The impact of Covid-19 related technological changes in work characteristics on university teachers' engagement in work-related reflection

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Abstract

Covid-19 has had a significant effect on many areas of education world-wide by causing the need for an increased amount of technology to be integrated into the teaching environment. These technological changes are likely to stay an integral aspect of teaching in the future. Therefore, the goal of this study is to estimate to what extent technological changes in work characteristics influence university teachers' engagement in work-related reflection. Literature suggests that the high impact on teaching the technological changes have are the reason for an increase in teachers' engagement in work-related reflection as a form of professional development. 213 lecturers from universities and universities of applied sciences from Germany filled in a survey to evaluate how their work behaviour changed due to the impact Covid-19 has had on their work-life. The results indicate significant positive predictive effects of changes in work characteristics which the teachers were confronted with, for work task reflection and social context reflection while no significant predictive effect was found for the impact on task performance reflection. The results also provided that, on average, older employees engaged in more social context reflection than their younger colleagues. Likewise, it was identified that men tended to engage in more work task and social context reflection in comparison to their female colleagues. Thus, the results indicate that the current changes in work characteristics predict an increase in university teachers' engagement in work task and social context and that age and gender in general have a significant moderating influence on these relationships. Such insights are important for designing adequate training and work conditions to support university teachers' reflective behaviour. Therefore, this study adds to a growing body of literature that helps understand the impact Covid-19 has had on educational staff and the way they go about their daily work lives.

Keywords: Covid-19, technological changes, work-characteristics, work-related reflection, work task reflection, social context reflection, task performance reflection

The past year has brought about many changes due to circumstances caused by the Covid-19 pandemic. Covid-19 is a respiratory disease which spread remarkably fast around the world since it was first discovered in December 2019, causing a global health crisis with detrimental consequences for the global economy (Fauci, Lane, & Redfield, 2020; Kniffin et al., 2021). In addition, the pandemic has created considerable challenges for all educational systems around the world, especially regarding the ways in which it is possible to continuously provide education for students (Daniel, 2020). The International Association of Universities (IAU) has published figures originally issued by UNESCO, which show that on 1st April 2020 educational institutions were shut down in 185 countries, which in turn affected approximately 1.5 billion students world-wide in all forms of education (Marinoni, Van't Land, & Jensen, 2020).

For higher-level education, the immediate transition from regular teaching to the provision of virtual education raised a number of issues (Sahu, 2020). The challenges posed by having to deal with new teaching technology as well as those caused by having to work from home, alongside the fact that universities may lack the resources to ensure successful online teaching, are all issues that academic staff now face (Sahu, 2020). Specifically, many universities do not have sufficient administrative capacities at hand to evolve effective teaching methods, which in some cases led to improvisation as a problem solution when it comes to teaching (Marinoni, Van't Land, & Jensen, 2020). For these reasons, the purpose of this study is to investigate some of the effects that Covid-19 related technological changes are having on the professional work life of university teachers.

Technological changes in work characteristics and the need for professional development

As stated above, Covid-19 has considerably impacted the way in which academic staff provide education and go about their occupation in general. For example, the constant use of video conferencing tools such as Microsoft Teams or Zoom for teaching was new for many and brought about a considerable change in the interaction with students, an increased reliance on the stable functioning of the technology and a decrease in physical activity. In the workplace, the sudden outbreak and rapid spread of the disease not only halted regular work routines but also increased the speed at which already existing developments towards moving work to online environments were pursued (Kniffin et al. 2021). According to Strielkowski (2020), the technological innovations in the academic context that were immediately called for because of the pandemic would usually have taken several years to be put into action when following the

regular procedures of the administrative systems in place. Additionally, Kniffin et al. (2021) make the important observation that any prior tendencies for online work were often instigated due to preferences of individual members of staff, rather than curricular requirements. In contrast, the pandemic, however, has made online work mandatory for all (Kniffin et al., 2021). Hence, as the teaching staff were confronted with the technological changes that were imposed by the terms and regulations provided from the state and thus also the university, they had little to no other choice than to accept and fulfil the new guidelines. The situation for university teachers is thus very unusual in that the technological changes in work characteristics affected virtually all of those employed in an educational context simultaneously and that these said changes became necessary with very short notice.

The International Association of Universities (IAU) Global survey has shown that since the outbreak of the pandemic, two-thirds of higher education institutions worldwide have moved teaching to an entirely online environment (Marinoni, van't Land, & Jensen, 2020). In their survey, some universities indicated that one challenge to their educational institutions was the need for a fundamentally different pedagogy in virtual teaching and learning and that the motivation on the teachers' behalf to accept the technological challenges involved varied (Marinoni, Van't Land, & Jensen, 2020). Notably, according to McFarlane, Green and Hoffman (1997), teachers' attitudes towards technology are crucial for ensuring its effective use.

In the educational sector, technological changes in work characteristics are multifaceted. They often increase the complexity of tasks as well as the mental work they entail, partially due to increased automatization of work tasks (Beer & Mulder, 2020). Beer and Mulder (2020) argue that newly introduced technologies can increase the pressure experienced by the teaching staff as the processes by which jobs are accomplished become more complex and the novel work characteristics can result in more work interruption. This further underlines that technological changes in work characteristics create a high impact on those employed in an academic environment, which, in turn, requires increased engagement in work-related reflection (Beer & Mulder, 2020).

Additionally, new technologies can change the meaning of tasks and work roles and also require increased availability on behalf of the university teachers (Beer & Mulder, 2020). Not only may teachers have reduced control over the way they perform their work tasks, the tasks and areas of responsibility may have also immensely changed. These changes require distinct professional skills to adequately incorporate the technology into everyday work activities and deal with the issues of increasing workload, need for self-sufficiency, and

complexity of the job (Beer & Mulder, 2020). Teachers are also responsible for establishing ways to expand their work-role and creating opportunities for professional learning (Beer & Mulder, 2020). Hence, the implementation of new technologies causes the need for constant professional development on behalf of the teaching staff (Beer & Mulder, 2020). This is especially crucial in the case at hand, as the extreme technological changes in work characteristics made necessary by Covid-19 were put to practice without any time for teachers to prepare in advance. This shift in work characteristics thus made personal development essential in order for teachers to be able to adapt to the given circumstances.

Even before the pandemic, there has been an increasing need for teachers to adapt their work and their teaching methods in line with continuous technological developments. Professional development is therefore essential, so that teachers are equipped to adapt to the changing environment. Guskey (2002) stresses that successful professional development is an essential aspect in almost all modern attempts at enhancing education. Professional development programs are understood as attempts to systematically transform teachers' methodological approaches, their perspectives and thus also the results for the students (Guskey, 2002). Messmann and Mulder (2015) identify reflection as a crucial aspect of professional development as well as a source for innovations within organisations by noting that reflection offers employees the flexibility they need to innovatively engage in novel tasks with unforeseen outcomes. Essentially, it could be the case that technological changes in work characteristics require more reflection on behalf of the teaching staff, however, that increased levels of reflection by teachers could also lead to more innovations and changes within organisations. This is also highlighted by Philipsen et al. (2019), who consider professional development of teachers as being constituted by the interplay of enactment and reflection. However, in the educational sector, the need for professional development is often disregarded (Minott, 2010; Guskey, 2002).

Work-related reflection as a form of professional development

Reflection in the educational workplace is of great importance as it provides benefits for teaching staff as well as the organisation itself. As an example, Minott (2010) states that the knowledge that is acquired from reflecting on behaviour and actions leads to increased teaching and learning abilities. However, reflection is by no means a simple construct (Høyrup, 2004). Therefore, to understand the concept of reflection as well as measure and analyse reflective practice, it is helpful to distinguish different types of reflection. Messmann and Mulder (2015)

consider the object, focus, and context of reflection and categorise work-related reflection into work task reflection, social context reflection and task performance reflection.

Reflection on work tasks refers to an analysis of individual elements that compose specific work tasks and the goals they relate to, as well as the long-term repercussions of related work activities (Messman & Mulder, 2015). This object of reflection also includes assessing varying methods for fulfilling tasks and adequately applying these to the environmental conditions and the aspired outcomes of tasks (Messmann & Mulder, 2015). Work task reflection occurs either before or after actions and includes combining methods and approaches to work tasks with their intended outcomes and goals (Messmann & Mulder, 2015). Thus, re-evaluating certain situations and how one behaved and handled them and reflecting on whether the methods and attempts for handling these situations fulfilled the desired goals can be considered work task reflection.

Reflection on the social context refers to the assessment of the way in which behaviour relates to the environment, both socially and culturally, at the workplace (Messmann & Mulder, 2015). Basically, this form of reflection entails that employees analyse and reflect upon their social interactions with others in different areas of their work, such as understanding of work tasks, their communication related to work, and employing forms of social comparisons with colleagues to achieve certain tasks (Messmann & Mulder, 2015). It also entails that by comparing aspects of work in the social context, individuals gain support for developing new approaches to fulfil work tasks (Messmann & Mulder, 2015). Like work task reflection, social context reflection occurs either before or after an action (Messmann & Mulder, 2015). In short, social context reflection is constituted of the exchange and comparison of approaches, methods, and ideas with the social network in place at work to learn and develop new ideas as well as to re-think previous approaches.

Reflection on task performance is mostly focussed on the genuine execution of work activities and their outcomes and involves evaluating whether work activities bring about the hoped-for results (Messmann & Mulder, 2015). Importantly, it also encompasses finding out how these results came about, regardless of whether they were successful or not (Messmann & Mulder, 2015). Unlike work task reflection and social context reflection, task performance reflection takes place during actions, so it is a continuous evaluation of ongoing behaviour in relation to completion of goals or subgoals (Messmann & Mulder, 2015). In a sense, task performance reflection entails that teachers constantly evaluate whether their present teaching methods are effective or in which ways they could be adapted. This, however, can make the

process of task performance reflection more disruptive and time consuming during the performance of actions than the previous two types of reflection.

All facets of work-related reflection are related and can take place either before an action, during or afterwards (Messmann & Mulder, 2015). For example, work task reflection and social context reflection are similar in the sense that they both function as preparation for performance and are considered forms of "reflection-on-action" (Messmann & Mulder, 2015). Generally, this means that they allow people to take all factors concerning tasks into consideration and therefore create the grounds for adequate task performance (Messmann & Mulder, 2015). In contrast, task performance reflection is considered a form of "reflection-in-action", which is enhanced by successful "reflection-on-action" (Messmann & Mulder, 2015). Essentially, work task reflection and social context reflection have an enabling function on task performance reflection (Messmann & Mulder, 2015). Taking all forms of reflection together, they benefit employees by aiding them to adapt and promote work procedures as well as their own performance (Messmann & Mulder, 2015).

The incorporation of technologies into the workplace can potentially increase the need for staff to engage in continuous professional reflection on all three levels. Beer and Mulder (2020) argue that these changes in work characteristics affect work roles and work activities, as well as self-regulatory activities such as work-related reflection. Dealing with these changes is thus increasingly important for both professional development and personal success (Beer & Mulder, 2020). For instance, reflecting on one's own professional role within the organisation is required as technology modifies the expectations held of the roles (Beer & Mulder, 2020). Also, to successfully work amidst these constant technological changes, skills such as self-regulation and reflection strategies are necessary (Beer & Mulder, 2020). Beer and Mulder (2020), therefore, identify the need for professional reflection which in turn can enhance professional development both individually and in relation to others.

The aim of this study is to specifically investigate the work-related reflection of teachers in the context of higher-level education, as education was greatly affected by the pandemic. The focus lies on analysing to what extent the theoretically expected increased need for reflection due to technological changes occurred in practice in the short time frame that university lecturers had to adapt to the Covid-19 circumstances. Thus, taking the above-mentioned aspects into consideration, the overarching research question, which is constructed based on Messmann and Mulder's (2015) differentiation of work-related reflection, is:

Do the technological changes in work characteristics caused by the Covid-19 pandemic predict university teachers' engagement in work-related reflection?

Moderating background variables: age and gender

Age

Studies on the effect of age on the integration of instructional technology in teaching have so far yielded varied results depending on the specific research focus. A study conducted by Gorder (2008) indicated that there is no significant age-related difference in teachers' attitude towards educational technology in the classroom. Similarly, a study regarding teachers' use of information and communication technology (ICT) in English teaching found no compelling age-related differences in technology integration at the workplace (Mahdi & Al-Dera, 2013). Morris and Venkatesh (2000), however, found significant age-related variations related to the perceived relevance of technology integration and implementation of technology at the workplace. More specifically, Morris and Venkatesh (2000) highlight several potential causes for the attitudinal differences towards technology adoption, such as that older employees may simply have less confidence in their own ability working with novel technology when compared to their younger colleagues. Furthermore, younger employees are more likely to have grown up with the new forms of technology which are implemented at the workplace, allowing them to make individual judgments about technology based on personal experience more confidently (Morris & Venkatesh, 2000).

These varied findings on the differences in attitude towards technology indicate the possibility that the technological changes in the workplace instigated by the Covid-19 pandemic may have a higher impact on older employees than their younger colleagues. If that is the case, then the older teachers may reflect more on their work tasks as Beer and Mulder (2020) see a link between higher impact situations and a higher engagement in work-related reflection. Therefore, this study will attempt to investigate whether age-related differences in work-related reflection, on all three levels, can be established in response to the changing work circumstances.

Hypothesis 1:
Older employees engage in more work task reflection, social context reflection and task performance reflection than their younger colleagues.

Gender

Studies on the role of gender regarding technology adoption in the realms of education also show mixed results. Zhou and Xu (2007) generally see a difference between male and female teachers in the way they approach technology. They argue that male teachers tend to possess higher levels of technological knowledge, which is why it may be easier for them to adapt to teaching in an online environment (Zhou & Xu, 2007). In contrast, female instructors were found to have lower levels of confidence as well as less experience in employing technology as a form of teaching (Zhou & Xu, 2007). Teo, Fan and Du (2015) state that teachers' level of computer competency may be a relevant indicator for the integration of technology in teaching. In line with the previous tendency that female instructors have lower confidence in the use of technology, Teo, Fan and Du (2015) emphasise that female teachers statistically have less computer competence when compared to their male colleagues, which could potentially interfere with their integration of technology in education. If there is a difference in the way male and female teachers approach technology, the question is whether this difference also influences the way they engage in work-related reflection when their use of technology changes due to circumstances caused by Covid-19. If it is the case that women, on average, struggle more with integrating technology in their teaching, the impact of the technological changes may have been more significant for them than for their male colleagues and, as stated above, higher impact situations at the workplace require more work-related reflection (Beer & Mulder, 2020).

For these reasons, this study will attempt to measure whether these apparent differences are also found in the way university teachers engage in work-related reflection, specifically on their work tasks, social context, and task performance, due to the persistent technological changes.

Hypothesis 2:

Female employees engage in more work task reflection, social context reflection, and task performance reflection than their male colleagues.

Practical and theoretical implications

This study investigates some of the effects that Covid-19 related technological changes in the workplace have had on the extent to which university teachers engage in work-related reflection. The technological changes that have emerged over the recent years are here to stay and are in fact more likely to increase and become progressively dominant. As mentioned, these changes impose new challenges on the teaching staff. Work-related reflection is one way of

adapting to higher impact situations and benefits the individual and therefore also the institution. Reflection itself is already well researched; however, there is a clear underrepresentation of the combination of work-related reflection, university teachers and differences between age and gender. If increased levels of reflection can be proven, this would demonstrate the importance of work-related reflection in higher education. In addition, this study attempts to provide a more differentiated understanding of work-related reflection of university teachers by utilising the conceptualisation of Messmann and Mulder (2015) and analysing the impact of demographic variables age and gender. This could be beneficial for designing adequate training opportunities for university teaching staff.

Methods

Participants and design

The present study is a cross-sectional, quantitative design which focused on teachers from both universities and universities of applied science throughout Germany. Of the 213 participants, 73.2 % (N = 156) indicated that they work at a university and 25.8 % (N = 55) work at a university of applied sciences, while .9 % (N = 2) selected the category ‘other’. The participants were either employed or freelance lecturers, teaching assistants or tutors. Importantly, professors were excluded from the participant sample as they are often more invested in research rather than in teaching activities. Participants that did not fill out the questionnaire completely were excluded from the data set.

In total, 213 teachers from 16 federal states in Germany voluntarily participated in the study, their age ranging from 24 to 70 years (M = 41.61, SD = 11.43). For later statistical purposes, the teachers were categorised into ‘younger’ and ‘older’ (Jang, Hardiman, Pramono, Sudibjo, Setiawan, & Alamsyah, 2020). The age of the younger participants ranged from 24 to 35 years (N = 83, M = 30.47, SD = 3.33), whereas the ‘older’ age group ranged from 36 to 70 (N = 130, M = 48.72, SD = 8.79).

The distribution of gender of the participants was 50.2 % male (N = 107), 47.9 % female (N = 102), as well as .5 % ‘other’ (N = 1). 1.4 % of the participants did not indicate their gender (N = 3). The educational level was not directly measured. However, in order to be part of the teaching staff at these types of educational institutions, the participants must have at least obtained one university level degree.

The participants were differentiated based on the branch of science they work in. The four categories available for selection were humanities and social sciences, engineering, natural

sciences, and life sciences. Furthermore, the participants also had the option to choose the category 'other' if their branch of science was not located in the previous categories. 57.7 % of the participants noted that the subject they teach belonged to the category humanities and social sciences (N = 123). 21.1 % of the participants assigned themselves to the category of engineering (N = 45), whereas 16.0 % responded that they taught subjects belonging to the natural sciences (N = 34). 4.7 % of the participants stated that they taught a subject in the field of life sciences (N = 10), and .5 % chose the category 'other' (N = 1). Regarding the function the participants fulfilled at their workplace, 67.1 % indicated that they worked as lecturers (N = 143). In addition, 6.1 % noted that they were employed in an academic advisory capacity (N = 13*)*, and 14.1 % stated that they worked as free-lance lecturers (N = 30). Lastly, 12.2 % of the participants chose the category 'other' regarding their function at work (N = *26)*.

Ethics approval was previously already granted by the University of Regensburg. Furthermore, every participant actively gave informed consent before beginning of the questionnaire.

Materials

An online questionnaire (in Unipark) was used to collect data. The questionnaire was developed by members of the Department of Pedagogy at the University of Regensburg. It concerned the summer term 2020, i.e., the first term which was affected by the Covid-19 pandemic. The survey consisted of 96 questions or statements and measured 5 variables with the addition of several demographic variables, which were agreed upon after a factor analysis had been carried out to check the validity of each scale.

The demographic variables included in the survey concerned the participants' age, gender, level of work experience, the branch of science they work in, their specific function in the workplace and whether they work at a university or a university of applied sciences. The further variables included in the questionnaire, from which the independent variable 'changes in work characteristics' and the dependent variable 'work-related reflection' were used for the present study, are listed below.

Professional development The first dependent variable the questionnaire measured was 'professional development', which consisted of three individual constructs which the participants had to respond to using a scale ranging from *a lot less* (-3) to *a lot more often* (+3), indicating how strongly their work changed throughout the digital semester (questionnaire inspired by Simons & Ruijters, 2004). The first construct was 'individual learning activities',

which achieved a Cronbach's alpha score of .79 and consisted of six statements. For example, the participants were asked to what extent they reflected on their role as a teacher during the digital semester. The second construct, 'social learning activities', received a Cronbach's alpha score of .77 and was made up of five individual statements. An example statement for this scale was "asked my colleagues for feedback". The final scale focused on the externalisation process and encompassed five items. It received a Cronbach's alpha score of .81 and included items such as "organisation of the information exchange between colleagues".

Work-related reflection The second dependent variable the questionnaire measured was 'work-related reflection', for which the participants once again had the chance to indicate how the amount of reflection they engage in related to their work changed during the online semester on a scale from *a lot less* (-3) to *a lot more often* (+3) (Messmann & Mulder, 2015). This variable again consisted of three individual scales, beginning with 'reflection on work tasks', which was measured with six items and received a Cronbach's alpha score of .76. The participants were asked to rate their engagement in work-related reflection during the digital semester compared to their previous teaching experience based on statements such as "reflecting on what constitutes my work tasks". Secondly, 'reflection on the social context' was assessed by five components consisting of items such as "reflecting on who I could turn to if I had a personal issue" and reached a Cronbach's alpha score of .66. Finally, 'reflection on task performance' was surveyed by five individual items asking the participants to reflect on matters such as "what do I have to know and be able to do in my work field". This last construct achieved a Cronbach's alpha score of .83.

Changes in work characteristics Following the dependent variables, the independent variable 'changes in work characteristics' was measured by using one scale consisting of 20 items; it had a Cronbach's alpha score of .83. Once again, the participants were presented with an answer choice ranging from *a lot less* (-3) to *a lot more often* (+3) and were asked to indicate to what extent their work had changed since the increased use of technology when compared to their teaching experiences prior to the Covid-19 pandemic. Examples from aspects of the participants' work life that may have changed due to technological advances were presented in this scale and included, amongst other statements concerning the quality of communication with colleagues, the supervision of work by colleagues and the amount of work. This scale was developed by the Department of Pedagogy of the University of Regensburg.

Organisational learning culture The questionnaire also measured a moderating variable, namely 'organisational learning culture', with 21 items (Marsick & Watkins, 2003;

Kortsch & Kauffeld, 2019). This scale received a Cronbach's alpha score of .92. For this variable, the participants were presented with a scale ranging from *does not apply at all* (1) to *fully applies* (6). The scale aimed at measuring how the participants perceive the institution they are employed at regarding its learning culture, which was assessed through statements such as "in my work institution, one is rewarded for professional development" or "my work institution encourages employees to think from a global perspective".

Self-efficacy The first control variable which was included in the questionnaire was 'self-efficacy', which was assessed using six items (Rigotti et al., 2008). The participants again had to indicate on a scale ranging from *does not apply at all* (1) to *fully applies* (6) in how far the presented statements such as "I achieve the vocational goals I set myself" relate to them personally. The scale scored a Cronbach's alpha value of .88.

Technical support As a second control variable, the technical support offered by the institution was examined by presenting the participants with four statements to which they could again choose an answer on a scale ranging from *does not apply at all* (1) to *completely applies* (6) (Raghu-Nathan et al., 2008). The scale assessing the perceived availability and usefulness of in-house technical support systems achieved a Cronbach's alpha of .92. This scale included statements like "our IT support is easy to reach out to".

Attitude towards change Lastly, the control variable 'attitude toward change' was measured with 15 items (Oreg, 2006). As previously, the participants were asked to indicate how much the statements related to their situation on a scale ranging from *does not apply at all* (1) to *completely applies* (6). For example, participants were asked to indicate how they related to statements such as "I protested against changes" or "I was afraid of the changes". The final control variable achieved a Cronbach's alpha score of .87.

Factor Analysis

For this study, the final factor analysis was a principal axis factor analysis with oblique rotation with four fixed effects as four constructs were measured with the items included in the analysis. These were the construct changes in work characteristics and the three individual forms of work-related reflection. The factor analysis ($N = 213$) achieved a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of .752, $p < .001$. Altogether, the four factors accounted for 32.09% of the total explained variance. The visual examination of the factor loadings showed that the items were not grouped in the way it was expected, as no clear loading pattern could be identified. For confidentiality reasons, the factor loadings cannot be presented in

connection with the specific items mentioned in the questionnaire. Therefore, the items are only referred to in an abbreviated form in the appendix (Appendix A).

Procedure

A form of convenience sampling was used to reach as many teachers as possible. They were sent a link to the digital survey per email either directly or through mailing lists. The email addresses were collected from each university department website. Once the emails were sent, information about the specific university, the branch of science, the department, the number of persons contacted from this department and the date of contact was entered into an Excel document so that the chance of contacting the same person twice could be eliminated.

Data Analysis

For the statistical analysis of the present data set, SPSS (27.0) was implemented. To answer the research question '*Do the technological changes in work characteristics caused by the Covid-19 pandemic predict university teachers' engagement in work-related reflection?',* a multivariate analysis was performed. As the structure of the questionnaire as well as the circumstances created by the Covid-19 pandemic presuppose, changes in work characteristics is in this case the predictor variable and the three types of reflection are treated as individual outcome variables. Next, to analyse the first hypothesis, '*Older employees engage in more work task reflection, social context reflection and task performance reflection than their younger colleagues',* a further multivariate analysis was performed by adding age to receive an interaction effect. Lastly, for the second hypothesis, '*Female employees engage in more work task reflection, social context reflection, and task performance reflection than their male colleagues',* a final multivariate analysis was run. Prior to conducting the multivariate analyses, all the corresponding assumptions were tested. The assumptions for linearity, independence of residuals, multicollinearity and homoscedasticity were all met for each individual analysis.

Results

First, the descriptives of the study variables are presented. Then, the results of the multivariate analysis conducted to answer the research question '*Do the technological changes in work characteristics caused by the Covid-19 pandemic predict university teachers' engagement in work-related reflection?'*, are reported. Finally, the outcomes of the second and third

multivariate analyses aimed at determining whether age and gender have a moderating effect on the relationship between changes in work-characteristics and reflection are presented.

Descriptive analysis of study variables

The descriptive analysis of the study variables indicated mean values ranging from .009 to 1.02 for the reflection variables as well as for changes in work characteristics (Table 1). For age and gender, both being dummy coded variables, the means were 1.46 and 1.51 respectively. Pearson correlations were used to establish the relationships between the independent and dependent variables. For the correlations with the moderating variables age and gender point-biserial correlations were calculated. Negative correlations indicate that the variables move in opposite directions, so when one variable increases, the other may decrease or vice versa. A significant negative correlation was found between gender and work task reflection, with r = -.14, N = 209, p < .005. Similarly, a significant negative correlation between gender and task performance reflection was established with r = -.19, N = 209, p < .001.

Positive correlations were found between changes in work characteristics and work task reflection with r = .157, N = 213, p < .005. Likewise, a significant positive correlation was found between changes in work characteristics and social context reflection with r = .18, N = 213, p < .001. These relationships indicate that, on average, high values in changes in work characteristics will result in high scores for work task reflection and social context reflection and vice versa. Also, as demonstrated in Table 1, work task reflection correlated positively with social context reflection, r = .52, N = 213, p < .001, as well as with task performance reflection, r = .55, N = 213, p <.001. Equally, social context reflection significantly positively correlated with task performance reflection, with r = .59, N = 213, p < .001. Thus, high scores for one type of reflection will likely lead to high scores for the other forms of reflection as well as the other way around.

Additionally, age had a significant positive correlation with work task reflection with r = .17, N = 213, p < .005, meaning that task reflection may be reactive to changes in age. Hence, there are differences between younger and older university teachers with reference to the amount of task reflection they engage in. Lastly, age also significantly positively correlated with changes in work characteristics, with r = .14, N = 213, p < .005, indicating that changes in work characteristics are also sensitive to changes in age and vice versa.

Table 1

Descriptive statistics and correlations of study variables

Variables	1	2	3	4	5	6
1. Work Task Reflection						
2. Context Reflection	.52*					
3. Performance Reflection	.55*	.59*				
4. Changes in work characteristics	.16*	.18*	.10			
5. Age	.17*	-.02	.07	.14*		
6. Gender	-.14*	-.11	-.19*	.10	.05	
M	1.02	.58	.67	-.09	1.61	1.51
SD	.64	.57	.66	.38	.49	.50
N	213	213	213	213	213	209

*. $p < .05$ (2-tailed)

The predictive influence of technological changes on work-related reflection

The multivariate regression provided a Wilk's Lambda score of .96, with F (3, 209) = 2.98, p = .033 which indicated that technological changes in work characteristics were a significant predictor for the three forms of work-related reflection. This implies that there are significant differences in work-related reflection that could be explained by the changes in work characteristics.

Inspection of the individual parameters indicated that technological changes in work characteristics positively predicted engagement in work task reflection, with F (1, 211) = 5.36, b = .27, partial η^2 = .03, p = .022. This means that university teachers who experienced more technology-related changes in their work were more likely to engage in higher levels of work task reflection. Similarly, technological changes in work characteristics significantly, positively predicted university teachers' engagement in social context reflection. For social context reflection, the values were F (1, 211) = 7.37, b = .28, partial η^2 = .02, p = .007. These values indicate that, on average, lecturers who experienced more technology-related changes at work were more likely to engage in social context reflection. However, technology-related changes in work characteristics did not significantly predict university teachers' engagement in task performance reflection with F (1, 211) = 1.94, b = .17, partial η^2 = .01, p = .165.

Regarding the research question, it can be said that technological changes in work characteristics significantly predict university teachers' engagement in work task reflection as well as social context reflection. However, the same does not hold true for the influence of technology-related changes in work characteristics on task performance reflection as in this case, no statistically significant effect was found.

The moderation effect of age

Concerning the first hypothesis, the multivariate regression analysis presented a non-significant Wilk's Lambda score of .97, with F (3, 209) = 2.02, partial η^2 = .03, p = .112. Hence, age in general does not seem to be a significant moderator for the relationship between changes in work characteristics and university teachers' engagement in work-related reflection. This means that there are no age-related differences in the amount of work-related reflection university lecturers engage in as a response to the technological changes in the workplace to be expected.

However, the examination of the individual parameters indicated that age is a significant positive moderator for university teachers' engagement in social context reflection F (1, 211) = 1.77, b = .32, partial η^2 = .03, p = .019. So, university teachers' engagement in social context reflection as a response to technological changes in work characteristics is sensitive to age. The results furthermore indicate that on average, older employees engage in more social context reflection when compared to their younger colleagues.

Nonetheless, no statistically significant moderation effects of age were established for the relationships between technology-related changes in work characteristics and both work task and task performance reflection. Hence, both work task reflection as well as task performance reflection do not seem to be sensitive to differences in university teachers' age.

The results have shown that, age in general does significantly, positively moderate the relationship between technology-related changes in work characteristics and social context reflection. More specifically, the results have indicated that, on average, older employees engage in more social context reflection than their younger colleagues. Therefore, the first hypothesis can only be partially accepted.

Table 2

Summary of Interaction effects of age and technology-related changes in work characteristics on work-related reflection

Source	Dependent Variable	Type III Sum of Squares	B	df	F	Sig.	Partial Eta Squared	Observed Power
Age	Task reflection	1.90	.20	1	4.76	.030	.02	.58
	Social reflection	.13	-.05	1	.42	.517	.00	.10
	Performance reflection	.32	.08	1	.72	.396	.00	.14
Changes in work characteristics	Task reflection	1.63	.24	1	4.08	.045	.02	.52
	Social reflection	2.43	.29	1	7.70	.006	.04	.80
	Performance reflection	.70	.16	1	1.60	.207	.01	.24
Changes in work characteristics*Age	Task reflection	1.38	.28	1	3.37	.068	.02	.45
	Social reflection	1.77	.32	1	5.57	.019	.03	.65
	Performance reflection	.98	.24	1	2.32	.137	.01	.32

The moderation effect of gender

For the second hypothesis, a multivariate analysis was carried out to examine the interaction effect of gender and changes in work characteristics in relation to the three types of work-related reflection. The Wilks' Lambda indicated a score of .95, $\eta^2 = .05$. As this score was significant, with $F\ (3, 205) = 3.58$, $p = .015$, it can be assumed that the interaction between gender and changes in work characteristics is a significant positive predictor for university teachers' engagement in work-related reflection.

The inspection of the individual parameters indicated that gender was a significant moderator for the relationship between technological changes in work characteristics and engagement in work task reflection. For work task reflection, the estimated values were $F\ (1, 211) = 3.09$ with $p = .005$, $\eta^2 = .04$, $b = .47$. Thus, on average, men engaged in even more work task reflection when experiencing higher impacts of technology-related changes in work characteristics. Likewise, gender was identified as a significant moderator for the relationship between changes in work characteristics and social context reflection. In this case, the estimated values were $F\ (1, 211) = 2.33$ with $p = .007$, $\eta^2 = .04$, $b = .41$. Hence, on average, men engaged in more social context reflection due to increased experience of technological changes in work characteristics. However, no significant effects were found for the interaction effect of gender

and changes in work characteristics in relation to task performance reflection (Table 3). Thus, no significant gender differences are expected in this case.

The hypothesis aimed at testing whether women in general engage in significantly more work task reflection, social context reflection and task performance reflection can therefore not be accepted. The results have shown that gender in general does significantly, positively moderate the relationship between technology-related changes in work characteristics and work-related reflection. However, on average, men engage in significantly more work task reflection and social context reflection in comparison to their female colleagues.

Table 3

Between-Subject Effects of changes in work characteristics and gender

Source	Dependent Variable	Type III Sum of Squares	B	df	F	Sig.	Partial Eta Squared	Observed Power
Gender	Task reflection	2.04	-.20	1	5.31	.022	.03	.63
	Social reflection	1.18	-.15	1	3.88	.050	.02	.50
	Performance reflection	3.86	-.27	1	9.10	.003	.04	.85
Changes in work characteristics	Task reflection	3.15	.33	1	8.21	.005	.04	.81
	Social reflection	2.89	.32	1	9.52	.002	.04	.87
	Performance reflection	1.38	.22	1	3.25	.073	.02	.43
Changes in work characteristics*Gender	Task reflection	3.09	.47	1	7.92	.005	.04	.80
	Social reflection	2.33	.41	1	7.55	.007	.04	.78
	Performance reflection	1.12	.28	1	2.54	.112	.01	.36

The findings demonstrated that, generally, changes in work characteristics have a positive effect on university lecturers' engagement in work task reflection and social context reflection. Thus, educational staff engaged in more work task reflection and social context reflection when they experienced increased amounts of technological changes in work characteristics. Additionally, both age and gender were found to be significant moderators for

the relationships between technology-related changes in work characteristics and engagement in both work task and social context reflection. Hence, there was a difference between older and younger employees, as well as between men and women in how they engaged in work task reflection and social context reflection as a response to the technological changes in the workplace.

Discussion

The purpose of this study was to examine to what extent technological changes in work characteristics, made necessary by the Covid-19 pandemic, impacted the way university teachers engage in reflection. More precisely, the question was '*Do the technological changes in work characteristics caused by the Covid-19 pandemic predict university teachers' engagement in work-related reflection?*. Based on literature, it was expected that the high impact the technological changes in work characteristics have had on university teachers would cause an increase in their engagement in work-related reflection in general. Additionally, two supplementary hypotheses were tested to establish whether age and gender had a moderating effect on the relationship between technological changes in work characteristics and work-related reflection. For all three research objectives, the distinction was made between work task reflection, social context reflection and task performance reflection.

Influence of technological changes on work-related reflection

Concerning the main research question, literature suggests that technological changes in work characteristics have a high impact on employees, therefore, the amount of reflection they engaged in potentially increases (Beer & Mulder, 2020). Regarding university teachers, the results of the present study demonstrated that technology-related changes in work characteristics positively predicted their engagement in work-related reflection, specifically in work task reflection and social context reflection. Thus, the increase in technological changes which resulted from the outbreak of Covid-19 resulted in an increase in university teachers' engagement in these two types of reflection. However, contrary to what was expected this was not the case for task performance reflection.

A potential reason as to why specifically work task reflection and social context reflection were affected by the changes in work characteristics is because they are strongly related. They are both forms of reflection-on-action, which acts preparation for employees' successful task performance (Messmann & Mulder, 2015). Hence, they go hand in hand, and

successful reflection on work tasks and social contexts ideally enhances an employee's engagement in reflection during task performances (Messmann & Mulder, 2015). This could explain why both of these two types of reflection were significantly affected and not just one of the two.

In contrast, task performance reflection is a form of reflection-in-action, hence it has a different point of time and object of reflection than work task and social context reflection (Messmann & Mulder, 2015). This could potentially explain why the results are not the same as for work task and social context reflection. According to Yanow and Tsoukas (2009), employees often do not have any time to reflect on their actions during their work activities. Employees must often continuously pay attention to what they are working on, so the object of attention switches constantly (Yanow & Tsoukas, 2009). The fact that, due to Covid-19, higher level education moved to an online environment and the work tasks changed significantly probably led to a considerable change in the way university teachers carried out their work. Thus, it makes sense to believe that university teachers had significantly less time for task performance reflection, having to focus much more on technical aspects whilst teaching. This could explain the lack of increase in task performance reflection.

A further explanation could be based on the relationship between task and social context reflection and task performance reflection. Successful task and social context reflection can theoretically lead to successful task performance reflection (Messmann & Mulder, 2015). Task performance reflection may therefore be indirectly influenced by changes in work characteristics through the other forms of reflection, which could be a subject for future research. Though both work task and social context reflection have already increased, it may therefore be possible that their increase has not yet affected the teachers' engagement in task performance reflection.

Initially it was expected to find significant positive predictive effects for technological changes in work characteristics on all three types of reflection based on the argument that the new technological changes in work characteristics with which teachers were confronted since the outbreak of Covid-19 had a significant impact on teaching staff, which in turn should have led to increased engagement in work-related reflection. With hindsight, however, it is understandable why the effects were only found for employees' engagement in work task reflection and social context reflection and not for task performance reflection.

Age as a moderator of the relationship between technological changes and work-related reflection

Next, the hypothesis, '*Older employees engage in more work task reflection, social context reflection and task performance reflection than their younger colleagues'* was examined. The results established that age, when taken together with changes in work characteristics, had a significant, positive moderating effect on the relationship between technological changes in work characteristics and social context reflection. Thus, age generally did play a significant role as a predictive moderator in the context of university teaching with regards to the social context. More precisely, the values indicated that on average, specifically older employees engaged in more social context reflection when compared to their younger colleagues. However, a statistically significant moderation effect for age could not be established in relation to work task reflection and task performance reflection.

In a study on experience level differences in reflective teaching, Afshar and Farahani (2015) established that reflective thinking as well as reflective teaching both increased with the level of work experience. They also concluded that as increasing level of teaching experience goes along with increasing age, older employees often engage in more reflective practice than their younger colleagues (Afshar & Farahani, 2015). According to Afshar & Farahani (2015), the increase in older employees' engagement in reflective behaviour may be linked to an increase in thinking ability which develops with the course of age. This could potentially explain why older employees, on average, were found to generally engage in more work-related reflection than their younger colleagues.

However, the present study also specifically focused on the technological changes in the workplace and how these could have impacted university teachers. Therefore, a further potential explanation is linked to the use of technology. As mentioned, novel circumstances produce a higher impact on those involved in the process (Beer & Mulder, 2020). Since Covid-19, there have been immense technological changes in work characteristics for all teachers (Kniffin et al., 2021). Additionally, studies have indicated that older employees potentially struggle more with the integration of technology into their teaching (Morris & Venkatesh, 2000). Taking these arguments together, it could potentially be the case that older employees experience a higher impact resulting from the technological changes, leading them to engage in more work-related reflection.

An explanation for why only the relationship between technological changes in work characteristics and social context reflection was found to be significantly moderated by the

'older' age group is difficult to find. As mentioned above, work task reflection and social context reflection are strongly related (Messmann & Mulder, 2015). Therefore, to find only one significant moderation effect was highly unexpected. However, older employees potentially would have needed more support or interaction with their colleagues in connection with the newly introduced technology which they were now required to use. This could potentially explain the distinctive increase in social context reflection for older employees only.

Gender as a moderator of the relationship between technological changes and work-related reflection

Lastly, the hypothesis '*Female employees engage in more work task reflection, social context reflection, and task performance reflection than their male colleagues'* was analysed. The results indicated that gender overall had a significant, positive moderating effect on the relationship between technology-related changes in work characteristics and both work task and social context reflection. Therefore, gender in general can be considered a significant predictive moderator for university teachers' engagement in work-related reflection as a response to technological changes in the workplace. However, a statistically significant moderation effect for gender could not be found for the relationship between technological changes in work characteristics and task performance reflection. Also, the found effects only hold for men, meaning that men engaged in more work task reflection and social context reflection in response to technology-related changes in work characteristics. Based on literature, it had been expected that women might engage more in work-related reflection due to the technological changes in work characteristics than their male colleagues as the impact of the changes might have been more significant for them (Zhou & Xu, 2007; Teo, Fan, & Du, 2015). The results, however, were quite unexpected as no significant scores were found for women.

Despite these unexpected outcomes, the present findings are somewhat in line with the research results presented by Afshar and Farahani (2015), who found that there are significant differences in the way men and women engage in reflective teaching. They concluded that men conducted more reflective teaching when compared to their female colleagues (Afshar & Farahani, 2015). Likewise, Bawaneh, Moumene and Aldalalah (2020) also established that male teachers engage in more reflective teaching than women. However, these findings must be applied to the present study results with caution as both sources stem from studies conducted in Middle Eastern countries, where gender differences are culturally more significant. This can be seen in their explanation that in their culture, men have more time to engage in reflection

before and after actions as oftentimes their sole responsibility is to work, whereas women are also responsible for children, housework etc. (Bawaneh, Moumene, Aldalalah, 2020). Having said that, this argument is in line with Chuang (2015), as she considers women's family and time restraints as a disincentive for women to take part in professional development at the workplace. However, none of these sources incorporate the technological aspect, which is the focus of the present research.

Scientific implications

Originally it was expected to find predictive values for technology-related changes in work characteristics on work task reflection, social context reflection and task performance reflection. As no predictive values were found for task performance reflection, this study has possibly identified further need of research regarding the relationship between the individual types of reflection. As Messmann and Mulder (2015) mention, the three types of reflection are related to each other, and successful work task and social context reflection can lead to successful task performance reflection. Hence, there is reason to believe that in this case task performance reflection may only be indirectly influenced by the technological changes in work characteristics rather than being directly impacted. Further research would, however, be necessary to analyse and strengthen these implications.

Practical implications

This study provides implications for enhancing university teachers' engagement in work-related reflection regarding teaching circumstances which have been impacted by technological changes. As noted above, reflective practice at the workplace enables employees to learn from past experiences and enhance future work-related activities (Helyer, 2015). Specifically, reflective teaching is an essential feature of competent teachers and greatly impacts teaching (Afshar & Farahani, 2015). Essentially, this study offered insights into how technology has impacted the way university teachers engage in work-related reflection and has proven that technology does play a significant role in this regard. With this finding, awareness has been raised towards the integration of technology in the work context which can be considered when designing new training programs and support systems to facilitate work-related reflection. So, with more substantiation, the present research findings could facilitate the development of technology-related trainings and support systems, which are simultaneously age and gender sensitive to ensure most efficient use of resources.

Limitations

A methodological limitation of this study is related to the factor analysis. The identified factor loadings were not related to the measured constructs as expected. Though the factor analysis did show four factors, i.e., three regarding reflection and one for the technological changes in work characteristics, the item loadings were to a certain extent unrelated. Some items did not show any significant loadings concerning any of the four factors, whereas other items loaded moderately with more than one factor. Likewise, the items for changes in work characteristics all loaded on different factors and the items for the three subscales of reflection mostly loaded on the same factor, despite supposedly measuring different constructs. Hence, no distinct pattern could be identified which could have been linked to the structure of the questionnaire. This on the one hand led to cross loadings for individual items and on the other hand to no significant loadings for others.

For changes in work characteristics, it is possible that the items all measure slightly different aspects of these said changes and therefore no clear loading pattern could be identified. Regarding work-related reflection, the constructs that were measured may have been conceptually highly similar, or the individual items were possibly measured incorrectly which could explain why all items loaded on one factor. It is also possible that there was a misunderstanding on behalf of the participants whilst filling out the survey. Ideally, the loading patterns should be more closely examined in order to be certain that the research materials actually measure what they were supposed to measure. Therefore, it would be valuable to re-evaluate the constructs and establish certainty about whether they measure what they should and whether they are measured and implemented correctly.

A practical limitation was found whilst comparing the moderating effect of age for younger and older employees. Literature suggests that lecturers count as ‘young’ when they are under 36 years of age (Jang, Hardiman, Pramono, Sudibjo, Setiawan, & Alamsyah, 2020). Hence, the groups were created for 24–35-year-olds and teachers 36 years and older. However, as the original questionnaire and sampling method did not aim at making inferences between younger and older lecturers, the sample sizes used for comparisons were quite unequal, having a gap of 47 participants. Even though it is technically possible to adequately compare two samples with different size, this could not be taken into consideration in this analysis. Thus, the results obtained may be different when conducting similar tests with equal sized samples.

A theoretical limitation that was identified whilst working on the study at hand is connected to the conceptualisation of reflection. Sources have indicated that the lack of clarity

of the conceptualisation of reflection has made it difficult in the past to introduce and apply it in the realms of education, both theoretically and practically (Van Beveren, Roets, Buysse, & Rutten, 2018). It has also been mentioned that a shortage of multi-professional studies on reflection has prevented the advancements of increasingly systematic theories of reflection in an educational concept (Van Beveren, Roets, Buysse, & Rutten, 2018). Essentially, there are differing theoretical frameworks concerning reflection in the educational sector. However, they have not really been combined into more overarching concepts yet. Therefore, though focusing on one conceptualisation as in this study is legitimate, generalisations must be made cautiously as a different conceptualisation of reflection might indicate and uncover different aspects.

Directions for future research

The results clearly indicate that novel technological changes in work characteristics influence the way university teachers engage in work-related reflection as a form of professional development in the workplace. As these technological changes, though initially caused by the global pandemic, are likely to remain an essential part in the daily work-life of many university teachers, it is highly relevant to understand the consequences that they can have.

Therefore, a crucial step for future research would be to address the difficulties mentioned above concerning the factor analysis. It is important to figure out whether the concepts that were supposed to measure different concepts were too similar or whether problems occurred during the measurement of the individual concepts. Despite it being common in social research that cross loadings occur, the causes should be considered and adapted to ensure more precise data analysis in the future (Asparouhov, Muthén, & Morin, 2015).

The present research has established that technological changes in work characteristics influence university teachers' engagement in work task reflection and social context reflection. In addition, the descriptive analysis of the study variables indicated that all three types of reflection correlate with each other. The theoretical framework established that successful work task reflection and social context reflection can influence engagement in task performance reflection (Messmann & Mulder, 2015). Therefore, it would be interesting for future research to evaluate to what extent task performance reflection increases indirectly through an increase in work task and social context reflection, i.e., whether it is not the changes in work

characteristics directly but the resulting changes in work task and social context reflection that influence task performance reflection.

Overall conclusion

The study at hand provided recognisable evidence that technological changes in the workplace led to increased work-related reflection amongst university teachers and also provided a differentiated picture of work-related reflection. Work task and social context reflection significantly increased on account of the technological changes in work characteristics, while task performance reflection did not. The demographic variables age and gender both had a significant moderating effect on the relationship between technology related changes in work characteristics and task and social context reflection. However, with further distinction, for age the only significant effect which was found was for older employees and social context reflection. For gender, only men seemed to have significantly increased the amount of work task and social context reflection they engaged in since Covid-19. These differing results underline the usefulness of a differentiated approach to studying the effects for work-related reflection. Albeit that a generalisation of the present research results must be established by further, more in-depth research, the present study thus contributes to a growing body of literature regarding the impact Covid-19 restrictions have placed on the educational sector.

References

Afshar, H. S. & Farahani, M. (2015). Reflective Thinking and Reflective Teaching among Iranian EFL Teachers: Do Gender and Teaching Experience Make a Difference?. *Procedia – Social and Behavioural Sciences, 192,* 615-620. doi: 10.1016/j.sbspro.2015.06.107

Asparouhov, T., Muthén, B., & Morin, A. J. S. (2015). Bayesian Structural Equation Modeling With Cross-Loadings and Residual Covariances: Comments on Stromeyer et al. *Journal of Management, 41*(6), 1561-1577. doi: 10.1177/0149206315591075

Bawaneh, A. K., Moumene, A. B. H., & Aldalalah O. (2020). Gauging the Level of Reflective Teaching Practices among Science teachers. *International Journal of Instruction, 13*(1), 695-712. doi: https://doi.org/10.29333/iji.2020.13145a

Beer, P. & Mulder, R. H. (2020). The Effects of Technological Developments on Work and Their Implications for Continuous Vocational Education and Training: A Systematic Review. *Frontiers in psychology, 11.* doi: 10.3389/fpsyg.2020.00918

Chuang, S.-F. (2015). Deterrents to Women's Participation in Continuous Professional Development. *New Horizons in Adult Education & Human Resource Development, 27*(2), 28-37. doi: 10.1002/nha3.20104

Daniel, S. J. (2020). Education and the COVID-19 pandemic. *Prospects, 49,* 91-96. doi: https://doi.org/10.1007/s11125-020-09464-3

Fauci, A. S., Lane, H. C., & Redfield, R. R. (2020). Covid-19 – navigating the Uncharted. *New England Journal of Medicine, 382*(13), 1268-1269. doi: 10.1056/nejme2002387

Gorder, L. M. (2008). A Study of Teacher Perceptions of Instructional Technology Integration in the Classroom. *Delta Pi Epsilon Journal, 50*(2), 63-76. Retrieved from: https://bit.ly/3wLLO1Q

Guskey, T. R. (2002). Professional Development and Teacher Change. *Teachers and Teaching: theory and practice,* 8(3/4), 381-391. doi: 10.1080/135406002100000512

Helyer, R. (2015). Learning through reflection: the critical role of reflection in work-based learning (WBL). *Journal of Work-Applied Management, 7*(1), 15-27. doi: 10.1108/WAM-10-2015-003.

Høyrup, S. (2004). Reflection as a core process in organisational learning. *Journal of Workplace Learning, 16*(8), 442-454. doi: 10.1108/13665620410566414

Jang, J., Hardiman, B., Pramono, R., Sudibjo, N., Setiawan, S. T., & Alamsyah, V. U. (2021). A Phenomenology Study of Young Lecturers in Higher Education: Journeys in Building Professional Identity. International *Journal of Advanced Science and Technology, 29*(5), 7036-7075. Retrieved from: https://t1p.de/5d9v

Kniffin, K. M., Anseel, F. Ashford, S. P., Bamberger, P., Bhave, D. P., Creaey, S. J., Flynn, F. J., … Van Vugt, M. (2021). COVID-19 and the Workplace: Implications, Issues, and Insights for Future Research and Action. *American Psychologist, 76*(1), 63-77. doi: http://dx.doi.org/10.1037/amp0000716

Mahdi, H.S. & Al-Dera, A. S. A. (2013). The Impact of Teachers' Age, Gender and Experience on the Use of Information and Communication Technology in EFL Teaching. *English Language Teaching, 6*(6), 57-67. doi: 10.5539/elt.v6n6p57

Marinoni, G., Van't Land, H., & Jensen, T. (2020). The impact of Covid-19 on higher education around the world. *IAU Global Survey Report.* Retrieved from: https://t1p.de/j4y9

McFarlane, T. A., Green, K. E., & Hoffman, E. R. (1997). Teachers' attitudes toward technology: psychometric evaluation of the technology attitude survey. Distributed by ERIC Clearinghouse.

Messmann, G. & Mulder, R. H. (2015). Reflection as a facilitator of teachers' innovative work behaviour. *International Journal of Training and Development, 19*(2), 125-137. doi: 10.1111/ijtd.12052

Minott, M. A. (2010). Reflective teaching as a self-directed professional development: building practical or work-related knowledge. *Professional Development in Education, 36*(1-2), 325-338. doi: 10.1080/19415250903457547

Morris, M. G. & Venkatesh, V. (2000). Age Differences in Technology Adoption Decisions: Implications for a Changing Work Force. *Personnel Psychology, 53*(2), 375-403. doi: 10.1111/j.1744-6570.2000.tb00206.x

Oreg, S. (2006). Personality, context, and resistance to organisational change. *European Journal of Work and Organisational Psychology, 15*(1), 73-101. doi: 10.1080/124943205000451247

Philipsen, B., Tondeur, J., McKenney, S., & Zhu, C. (2019). Supporting teacher reflection during online professional development: a logic modelling approach. *Technology, Pedagogy and Education, 28*(2), 237-253. doi: 10.1080/1475939X.2019.1602077

Rapanta C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity. *Postdigital Science and Education, 2,* 923-945. doi: 10.1007/s42438-020-00155-y

Rigotti, T., Schyns, B., & Mohr, G. (2008). A Short Version of the Occupational Self-Efficacy Scale: Structural and Construct Validity Across Five Countries. *Journal of Career Assessment, 16*(2), 238-255. doi: 10.1177/1069072707305763

Sahu, P. (2020). Closure of Universities Due to Coronavirus Disease 2019 (COVID-19): Impact on Education and Mental Health of Students and Academic Staff. *Cureus, 12*(4). doi: 10.7759/cureus.7541

Strielkowski, W. (2020). COVID-19 pandemic and the digital revolution in academia and higher education. *Preprints.* doi:10.20944/preprints202004.0290.v1

Teo, T., Fan, X., & Du, F. (2015). Technology acceptance among pre-service teachers: Does gender matter? *Australasian Journal of Educational Technology, 31*(3), 235-250. doi: 10.14742/ajet.1672

Van Beveren, L., Roets, G., Buysse, A., & Rutten, K. (2018). We all reflect, but why? A systematic review of the purposes of reflection in higher education in social and behavioural sciences. *Educational Research Review, 24,* 1-9. doi: 10.1016/j.edurev.2018.01.002

Yanow D. & Tsoukas, H. (2009). What is Reflection-In-Action? A Phenomenological Account. *Journal of Management Studies, 46*(8), 1339-1364. doi: https://doi.org/10.1111/j.1467-6486.2009.00859.x

Zhou, G. & Xu, J. (2007). Adoption of Educational Technology: How does Gender Matter? *International Journal of Teaching and Learning in higher Education, 19*(2), 140-153. Retrieved from: https://eric.ed.gov/?id=EJ901292

Appendix

Appendix A

Items	Factor 1	Factor 2	Factor 3	Factor 4
Changes 1	-.08	-.19	**.52**	-.12
Changes 2	-.01	-.04	**.50**	.17
Changes 3	.09	.04	**.57**	-.24
Changes 4	.11	-.13	**.53**	.07
Changes 5	-.05	.17	-.02	**.54**
Changes 6	-.16	.16	-.23	**.51**
Changes 7	-.18	**.44**	-.02	.24
Changes 8	.05	.26	.19	.16
Changes 9	.13	.05	**-.46**	-.05
Changes 10	.03	.15	**-.46**	-.26
Changes 11	.01	.24	**.56**	-.23
Changes 12	.08	**.38**	**.47**	-.19
Changes 13	-.11	**.65**	.08	.04
Changes 14	**.32**	**-.32**	-.15	-.10
Changes 15	.25	.12	**.30**	-.13
Changes 16	.17	**.65**	-.21	-.07
Changes 17	.18	-.09	**.37**	-.01
Changes 18	-.04	.22	**-.43**	**.35**
Changes 19	.11	**.61**	-.01	.07
Changes 20	.00	.29	-.06	.01
Task reflection 1	**.58**	.05	-.00	.21
Task reflection 2	**.38**	-.24	-.20	.16
Task reflection 3	**.57**	-.09	.02	-.03
Task reflection 4	**.50**	-.17	-.05	.20
Task reflection 5	**.53**	-.05	.04	-.02
Task reflection 6	**.67**	-.02	-.06	.15
Social reflection 1	**.31**	.06	.13	.21
Social reflection 2	.21	.06	**.30**	.20
Social reflection 3	.27	.09	.01	-.08

Social reflection 4	**.65**	.14	-.05	.15
Social reflection 5	**.39**	.04	-.04	-.12
Social reflection 6	**.50**	-.01	.16	.09
Performance reflection 1	**.49**	-.07	.10	-.11
Performance reflection 2	**.39**	.04	-.16	-.24
Performance reflection 3	**.75**	-.06	-.03	-.11
Performance reflection 4	**.58**	.02	.16	-.12
Performance reflection 5	**.61**	.19	.03	-.25
Performance reflection 6	**.60**	.05	-.20	.03

Note. crucial values above .30 were highlighted in bold.