

Core Job Knowledge and Remote Work: The Impact of COVID-19

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Abstract

At the core of higher education is the creation, transmission, and execution of a knowledge-based mission. The emergence of COVID-19 forced universities to transition to remote and online operations. However, not all jobs can be performed equally and effectively. Key differences between tacit and explicit knowledge embedded within different higher education jobs are likely to underline performance variations. As education administration and leadership seeks to engage their stakeholders in online formats across diverse jobs, a deeper understanding of the impact of tacit and explicit knowledge jobs on employee performance and impact is important. A mixed methods approach was used to compare the impact of the remote transition on core explicit and tacit knowledge jobs. A behavioral knowledge scale reported results consistent with face validity group selection. Open-ended survey responses were analyzed for thematic trends. The explicit group was more productive and confident in their ability to perform their jobs remotely. The tacit group was less confident and productive. The tacit group was more impacted by issues involving work/life relationships, social connection, and stress. These findings suggest that a more nuanced approach to remote operations and additional leadership support based upon job knowledge characteristics is needed for education administration and leadership.

Keywords: Core Job Knowledge, Remote Work, COVID-19.

Introduction

There is a long-term trend of increasing levels of telework (Bailey & Kurland 2002; Desilver 2020), working outside the conventional workplace and communicating with it by way of computer-based technology (Nilles 1994; Olson & Primps 1984). Some leaders in higher education have noted the potential disruptive effects of this trend both inside the classroom as well as within their administrative offices (Thompson and Miller 2018). In higher education, well known for remote teaching, only 16% of workers have access to telework (BLS 2020) even though 33.7% of all students in 2017 took some form of distance education (NCES 2017). While higher education scholars have focused on the implementation and effectiveness of remote learning (e.g., Broadbent and Poon 2015; Littlejohn, Hood, Milligan and Mustain, 2016; Xu and Jagggers 2014), this represents only a single aspect of telework as universities are reliant on many jobs beyond the classroom. Thus, our understanding of telework and its relation to occupational effectiveness for specific jobs within higher education is largely unexplored.

Given the near universal response by universities to transition all jobs to telework in response to COVID-19, evaluating the effectiveness of higher education jobs within the telework context is both timely and highly relevant for higher education leaders (Chang 2020). Further, the immediacy and thoroughness of this transition represents a unique opportunity to explore job effectiveness of telework within higher education beyond the scholarship of learning and teaching. Implications of such an investigation include establishing appropriate performance expectations for certain jobs within higher education and guidance on how education administration and leadership might better aid individuals transitioning to telework. Additionally, results could reflect how the ability of different jobs to effectively telework may play a critical role in the success of higher education programs facing increasing financial pressure. The main objective of this research is to study the impact of COVID-19 on core job knowledge and remote work.

The Importance of knowledge in Higher Education

A primary challenge of higher education institutions involves the creation, accumulation, application and dissemination of knowledge. Nonaka and Konno (1998) conceptualize 'knowledge' as a shared meaning space evolving through a spiraling evolutionary process of socialization, internalization, combination and externalization. Through the dynamics of socialization and internalization, knowledge moves from tacit at one person to tacit at another person while the dynamics of combination and externalization move knowledge from tacit at the individual level to explicit. Tacit knowledge is understood as tied to individuals and being difficult or impossible to articulate. It is only through observation and doing that tacit knowledge can be transferred (Eisenhardt and Santos 2002). As knowledge is enacted, some part of it may be codified and transmitted through messages, rules, and other processes. Such codified knowledge is understood as explicit knowledge (Eisenhardt and Santos 2002).

The interplay of tacit and explicit knowledge is subtle. Smith (2001) writes 'comparing tacit and explicit knowledge is a way to think and not point out differences.' In the interaction of the two, explicit knowledge is often about the *process*, addressing how knowledge is organized to provide a predictable environment for the application of tacit knowledge. Explicit knowledge is the *practice* of how work is conducted (Smith 2001).

The impact of knowledge on performance has a long history of study. Knowledge is a foundational theory of the existence and structure of firms (Eisenhardt and Santos 2002). Especially critical in knowledge-based firms, knowledge has been linked to firm performance (Harlow 2008), innovation process and outcomes (Seidler-de Alwis and Hartman 2008), dealing with environmental uncertainty (Lecuona and Reitzig 2014) and competing in new markets (Subramaniam and Venkatraman 2001).

Tacit and explicit knowledge in Higher Education

The role of tacit and explicit knowledge on individual and organizational performance is backed by a strong stream of research. In the higher education setting this research is less developed, concentrated primarily on the technology transfer of research universities and student learning with a lesser focus on other aspects of the higher education enterprise.

Scholars of technology transfer have concentrated on the impact of knowledge on the outcomes of research relationships between research universities and private enterprises (Agrawal 2001). A significant body of work focuses on tacit knowledge transfer between research universities and the biotechnology industry (Audretsch and Stephan 1996; Pisano Shan and Teece, 1988). Researchers have found that the co-location of technology firms near research universities is partially explained by the need to transfer tacit knowledge that cannot be fully codified in research publications (Agrawal 2001; Zucker, Darby and Armstrong, 2002). The importance of co-location emphasizes the need of face-to-face social contacts and informal communication as a means to capitalize on the 'application' and 'dissemination' role of higher education research.

The scholarship of tacit knowledge on student learning often concentrates on undergraduate performance. For example, Insch, McIntyre and Dawley (2008) found support between cognitive, technical, and social tacit knowledge behaviors and academic success as measured by undergraduate GPA. In contrast to undergraduate students, there is relatively little research regarding graduate students and tacit knowledge. An exception is Edwards and Schleicher (2004), who found that measures of tacit knowledge were effective predictors of psychology graduate school success beyond measures of GRE, undergraduate GPA and personality dimensions.

The acknowledgement of universities as knowledge-based organizations (Martin and Marion 2005), has also led to research on the internal processes of higher education systems that influence knowledge sharing. For example, Fullwood, Rowley and Delbridge (2013) found that a positive individualistic knowledge sharing culture exists within academics; however, this culture could also be self-serving and instrumental, which can present challenges for organizational level knowledge sharing systems. Also related to culture, Cheng (2020) found that collaborate cultures increase knowledge externalization and combination. Knowledge sharing within the educational context is also facilitated by increased self-efficacy and the use of high-commitment Human Resource Management practices (Runhaar and Sanders 2016). In terms of restricting knowledge sharing, researchers have identified a knowledge hoarding effect where high competency scholars refrain from sharing knowledge when structural dimensions (rewards, incentives and recognition) are lacking (Cheng, Ho and Lau, 2009).

Focusing more on leadership within higher education, Keramati and Azadeh (2007) emphasized the importance of top management commitment and resources for knowledge management success. In support of this emphasis, weak leadership and associated structural challenges, such as siloed departments and poor technology platforms, have been found to inhibit effective knowledge sharing (Basu and Sengupta 2007; Fullwood, Rowley and Delbridge 2013). This has led researchers to encourage a more distributive approach to leadership (e.g., Jones, Harvey, Lefoe and Ryland 2014) as a means to increase collaboration across departments and create innovative solutions to problems faced by the institution.

Despite the clear importance of knowledge sharing and its impact, Chugh (2013) found strong variation in universities' structural support of knowledge sharing activities, suggesting that best practices for knowledge sharing in higher education have yet to be fully established or disseminated. Higher education leaders need to display strong "agility" when balancing the competing demands of stakeholder groups (Joiner and Josephs 2006), especially when faced with unpredictable and at times, undefined circumstances (Drew 2010).

Our review suggests that tacit and explicit knowledge are important across multiple higher education processes and that leadership actions impact the processes that support or hinder knowledge flow and transfer. However, scholarship of the topic is focused on a limited number of knowledge contexts, mainly technology transfer of research activities, elements of internal organizational processes, and undergraduate education. The narrowness of this focus is exacerbated when technology mediated interaction is also considered. To date, only the impact of online education on knowledge transfer in undergraduate learning has been considered. However, even in this area, scholars are mixed on the impact of online education on tacit knowledge transfer and the processes necessary for such transfer (e.g., Tee and Lee 2013; Nilmanat 2011; Oztok 2013; Yunduan 2011).

Research Questions

In the Fall of 2020, due to the COVID-19 pandemic, all U.S. higher education establishments stopped face-to-face activities and went completely online with all instructional and most support operations. Given the lack of research on the effectiveness of higher education jobs in a telework context, as well as the challenges faced by individuals within those jobs, universities and policy makers have been left struggling to cope with the transition to telework (Chang 2020). Research is desperately needed in higher education to expand our limited understanding of the effect of telework on jobs with varying levels of tacit and explicit knowledge.

We developed the following research questions to guide a mixed-methods investigation into how higher education jobs with different levels of tacit and explicit knowledge are coping with the transition to telework due to the COVID-19 pandemic. Our broadest research question asks: *How effectively do university jobs transfer online?* Our more specific research questions ask: *Do high explicit and high tacit knowledge jobs transfer online equally?* And: *What challenges are identified for high explicit and high tacit jobs when performed online?*

Research Methodology

Research setting and participants

The Occupational Information Network 'O*Net', run by the U.S. Department of Labor, identifies and defines 33 knowledge areas that underlie all occupations (Peterson, Mumford, Borman and Jeanneret, 2001). To examine jobs that require differing levels of tacit and explicit knowledge, we select two knowledge areas that are present in higher education and have strong face validity differences in knowledge type. These were 'Fine Arts' with a strong tacit component and 'Clerical' with a strong explicit component. The O*Net definitions are:

'Knowledge of the theory and techniques required to compose, produce, and perform works of music, dance, visual arts, drama, and sculpture.'

and

'Knowledge of administrative and clerical procedures and systems such as word processing, managing files and records, stenography and transcription, designing forms, and other office procedures and terminology.'

Occupations were then identified within O*Net where these knowledge areas were very 'important' to success in the field. In the 'Fine Arts' knowledge area, 'Music Teachers, postsecondary' was identified. In the 'Clerical' knowledge area, 'Secretaries and Administrative Assistants' was identified. Data was collected from employees within these occupations working at a large state university located in the

Southeastern United States. Participants were limited to Fine Arts Music faculty and clerical and administrative employees.

This university moved to exclusively remote work starting on March 16, 2020. Data collection occurred during late March and early April. Thirty-three clerical and administrative participants completed the survey, while 32 Fine Arts Music faculty completed the survey. After adjusting for ‘straight lined’ responses (DeSimon, Harms and DeSimone, 2014), our final sample included 29 Clerical/Administrative responses and 28 Fine Arts Music responses. Sample characteristics are provided in Table 1.

Table 1: Sample Characteristics

Sample Characteristics	Total	Clerical (N=29)	Fine Arts (N=28)
Gender			
Male	19	3	16
Female	38	26	12
Ethnic or Racial Background			
Black/African American	3	3	
Hispanic	1	1	
White/Caucasian	51	24	27
Other	2	1	1
Age			
Under 30 years old	4	4	
30 to 40 years old	14	7	7
41 to 50 years old	9	3	6
51 to 60 years old	17	10	7
Over 60 years old	13	5	8
Occupational Status			
Full-time	45	28	17
Part-time	12	1	11
Years in Occupation:			
Less than 5 years	9	9	
5 to 9 years	17	9	8
10 to 20 years	18	9	9
Over 20 years	13	2	11
Highest Level of Education Completed			
Some College	8	8	
College BA/BS degree	9	7	2
Some graduate school	9	4	5
Master's Degree	15	8	7
PhD, JD, EdD, or other doctoral degree	13		13
Other	3	2	1

A mixed-methods procedure was used to exploit the advantages of both quantitative and qualitative methods (Greene 2007). Quantitatively, tacit and explicit knowledge was assessed using a composite measure (Wang & Wang 2012). Qualitatively, open-ended questions were posed to the respondents through a Qualtrics online survey.

Quantitative measures

Tacit and explicit knowledge for the two groups was assessed using modified behavioral scales validated in other studies (e.g., Shariq, Mukhtar, and Anwar, 2019; Wang, Sharma, and Cao, 2016; Wang, Wang, and Liang, 2014, Wang and Wang 2012). The scales were modified from a focus on organizational processes to specific knowledge competencies required within the specified knowledge area.

Prior to being presented with the scales, participants were given the O*NET definition corresponding to their respective knowledge area. Participants were then asked to rate the degree to which that knowledge area is enacted through different knowledge-based behaviors. Seven tacit knowledge and six explicit knowledge behavior items were measured. Each item was rated on a 5-point agree/disagree Likert scale. Items are provided in Appendix A.

The tacit and explicit scales demonstrated strong reliability between the two groups. Cronbach’s alpha for the tacit scale was .84 for the Clerical/Administrative group and .93 for the Fine Arts Music group respectively. For the explicit scale, Cronbach’s alpha was .71 for the Clerical/Administrative group and .83 for the Fine Arts Music group.

A single item was used to quantitatively evaluate the degree to which participants felt able to perform their job remotely. Participants responded to the item, ‘I feel that I am able to effectively do my job remotely,’ using a 5-point agree/disagree Likert scale.

Qualitative process and measures

NViVo (QSR international – version 12.6.0) was used to facilitate the content analysis of the written responses (Vaismoradi & Snelgrove 2019). Three researchers independently read the transcripts to identify major themes. The theme lists were compared to identify commonalities and missed themes. An agreed-upon theme list was developed and used to establish theme codes (See Table 2).

Table 2: Qualitative Themes

Themes & Subthemes
Productivity
- Technology
Work/Life Relationship
- Workload
- Commute
- Family
Social Connection
Stress

One researcher then completed an initial pass assigning codes to the responses. The two remaining researchers completed independent reviews of the initial coding effort. A final review with all researchers in attendance addressed any questions about initial and subsequent coding efforts. The final result was a completed coding product that all three researchers agreed represented an accurate reflection of the themes contained. Summary reports were generated for each group and these were studied to identify relationships with the quantitative data analysis.

Preliminary Results

Quantitative results

The two groups were selected for ‘face validity’ differences in their core knowledge areas. These differences were generally supported in the quantitative analysis. Results are presented in Figure 1. We anticipated that the Fine Arts Music Faculty would report more behaviors associated with tacit knowledge than the Clerical/Administrative employees. A Welch two sample t-test was used to compare the two groups. While the results were directionally correct, they were not significant; $t(48)=-.49, p=.63$. However, mean scores were in the anticipated direction, with Fine Arts Music faculty ($M=4.53; SD=.68$) having a higher reported use of tacit knowledge than Clerical/Administrative employees ($M=4.45; SD=.49$). In a larger sample, the directional difference we found would likely be significant.

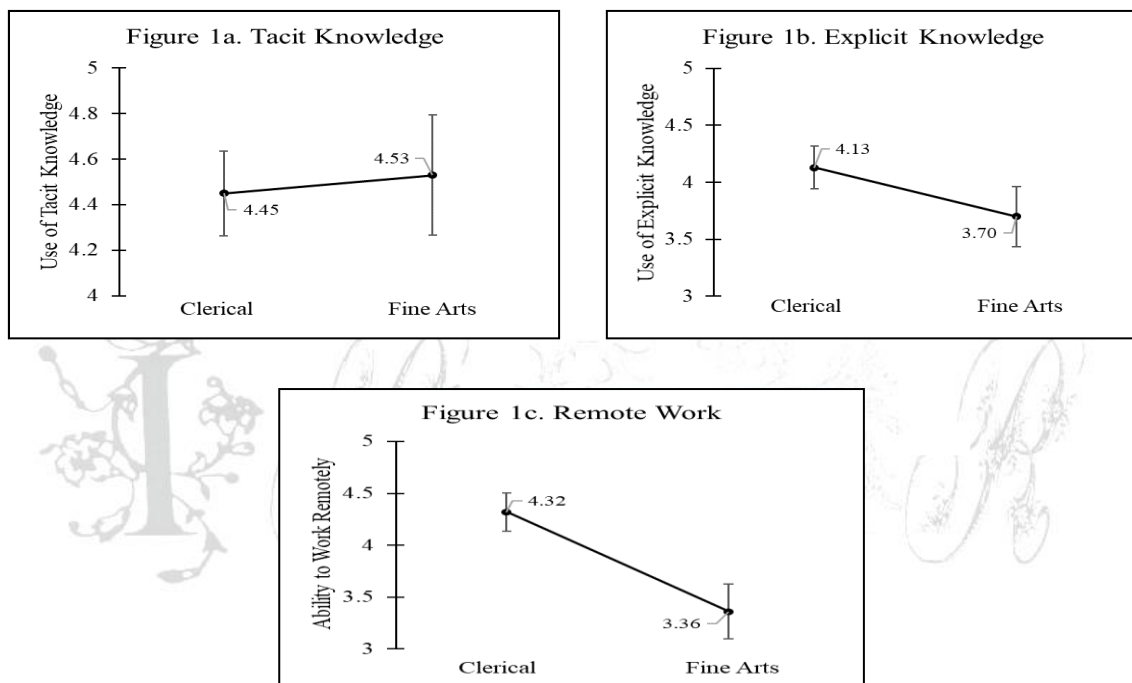


Figure 1: Comparison of mean scores; vertical lines indicate 95% CI intervals.

We also anticipated that the Clerical/Administrative employees would report more behaviors associated with explicit knowledge than the Fine Arts Music faculty. Our results supported this position $t(50)=2.37, p<.05$. Individuals in the Clerical/Administrative group ($M=4.13; SD=.58$) reported significantly higher use of explicit knowledge than the Fine Arts Music faculty group ($M=3.70; SD=.77$).

Given the nature of tacit vs explicit knowledge we expected that the group with higher explicit knowledge (Clerical/Administrative) would have higher efficacy remotely performing their job responsibilities. The results supported this finding. The Clerical/Administrative group ($M=4.32; SD=.85$) had a significantly stronger belief in their ability to complete their work remotely than individuals in the Fine Arts Music faculty group ($M=3.36; SD=1.19$); $t(43)=3.29, p<.01$. Our quantitative results found differences in explicit knowledge use with the Clerical/Administrative group having higher use of explicit knowledge behaviors than the Fine Arts Music faculty group. The Clerical/Administrative group also was more confident on their ability to effectively perform their jobs online.

Qualitative results

Participants acknowledged a wide variety of benefits and challenges related to the COVID-19 induced telework. Four overarching themes emerged: (1) Productivity, (2) Work/ Life Relationship, (3) Social Connection, and (4) Stress, each of which are briefly discussed.

Theme 1 – Productivity

The move to remote work had differential effects on productivity between the groups. The Clerical/Administrative group indicated the same or better level of productivity, with comments such as ‘It has allowed me to be extremely productive with sometimes better turnaround time for requests’. It appeared that the increase in productivity was partially attributed to a reduction in the level of distractions embedded in the office-based work environment and having the ability to use technology to effectively address remote work requirements. Respondents wrote ‘less impromptu meeting/visits from colleagues or students allow time for more productivity’ and ‘I’m still able to get all of my work done; the only difference is that I am not answering the phone or dealing with a physical walk-in.’ Other comments focused on the positive ability of the technology to address the needs of remote work: such as ‘I was pleasantly surprised to find that I am able to do every bit of my job, with the exception of ‘face to face’ meetings, remotely.’ However, coming up to speed on the remote technology has not been without challenge, ‘It has ‘forced’ me to become familiar and comfortable with virtual meeting platforms.’ There were also elements of computer mediated communication that were not seen as effective in a virtual environment ‘It is difficult to determine urgency of tasks and evaluate needs from others purely by email communication.’

The Fine Arts Music faculty had a less positive and more nuanced perspective on productivity. With respect to teaching, there was a general consensus that there was a loss in quality with comments such as: ‘I feel cut off from the full interaction without the time and energy in the rooms together. We are making it happen the best we can and there's hope but it's difficult for all’ and ‘Private music instruction is most effective when conducted live and in person’. However, some noted the potential for different degrees of effectiveness depending upon the student’s level of advancement, ‘I can teach online, but it only does so much good as the less experienced students really need ‘hands on’ to help correct issues with technique. More advanced students generally do better as it involves more conceptual teaching and less actual technique.’ Others commented on differences of teaching effectiveness depending upon the interactive and communal nature of the subject, ‘I typically teach one-on-one, so online lessons have worked well but in music we have challenges with ensemble and live performances that cannot be replicated online.’

While the Clerical/Administrative group found remote work technologies effective for the performance of their jobs, the Fine Arts Music faculty identified this as a limiting element of their teaching effectiveness with comments such as: ‘I cannot fix [their instruments] via Zoom or phone’ and ‘...so much of the arts, specifically music, is refined with nuances that are the essence of the arts and what separates the amateur from the master. With the inconsistency of internet connections, quality of audio and video, as well as simple things like camera angles, effective remote learning is impacted one way or another.’ The sentiment of the Fine Arts Music faculty on remote teaching can be summed up by one respondent who wrote ‘The work is far greater; the impact is far less.’

Theme 2 – Work/Life relationship

While there were some instances of specific tasks being eliminated, both the Clerical/Administrative and the Fine Arts Music faculty found an increase in workload. The Clerical/Administrative group noted the way ‘work time’ expanded with comments such as, ‘it is hard to shut work off’, ‘it has been more difficult to keep normal office hours’ and ‘Separating work and work-life balance is quite a challenge. Being at home makes it difficult to separate the two. Some days it feels like I work more and for too long.’ The

Clerical/Administrative group may also have been seeing an increase in actual workload, illustrated by a respondent who commented, 'combined with faculty, staff, and students requiring more assistance in many cases, it seems I now have more work than ever.'

The workload on Fine Arts Music faculty increased with the need to reinvent the curriculum, 'Converting my instruction for a performing arts course (Music) has significantly increased my preparation time for each course' and 'I have put a lot of time in learning to find a way to transmit musical experiences through the internet.' However, even after this initial effort, it would appear that higher sustained levels of work are still required for effective pedagogy. One respondent wrote:

Performance assessments with feedback would happen within minutes during a face-to-face class. Now, extensive feedback sheets must be produced to provide specific feedback directly on the printed music. All performance assessments must be submitted on video. Time to assess the class takes much more time due to the need to review each video separately.... Online instruction for my performance-based courses would not be sustainable for more extended time periods.

The two groups agreed that their workloads increased but for different reasons. The increase in workload for the Fine Arts Music faculty also seemed to be more sustained. Both groups agreed that the lack of a commute was a benefit, but this was much more prominent in the Clerical/Administrative group, likely due to the inherent lack of time flexibility of these jobs. The recapture of commuting time and increased time flexibility had a positive effect as one Clerical/Administrative respondent wrote:

It has been an amazing, rejuvenating experience ... I have very young kids who go to bed early, so with the commute included, I was feeling very out of balance in my time and energy devoted to work ... I feel like I am truly balancing work and family for the first time in my career.

Establishing a balance between work and home was a challenge for both groups. Concerns about managing children was more prominent in the Clerical /Administrative group. It was clear that the closure of schools was increasing the challenge of the situation. A member of the Clerical/Administrative group wrote 'I am juggling the balance of kids, a house and work. My job is a 40 hour a week job so now I'm having to balance it all. My husband works outside the home as an irrigation foreman so I'm home alone with the kids trying to work.' In comparison, a member of the Fine Arts Music faculty wrote 'My son (age 7) is out of school now, therefore I'm teaching him from home. I have enjoyed this opportunity to spend more time with him.'

While comments from both groups indicated challenges, such as the elimination of work boundaries and managing children, the overall comments were very favorable to improved work/life balance. Responses from the Clerical/Administrative group included 'So far, COVID-19 has allowed me to have a better work-life balance' and 'I find that 100% remote work has translated into a better work-life balance.' Similar comments are reflected in the Fine Arts Music Faculty such as 'It has, in many ways improved my work life balance, I'm sleeping more, getting a little bit more practice time in, exercising more, etc.' However, embedded the Fine Arts Music faculty comments are also concerns about the quality of their work, with comments such as 'I find that 100% remote work has translated into a better work-life balance because I worry less about it and because applied music courses (wherein playing together is the central focus of the courses taught) are far more difficult to effectively teach online.'

Theme 3 – Social connection

The move to remote work dramatically impacted the face-to-face interaction of both groups and stressed the social connections vital to effective work. Both groups felt the impact of being removed from their work relationships. Members of the Clerical/Administrative group wrote 'I do miss the interaction with colleagues', 'I miss being able to converse with faculty, staff, and students' and 'Working from home is

convenient, but human interaction, connectivity, and being 'seen' trumps the gas savings.' The Fine Arts Music Faculty wrote about similar concerns but those also extended more directly to the impact on their students. One respondent wrote 'I feel a huge disconnect with my students, even though we Teams our classes each day they meet. It's just different because I can't see all of their faces, or hear their voices - they appear to be disengaged and disheartened' and 'I have kept our class schedule to try to help my students maintain a routine, and have offered extra Zoom/Teams meetings for my students so that they can 'see' each other and try to avoid isolation.'

Theme 4 – Stress

There was a palpable difference in stress between the two groups, with the Fine Arts Music faculty indicating much higher stress levels. Comments from the Fine Arts Music faculty grouped around three concepts: the stress of teaching, the stress of personal uncertainty, and the stress of student financial and career path uncertainty.

The increase in the immediate workload due to the transition and the long-term problems of teaching skills not well suited for computer mediation created a stressful situation for the faculty. While discussed previously, two comments reiterate the issue: 'Teaching 51 students across 3 classes online has been difficult and stressful. We were given such short notice to convert our courses' and 'I do not think this job should be done remotely if face-to-face is available, and feel it is not best for my classes and my students.'

The move to online and the elimination of external music-related work has created strong personal uncertainty around career and finances for members of the Fine Arts Music faculty. This is shown in comments: 'To say I have been impacted in my life, work, and career is an understatement. I'm fearful of being furloughed, because I work in the arts. Even though I am a tenured faculty member, I know there are no guarantees with what the future holds', 'I have lost thousands of dollars in guest conducting and clinician engagements that I was invited to participate in' and 'I've lost a great deal of "gig" work and income from COVID-19.'

An added area of stress for the Fine Arts Music faculty is the pressure being imposed on their students now and, potentially in the future: One faculty respondent wrote: 'The students are overwhelmed by having to exchange their music for a pen and paper, and are also having financial issues to even stay focused/engaged in their courses' and 'I am wrestling with the fact that I am assisting students in a career path of an art form that currently has the majority of its personnel without work, in the same pool of competition for online teaching and performances, as well as wondering how it will shape and affect the ability to thrive in the future.'

Discussion

Knowledge differences, Job Performance and Challenges

This study had several research questions, with our broadest research question being, '*How effectively do university jobs transfer online?*' The Clerical/Administrative knowledge group exhibited greater explicit knowledge behaviors and was more confident of their ability to remotely execute their jobs. The Fine Arts knowledge group exhibited lower explicit knowledge behaviors and were less confident in their ability to work remotely. It makes sense that the group with higher explicit knowledge behaviors would be more confident remotely doing their jobs as explicit knowledge should be easier to remotely implement and exercise. Our tacit knowledge behavior measures were directionally correct but were not significantly different between the two groups. While the ability of university jobs to effectively transfer online is complex, we believe an important consideration for administrators is the type of core knowledge required of the position.

Our more focused research questions were ‘Do high explicit and high tacit knowledge jobs transfer online equally?’ and ‘What challenges are identified for high explicit and high tacit jobs when online?’ Even though we were not able to quantify tacit knowledge behavior differences between the two groups, our qualitative results shed light on these research questions given the face validity of our two groups.

The Clerical/Administrative group identified similar or increased levels of productivity. They credited a more focused remote work environment that was removed from the interruptions and distractions of the office environment. They also found that remote technology was effective for them in completing their jobs. The same could not be said for the Fine Arts Faculty. They identified a loss of effectiveness in teaching and the inability of the mediating technology to substitute for the in-class experience (Jensen, Price and Roxa, 2020). From a productivity perspective, the high explicit group was able to transition more effectively to remote work than the high tacit group.

Improvements in Work/Life Relationships were seen in both groups. The lack of a commute was jointly seen as a strong benefit. There was also a benefit to both groups related to the time flexibility of remote working although this effect was more pronounced in the clerical group. While both groups saw an increase in workload, it did appear to be coming from different sources. The high explicit clerical group identified an increase in workload coming from additional requests for assistance due to the remote transition. It can be reasonably assumed that as remote work would become more familiar to all, the requests for additional support would subside. The high tacit fine arts music faculty group identified an increase in workload due to a need to reinvent the curriculum, feedback mechanisms and to support the students in the new environment. There was an expectation that sustained high levels of additional work would be necessary to be effective in a remote environment. The tacit nature of music education was contributing to the increase in the work necessary to be effective.

Social connection was stressed in both groups as the lack of face-to-face interaction in the remote environment was a challenge. While both groups mentioned the lack of interaction with colleagues, the faculty group more prominently mentioned the lack of interaction with students. There is a potential tacit knowledge effect here. Interpersonal relationships are important to tacit knowledge transmission. To be effective educators, the Fine Arts Music faculty have likely developed strong relationships with the students they teach. As such, they are likely more sensitive to the disruption of those relationships.

Stress was much more prominent in the Fine Arts Music faculty. This appeared to originate from sources that can be traced back to the tacit nature of the core knowledge of the field. Stress was being induced from the remote challenges of teaching music, including ensemble instruction. Added stress was coming from the knowledge that the entire field of music education had moved to remote delivery, thereby setting up hiring challenges for students in the program. Finally, stress was being induced from the loss of external revenue opportunities that were often tacit driven, such as guest conducting, lessons or clinician engagement.

Application for higher education management and leadership

The impact of knowledge difference extended well beyond a simple productivity effect. The challenges of operating a core tacit knowledge base in a remote way created differential issues that extended into work/life relationships, social connections and overall stress (Mohammadi and Karupiah 2020). These findings have implications for the way higher education management and leadership supports remote operations over the long term and identifies potential challenge areas when making these changes. In doing so, these findings help higher education leaders enact change with a better understand the ramifications of their decisions, a critical component to successful stewardship in change management (Drew 2010; McRoy and Gibbs 2009; Thompson and Miller 2018).

While we chose Fine Arts Music due to its high tacit knowledge content, other disciplines are likely to have various levels of tacit knowledge. A deep understanding of this variation is important for administrators and leaders as they design remote operations. Positions with higher levels of tacit knowledge are likely to need greater support in any number of ways. For instance, technology solutions that are appropriate for positions with strong explicit knowledge cores may not be effective for positions with strong tacit knowledge cores. Supportive services, such as Employee Assistance Programs, could be more targeted or designed to be more proactive for high tacit positions.

We expect this effect to extend to individuals working in positions of leadership as well. Given the higher stress levels found in the high tacit group, we expect that leaders with strong Emotional Intelligence (Salovey and Mayer 1990) may be more needed in high tacit programs. Developed Emotional Intelligence ability has been shown to increase the level of tacit knowledge sharing among organizational members (Othman and Abdullah 2012). As higher education moves into a new more remote phase, it will require all of us to have a deeper understanding of the ways core knowledge in our disciplines is operationalized and transmitted.

Limitations and Future Research

While providing novel insight into the knowledge differences between occupations within higher education and their ability to cope with the transition to online work in response to COVID-19, the current study has a number of limitations and opportunities for future research. Most notably, the study was conducted with only two occupations, selected for their anticipated variance in knowledge use, further occupations should be examined. For example, future research could examine how faculty from different colleges vary in their explicit or tacit knowledge use. A more granular approach could compare faculty within the same college, but working in different fields of study. Organizational culture has also been found to influence instructor's willingness to engage in innovative teaching approaches, such as online instruction (Zhu and Engels 2014), and therefore might influence how individuals in high tacit level jobs respond to the transition to remote work. While we anticipate our results to generalize across most institutions, expanding the study to include multiple universities or colleges might provide insight into how organizational culture relates to the current findings.

Study also encourage researchers to build on the current study by examining the knowledge core of often neglected occupations within higher education research (e.g., administrators, technical support, advising, etc.). By establishing a broader understanding of how different occupations across higher education use explicit and tacit knowledge, novel mechanisms and processes for adapting to remote operations could be uncovered, as well as ensuring occupations receive the individualized attention needed to maintain the overall effectiveness of their institution. Another potential avenue for future research involves further developing the behavioral tacit and explicit knowledge index for higher education. While our small samples results are promising, further development and a larger validation will give greater numerical accuracy to measures of tacit and explicit knowledge, allowing a wide breadth of research. As higher education continues to adjust to remote jobs forced by COVID-19 (e.g., Bao 2020; Crawford, Butler-Henderson, Rudolph and Glowatz, 2020; Toquero 2020), understanding how occupations within higher education are able to adapt to online and remote work will remain a critical investigation. We encourage researchers to leverage the findings in this study to carry on in this pursuit.

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