Apparently this lecturer also got negative intel from colleagues.

Another lecturer that did not experience time as the biggest barrier, phrased it as: '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, 162]

It can be concluded that barriers to online teaching are similar to previous work and haven't changed in nature. There still seems to be a very individual experience of these barriers, as seen by how the need for time can be explained in different ways.

Environment

The final section of the questionnaire focused on the social surroundings of the lecturers. This can also be evaluated focusing on either the lecturer or on the social factors themselves. Trends will be compared to relevant literature and support will be found in the interviews. A short overview of the findings in this section can be found in Table 12.

<u>Question 25+26</u>: As discussed in the second section, according to Alsadoon, behavioural decisions can be influenced by attitude and by subjective norm. We have discussed factors containing factors of attitude already and now the influence of colleagues will be discussed.

The four statements used look into if colleagues are currently using DLTs and are skilled working with them, if they expect you as a lecturer to also use them and if colleagues think DLT-use in your classroom would be useful. The responses can also be seen in more detail in Figure A15 in Appendix 2. All statements are fully agreed with for five out of six lecturers, only LEC3 disagreed with all statements. Furthermore, four out of six lecturers disagreed with the statement *Colleagues expect me to use DLTs in my classroom*. Alsadoon found strong agreement with the first and last statement as well however their respondents disagreed with the statement that colleagues are skilled in using DLTs with 60%. Also, their respondents did agree with 59% that colleagues expected the respondents to use DLTs in their classroom.

When LEC 3 was asked why he strongly agreed with the principle of colleagues' influence in the rating of ten, yet disagreed with all statements, he elaborated that the influence of colleagues focuses more on when he would adopt new technologies, but convincing lecturers to use new tools is rather difficult. 'That means, your stuggling to-to adopt a new technology and so, and you do that, but it's not used by- by your own colleagues. They don't have to use it. It'-it's just an advantage for them if they do that. 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, 451]

LEC1 says that recommendation of a colleague is still a strong indication whether a new technology is worth using. '*Cause -well, at least for me. I am more likely to try something if it's worked for somebody else. And that- you know, I would try that first, before I try something else. So, the conversations with colleagues definitely.*' [LEC1, 231]

In general colleagues can be instrumental in providing surroundings that motivate other lecturers to start innovating, however colleagues have to be willing to try and interact.

Question 27: Social surroundings:

Another part of influence could be more informal, family and friends for example, or more university based as formal recognition of a reward system. This question explored these social surroundings of the lecturers. The data will be analysed based on the social factors and per lecturer.

- Per social factor

Figure A16 in Appendix 2 shows a bar chart involving the average rating for all the social factors included. Highest factors ranked were: *Interest in student learning, physical resources, interest in technology, interest in teaching*. Lowest factors: peer pressure, formal recognition institutional reward system.

As based on research on barriers for lecturers to engage in new technologies, formal recognition for time spent and a reward system of some kind were viewed as valuable. However, this data shows that this pool of lecturers values the personal interest factors higher together with physical resources.

When comparing this to the results Medlin found there is agreement that the personal interest factors were all three together important motivations to engage with digital learning tools for lecturers. Medlin found that in the category of organizational factors, the physical resources were the most

influential, as was found in this study too with a score of 3 out of 4 averaged over all lecturers. In the more social area Medlin found that the students is the most influential factor next to *Friends, Shared values in the department* and *Peer support.*

The value of students was also found in the interviews. This was already noticed during the exploration of teaching philosophy and motivation to start teaching but also on the topic of what the drive behind an increase of online teaching could be, students are named the most. '*It's not become necessary for my teaching. But it has become necessary in terms of the students. And how they, how they learn. And how they approach the subjects and so on. They need the technology. They need that presentation.'* [LEC3, 84]

Intuitively it is surprising that a *reward system* or *formal recognition* are not valued higher. However, when looking at the motivational factors found, it can be said that having lecturers driven by their personal interest and/or the needs of their students this is more valuable than forcing innovation with promises of financial reward.

- Per lecturer

Comparing the average use of tools to the use per lecturer gives insight in how different people are influenced by different factors. However, it should be noted here that interpretation of the factors might be affected by availability. It was noted for example that there is no reward system present at TU Dublin. This can therefore result in some lecturers who would not rate this as influencing them, although other might indicate that if a reward system was put in place it would help.

The separate bar charts for social surrounding rating per lecturer can be seen in Figure A17-A22 in Appendix 2. What is striking that the range and the influence of some social factors differ per lecturer. Highest score is obtained by LEC5 and lowest score is obtained by LEC6, which is to be interpreted roughly as a measure of influence by social surroundings positive or negative. LEC5 scores three statements with *Very important*, namely: *Mentors*, *Physical Resources* and *Personal interest in students learning*. Only one statement is scored as *Not important* that is *Institutional reward system*. This resembles the data found by Medlin.

LEC6 on the other hand is not highly influenced by social surroundings and stated eight out of thirteen statements as not important. The only statement to be rated as important is *Shared values by department*. Next to that, *Students, personal interest in teaching and -in students learning* and *Mandate by the university* are rated as somewhat important. This lecturer finds shared values in the department the most important and is not interested personally in technology and is not as much influenced by physical resources as found on average.

Also notable are the charts corresponding to LEC1 and LEC2, as they score all factors in the mid-section, meaning either *somewhat important* or *important*, but not lower or higher. Although LEC1 is a bit more influenced by social factors, both agree that organizational factors such as *formal recognition* and *mandate from the university* are less important than *physical resources, students* and *personal interest in teaching*.

Lecturer identities, landscape, and all data per lecturer

Another way of looking at the data focuses completely on lecturer identity. With the use of the landscapes that were produced from the questionnaire data and the more in-depth insights gained in the interviews, the effect of lecturer identity on the use of VLE and DLTs and the experience during a VLE change will be discussed.

As discussed in the results section the landscapes made form the data of the questionnaire serve as a visual aid in determining lecturer identity. Some trends were observed based on several biographical factors as age and years of experience in academia. Self-assessed adopter type of innovation seems to increase with age group and increasing years of academic experience seems to influence both perceived risks and more frequent use of digital tools. Although on the contrary gender does not seem to have a trend based on the questionnaire scores, although reported in literature is that gender could influence confidence with claiming achievement and confidence in ability, where men are usually more outspoken about their achievement and accomplishments.

This underlying factor of confidence in ability in general is harder to quantify by this questionnaire. It was noticed that the biographical information discussed could attribute to an individual's likeliness to self-assess certain abilities like quality in teaching or personal achievement, but without complete certainty. A fuller landscape might indicate more ability or more confidence in ability or just more exposure to the fields explored in the questions.

For example, the increase use of digital learning tools with years of academic experience might correlate to more time that was available to use different tools. But it might just be correlated to interest in digital learning tools and teaching as well, and that could have cultivated more over the years. Someone with a short career in academia so far probably hasn't tried every tool there is out there yet, since teaching is a learning process of itself and using tools might be a more advanced level, or by being exposed to good practice early-on by a teaching degree for example, might lead more recently trained teachers to only use a handful of tools, making the score to this question lower too.

Differences in answering was also supported by the interviews where one lecturer with a shorter experience in academia stated that: 'I did a group-project around blended learning, you know. I'm just kind of catching up with it really, I suppose. It's a useful thing. And I think students, you know, from feedback they give me, they enjoy engaging with it. I just don't have the time now to do that with them.' [LEC6, 353] This lecturer clearly has had experience with working with a digital learning tool and saw a benefit in it from student engagement, but is not currently using it due to time issues.

Whereas a lecturer with more experience in academia stated: 'I mean we did try wikis, and we did try all these things, but it's just.. To be honest, the information we're trying to give them sometimes gets lost in the technology. -But I have gone through all of the various different Blackboard technologies when they used to use Echo360, and then we used- 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, 134&174]

Here the lecturer clearly indicates that also the longer exposure time to the system has discouraged them to try new tools, since there have been so many. This lecturer has tried a lot of them over the years which gives a higher score in use of digital learning tools, but there is not more engagement with them now and even resistance to learning about new tools.

And another remarkable thing about LEC2 was that she made comment in the questionnaire, section environment: '*The lecturers voice is not always listened to.*' Which gives an indication of this lecturer's disposition towards the institution with some regards to innovation and/or the effect of social factors on the adoption of new tools in learning.

VLE change experience

Edited answers from each lecturer are displayed in Table 15 for reference and transcriptions of the whole interviews can be found in Appendix 3.

LEC2 had a negative experience during the change to Brightspace: '*Extremely complex, very difficult. I had to rebuild all my modules.*' LEC3, LEC4 and LEC5 all respond positively, stating that it either was not as bad as expected or that it was less adjustment than expected. LEC6 claims to not have engaged with it much up until now and LEC1 didn't like Brightspace to begin with and would prefer Moodle.

To the question of the effect of the change on teaching practice only LEC2 answers strongly that it's had effect. LEC2 elaborates: 'Oh absolutely, one-hundred percent, without the shadow of a doubt. The students know that we can't actually keep up with half the stuff.' The five other lecturers state that the change hasn't affected their teaching practice really. LEC5 explains it as: 'Mmm, no. Not really. I mean only in the respect that I had to figure out how to use the functionalities that I used on Webcourses, but no.'

It can be said that on average the lecturers did not experience huge changes. LEC2 seems to have the most intense experience. Also discovered in the interviews about LEC2 was that she only teaches online, meaning probably that the effect of a VLE change for her would be bigger than lecturers also seeing their students in class.

Two lecturers note that the change required them only to learn what they were using before on the old platform, this links well to the change-blindness described by Sutton as discussed in the introduction. Often with innovation it was found to behave more like replacement rather than change in practice.

The goal of the questionnaire was to get a look into the personality the lecturers portray on different facets of their teaching practices and training to where they are now. This insight into their personality could then inform their experience of the VLE change and it can certainly be said it has. A statement as LEC6 saying he hasn't engaged much with the new VLE and doesn't see much change in his teaching practice is now backed-up by knowledge obtained by the questionnaire that he indeed uses less digital learning tools on an average basis and one of his main influences for motivation to innovate comes from shared values within the department. Or LEC2 for example, one of the most experienced lecturers as can be seen in the lecturer landscapes and the second section in the questionnaire about the perception of self. Her tool usage was found to be the highest and one of the barriers listed was support. The statement she makes about the VLE change that she had to rebuild all of her modules and had a difficult time getting courses up and running reflects this.

5. Conclusion

Suggestions will now be made in order to answer the research questions.

What is the general perception of current chemistry lecturers at TU Dublin on using the VLE and Digital learning tools in education?

Perception of self shows a high significance of individuality in lecturers. Although their main teacher educator facet is clearly teacher, their personal attributes and how they shape their levels of expertise can be correlated to their unique experiences while teaching. Sense of achievement is hard to quantify exactly, but a clear perception of engaging as early majority innovation adopters is present. Selfassessment of qualities is bound to be conflicted with self-image or desired self-image as is psychological in nature.

Perceptions when using DLTs based on Alsadoon concluded that the general development of technical skills nowadays has resulted in a higher perception of usefulness and general ease of use of DLTs. When looking at perceived risks they are low on average but the fear of a strong increase in workload is still present among the lecturers and was also supported in the interviews. DLTs do serve a support on a pedagogic level, in the sense that tools facilitate a diverse way of learning for students. However the students could be given an more collaborative role in content creation when learning.

Digital learning tool use has increased in frequency and in number of tools since previous study was done, most likely due to the development of use of online tools in teaching over the last seven years. LEC3 and LEC2 supported traits discovered based on having a more innovative mindset and having a longer academic career respectively. Where LEC6 was found to engage with less tools as could be explained by the lack of time available in his work schedule. Time constraint was also found as the main barrier to engaging more with DLTs for more lecturers and have been found before in literature. The specific origin for time-constraint however differs per lecturer.

Social surroundings are still influential when adopting new technology. Although it might be frustrating for some that new innovations they make in their teaching does not motivate other lecturers to use it straight away, the word of a colleague is still worth a lot when it comes to deciding what to use next if a lecturer is open to it. When it comes to motivational factors it is intuitively surprising that a reward system or formal recognition by the university are not rated as highly influential. Although supported by literature as well, lecturer state that students and personal interest in teaching and the learning of students drives them most, as intuitively as good teacher would. LEC6 defends his position that as a newer and less experienced lecturer, shared values in the department can be a highly motivational influence, and less so physical resources as others claim. Also, ambivalence is found in some lecturers, but the general trend still points to higher social influence by students and higher personal interest on different aspects of teaching than are the organizational factors of reward systems.

Does the construct of having a questionnaire and a visual form of that help broader trends from the questionnaire data?

The landscape served as the visual aid to make bigger connections in the questionnaire data based on the biographical data of the lecturers. Self-assessed adopter type of innovation seems to increase with age group and increasing years of academic experience seems to influence both perceived risks and more frequent use of digital tools. An explanation of these trends remains to be concluded as it was noted that underlying factor of confidence in ability based on age and gender and experience is hard

to quantify. Some lecturers were found to be more confident in general, also supported by the interviews. But the more confident lecturers expressed being alone in their innovativeness and the more insecure lecturers perceived pressure from peers to improve but also time constraints to do so. The landscapes helped to uncover categories of lecturers in one useful glance with minor training, which helped to shed light on linking trends found per question to the whole pool of respondents. This process would be interesting to try on a larger scale to test its usefulness further.

How do chemistry lecturers at TU Dublin describe their experience through a VLE change and how does it affect their teaching practice?

The goal of the questionnaire was to get a look into the personality the lecturers portray on different facets of their teaching practices and training to where they are now. This insight into their personality could then inform their experience of the VLE change and it can certainly be said it has.

Two lecturers were described with a triangulation of all data used and their experience can be largely supported by data found in the questionnaire and landscape. On average the VLE change was experienced as positive by a majority of lecturers and the effect to teaching practice has been minimal. It has to be noted that the new VLE at this stage can be seen rather as a replacement of the old VLE and no innovation has taken place yet.

Does triangulation of an interview, a visual form and interviews give more coherent data to formulate conclusions on how chemistry lecturers at TU Dublin experienced a VLE change?

Parallels about the experience during the VLE change can be drawn for all lecturers involved in this study and the triangulation of a questionnaire to get certain attributes and facts together with a visual representation in the lecturer landscapes, then followed by interviews serves the purpose of getting to know the pool of respondents via data only. It allows for the description of the VLE change to be put into context with data known about each lecturer. For example about their average digital tool use or if they see innovation as a solitary or group effort and the perceptions about digital tool use gives us a sense how they view online teaching in a broader sense and the perception of self can give a hint about the confidence they hold in their own ability.

The moment of data-analysis is done after the interviews are completed and by going through the transcripts and matching the quotes with the questionnaire data, which gives the sense of protection from subjectively reading into data by knowing the respondent and it allows for seeing how all the data about one lecturer can fit together.

6. Future recommendations

In the process of data analysis some thoughts came to mind on how situations might be improved in the future. This goes for both lecturers experiencing innovation, as the support staff or managing staff involved in designing innovation and or managing the lecturers going through it.

Disclaimer: I am in no means a staff member or a lecturer and I have great respect for all people involved in the goings-about of running a university. I am making suggestions and recommendations based on my own experience looking at the change happening at TU Dublin and talking with some of its' lecturers. I hope these insights can help some people involved with looking at the situation from the outside like I did for four months and possibly it could help with their day-to-day experiences as innovation and managing staff during innovation is a thing of the pas, present and future.

For support/managing staff

For lecturers

1	Lecturers need to be treated as individuals	Evaluation of the core values of tools used
	as much as one body of staff	Innovation should not be enforced on
	Innovations for the majority of a	lecturers who function good with the latest
	department or university are sure to be	form of the technology. Going back to core
	appartment of university are sure to be	values is great when mastered well, and
	lasturer paede en ennertunitu te encel	lasturers should metivate the mashues to
	the invested and the heavest Alass whet the	lecturers should motivate themselves to
	their mind and to be heard. Also, what the	become an expert in core values as
	change is going to mean for each member	delivery of material, student engagement
	of staff needs to be explored further,	and tracking student progress for example
	focusing on how the innovation is going to	before taking this to the next level. Funnily
	affect them but for sure also any need the	enough technology can help you master
	lecturer might have that the change can	this although it might take time to learn
	possibly facilitate. With infinite time and a	how to use the technology.
	free mind, one can think of things to	
	innovate, so how about with the help of	
	the existing platform?	
2.	More one-on-one support for learning	Involve students in the learning process
	tools is needed	Students are still one of the most
	Discovering what a new tool or platform	significant motivations to innovate as
	can do on a large scale is good to iron out	found by the majority of lecturers. This
	initial bumps, but real value comes from	could also indicate that there are needs of
	assessing the individual cases. Many	students that can be answered by
	lecturers expressed feeling of needing	lecturers. Learning is a fluid process and
	support beyond the initial start-up as well	can take many shapes, also the
	as help with very specific problems. A	involvement of a teacher is different
	diverse teaching style needs to be	student to student. So as to how every
	encouraged and so does a diverse online	lecturer will approach online teaching
	teaching style largely involving a diverse	differently, so will every student benefit
	use of the platform. For example, were the	from it differently. Asking them for
	staff consulted that underwent initial trials	suggestions on how to tackle cortain issues
	with the new platform or wore the large	with an assignment or online delivery
	with the new platform of were the large-	might give insights as to what students
	scale training sessions on the new platform	might give insights as to what students
2	run by outside support?	expect nowadays.
5.	chored when asked for	Ask for help when heeded
	Among locturers there are few who	hut during the interviews it comptimes folt
	innovato individually, but this innovation	as if a frach face and a genuine substine as
	innovate individually, but this innovation	as if a fresh face and a genuine question as
	only spreads when other lecturers are	to what barriers where experienced
	open to receive help. Effect of sharing one-	opened up a topic that had been left aside
	on-one, or local experts could come into	for a while. Talking about needs with more
	play more often, where certain lecturers	lecturers than the ones familiar with might
	can be helped just as easily by other	lead to more specific help or recognition
	lecturers rather than support staff, or this	for your problem. And this also included
	link can be facilitated by support staff.	not complaining about your problem and
	When staff is unwilling or less open to	finding company for that, since it
	change there must be an underlying reason	discourages others to explore by
	for it that needs solving first.	themselves. However well-founded shared
		problems can be brought to attention of
		managing staff more easily.

4.	Time investment should be valued or explored further Invention of a time-turner from Harry Potter could be attempted to give lecturers more time. But certainly, the origin of the time constraint per lecturer needs to be explored. This could then be remedied more to the need of the specific lecturer. A managing staff member could aid with questions about time management. Also one-on-one sharing of experiences between lecturers or the reduction of repetitive tasks could be attempted, possibly by technology?	Time investment should be taken as constant rather than blocks While an event as a VLE change might have a sudden new for adaption, time investment in learning new technologies should ideally be done over time and with a sense of interest or a goal why it's being done. Easier said than done there is much to learn about time investment. Especially from more experienced lecturers or lecturers who don't seem as bothered with time constraint or an opposite one as the one you're concerned with.
5.	Separate sales-pitch and goals for lecturing staff	Lecturers should feel energised by change During the project it felt sometimes as if
	I have found during the interviews that the conception of what the VLE or new tools should be able to perform and aid with as told in the sales pitch sketches an unrealistic perception of what lecturers should be able to achieve with it. Certainly the initial goals for innovation create a successful change to a new platform by all lecturers, to establish a new-normal as it were. After which this new normal can be optimized and possibly be developed in a unique way by each lecturer as their modules or their students require it. The development of lecturers as they discover possibilities might not align with promised	some lecturers would rather have some stability for a moment and catch a breath, while other were secured enough to sail the wave of change and innovation. I think accepting change as a constant variable like time will help to change views on what to expect and it might help empower some lecturers instead of make them feel like they are behind or not grasping the change. Stepping in somewhere and going from there, no starting level is the same, but rather it's the constant change that is the same for everyone.
	outcomes as in the sales-pitch but is that the measuring bar?	

Covid-19

The writing of this report was started before the Covid-19 pandemic forced lecturing staff world-wide to teach online full-time as it was the safest way to conduct education. When completing this report, a very large majority of staff have just experienced a full change into online teaching, with no real-life contact with students forcing all communication and even exams to be conducted online. I want to commend all lecturers for stepping into this and continuing their profession in these testing times, while also needing to quickly learn and develop new ways of transferring the knowledge they have to students and finding ways to change all normal encounters with the university and students to an online environment.

In a way this satisfies the ultimate goal online teaching is encouraged by managing staff or by creators, its ability to adjust and be flexible and so-to-say be capable of even more than real-life teaching could be. This is put to the test on a global scale and with a turn-over that consisted of only a couple of days. It would be interesting to in future study the long term effects that this experience of fully-online teaching has made to lecturing staff and if they see online teaching different now as they did before

the Covid pandemic. I am glad my study is conserving a period before the pandemic and who knows if I can ever follow-up on how my six lecturers and their teaching practices have changed now and if they have a different view towards online teaching now?

7. Critical notes

In conclusion this multiple-case-study approach to VLE and DLT use and the experience of a VLE change was a complex project. Taking four months for an unexperienced student is a short period of time to gain real depth. In the end some design flaws can be seen in the structure of the research and therefore making data-analysis a little more complicated. Some limitations to the study are explored here.

7.1. Pool of respondents

The pool of interest was chemistry educators working at TU Dublin. This included the school of chemistry (around 25 educators) and the school of food science at City campus (around 30 educators) and the school of chemistry at Tallaght campus (around 10 educators). This resulted in a total pool of 65 possible respondents.

The choice of Google Forms resulted in the exclusion of the Tallaght educators, due to restricted access without a Gmail account. The questionnaire plus request for an interview was distributed through the assistant heads of school of the two remaining schools. When the time window required more responses, it was decided to contact some educators directly with a request for an interview, accompanied by the link to the questionnaire as preparation for the interview. This process resulted in six responses accompanied by six interviews.

It can be argued that this group of respondents was more hand-picked, and may not be representative for the whole pool of chemistry educators at TU Dublin. However, the group that is discussed in this study does show gender-balance in the sense that there is a 50%:50% response rate female to male. Also, when looking at the variation in age and academic experience it can be seen that several age groups are represented with a difference of academic experience, also reflected in the several academic roles held by this group. Ages from 31-40 up until 51-60 are found and 2 different academic roles are seen namely four *lecturers* accompanied by two *Senior Lecturer II*. The two Senior lecturers help correlation to their academic role by having at least two people in this role and prevent singular data to this role this way. Also, there is a spread in years in academia, going from five years up to twenty-five years. A larger group of respondents would have been preferable to conclude trends in general, but the range in academic experience, age and the gender balance makes that the group of respondents of six, can give an account for the pool of interest of chemistry educators at TU Dublin.

7.2. Bias

This research project was performed by one researcher making personal bias a prominent part for consideration. Bias towards the university was already minimised as the study was performed in Dublin, Ireland at TU Dublin, a new university where the researcher had not spent time or studied prior to this project. Meaning also that all respondents, university staff and supervisors where all unfamiliar before the start of this project therefore not enforcing any bias of prior engagements with lecturers during modules or awareness of certain opinions and/or reputation within the university. When interviews were performed, in most cases this was the first contact with a certain lecturer outside of contact via e-mail. Only two lecturers aided in informal conversations in the beginning of the project to, in one instance, help shape a sense of the identity of the school of chemistry in the city campus

and, at a second instance, a discussion regarding possible lab-assistant duties, which are both not to be regarded as influencing the study to a high extent.

All data was handled anonymously, the questionnaires were numbered and the interviews were numbered based on the order they were performed in. Making sure that processing of the interview data and questionnaire data was not cross-influenced at this stage. A conversion table was made separately so that all data could be listed using the same indicator for each lecturer, allowing for correlation at the data-analysis stage although still anonymous. It has to be said that when performing interviews as the principal researcher, some anonymity is lost in the processing as recognition of the conversation will remind you of the person being interviewed. However, since all respondents were newly acquainted with the researcher this effect is not regarded as too influential.

At every step of the process, all respondents were fully informed about the goal of the research and participation was voluntary as stipulated by the ethical requirements. All respondents signed an ethical consent form with participation of the interview, and approval was also required with a full list of consent questions prior to filling out the questionnaire, and use in the study was approved by a digital signature from respondents.

8. Ethical Approval

Prior to the start of the project at TU Dublin, the project was submitted for ethical approval by the broad of ethics at TU Dublin. This process involved an extensive form including a full description of the planned study, detailed description of the target respondents, research methods and handling of the data. Consent forms were approved of use to include in the questionnaire and interview process to ensure fully informed and voluntary sign up of all respondents. The prime responsibility was held by the first supervisor prof. Christine O'Connor, to ensure full supervision during the project of all ethical responsibilities promised to the board.

All questions from the board of ethics have been answered and an informal go ahead was given to proceed with the project as was done so. The study is still pending official ethical approval to this date.

9. Personal experiences

9.1. Switching to social sciences

A literature search, a research question, a questionnaire, a design for landscapes, interviews and report writing was completed to yield data that can possibly conclude something and a lot happened in between.

The study set out as a piece on the experience of lecturers in a VLE change. This was going to be a phenomenological study and I derived the research questions from an example of phenomenology questions. I was going to try and leave human experience as complex as it is and make notes on the event and try and say something about how that experience was and how to deal with it or at least how to see it when an institution as a university changes something for such a pool people as their lecturers.

That changed a bit when people proofed to be all complex and different from each other: How could I then say anything about them? I needed to know how to quantify them, and to be fair, learning about lecturers and universities and social science at the same time. I went out and read about all these

aspects of professional identity, innovation research, digital learning tools in higher education etc. I arrived at some studies that categorised aspects of professional identity into measurable statements or facets that I could use to maybe create categories of teachers or persona's, or like a label. So, the idea emerged that before I would go and do interviews I would send them a questionnaire to get a feel for the lecturers' identities: Who were they, what experiences did they have, how did they identify with all those facets and aspects that I found.

Being used to work with numbers, questions on scales was more insightful for me and I could generate question scores and overall scores relative to total scores. Numbers just mean more to me than words. So, I did what any natural scientist probably has a tendency too with numbers, I made a graph. Instead of creating personas, which also isn't the easiest thing to create, with validity and statistics and testing of your categorizing system, I ended up creating a visual representation of the lecturers' scores on the questionnaire which I called the lecturer landscape. A multi-axial, one scale, interpretation of different types of questions in the questionnaire, that allows for a one glance comparison of a lecturers' identity following all those aspects and facets that I found in literature.

Following the great roll-out to the university's chemistry departments, I imagined having loads of questionnaires to analyse and hopefully finding trends in lecturer identity that could have me select some interesting people based on their landscapes. I could make a purposeful selection and interview those interesting lecturers, based on the fact that they might use a lot of DLTs or have a very low score on adopter type, it could be anything to have a full spread of lecturer types.

I only ended up with six replies, so these replies became my trusted six lecturers who I actually came to cherish now. In all honesty without looking to the interview quotes, I don't know who is who, I mean the quotes just give it away because I basically memorise all interviews from the whole transcription process. But these 6 lecturers became my data pool. They had the extremes and trends that I was going to find and they were going to teach me so much on how to analyse every bit of data and how to look at social type data and how to draw conclusions. I take the lecturers as whole, I compare them, I question them, I believe them, I protect them because I care too much, or I am too blunt about their scores, all the emotions.

And now we are here. All the data is on paper and I don't know the story yet. Is lecturer 1 really not scoring that high or is it just because he/she is very talented but just modest with answering questions? Is there really a correlation between age and adopter type or is that just my six-sample bias? Do the landscapes really tell me something other than that they look pretty and there seems to a difference between them? Can you apply them to other fields of study? Could I repeat this study with for example 100s of participants with this method? Do the interviews and the landscapes really correlate, or are spoken interviews, with a loose interview structure just too difficult to analyse because I did not have enough experience? Basically, just giving me a nice experience but only a couple of nice conversations on paper without any real conclusions? Will this study still make it out to an article even though the design flaws since it was my first time designing a social study? I hope so...

At least I liked the experience. The writing bit at the end was a real struggle and I cannot recommend switching supervisor just for the writing part. My supervisors tried their best to be there for me, I was just lost on what to do, but that also taught me a lot.

Every step in this project was one where I learnt a lot, every step was new in a way. I knew what doing research was, I just had hardly any background in this field. Doing new types of research in the right

way for the first time was challenging, but I definitely felt so powerful after every step, and I felt so valued in what I was learning and what I managed to achieve, I will never forget that. I am happy that this paper is almost done and I am curious about the feedback.

9.2. Networking Opportunities

While in Dublin, I got the opportunity to attend Methods of Research for Science Education (MORSE). This one MORSE is a one-day conference that provides useful and usable information to those working in education about the processes of 'doing' educational research. The audience typically comprises teaching focused academics with an interest in educational research and research informed teaching, postgraduate students, and teachers (including those doing postgraduate degrees). The day itself features talks and workshops from several experienced science education researchers, who, in workshop/discussion style, cover various aspects of 'doing' science education research.

At this conference I got to meet and network with a number of significant staff members and experienced people in the field of Science Education. Among who was also Prof. Michael Seery, professor in Chemistry Education and Director of Teaching at the School of Chemistry at the University of Edinburgh. And editor of Chemistry Education Research and Practice.^{xxii}

Also, I got the opportunity to meet Prof. Tina L. Overton from the University of Leeds. She currently is Director of the Leeds Institute of teaching Excellence, previously she has worked as Professor of Chemistry Education at the University of Hull, and Monash University in Melbourne, Australia.^{xxiii}

10. Acknowledgements

I want to thank everyone involved, I learned so much and I hope I can be of use in this field in the future. I will take the experiences with me though wherever I may go after my Masters.

To Christine and Barry, My Dublin supervisors. Thank you for always believing in me and being so open to host me for a research project. Thanks for providing me with weekly guidance during the project and giving me valuable feedback.

To martin who helped me finish this report. Thanks for you feedback and guidance during the last couple of months.

To all my Erasmus friends who made my exchange project an unforgettable experience.

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