Cultivating Digital Skills: Assessing Trainee Digital Skills and Individual Needs

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Abstract: It is widely recognised that having applicable digital skills is crucial to a lot of professions and is highly relevant to economic growth and digital transformation. Additionally, a lot of digital training does not consider, the specific needs of the individual. As such, this paper presents an adaption for means of digital skills assessment and training readiness, and practical skills appraisals, which allows training to be modified to individual needs. This paper focuses on a skills' assessments (appraisals) for working professionals that are not in traditionally IT specialist roles such as physio therapists and food technicians, specifically in how working professionals can be assessed and better prepared for digital upskilling. An adapted framework is motivated by using concepts of digital skills' assessment by Van Laar et al. (2018), which includes adapting their established set of measures for 21st century Digital skills. The results and findings, to date, are based upon twelve skills appraisals and six short training sessions, across six participants. Resulting in qualitative data in the form of researcher observations and participant narrations over skill-based activities with non-IT based professionals. Participants were recruited primarily from a regional skills support scheme focused upon digital skills' development, for people in employment. The aims of this paper are to report the findings of active research and to provide initial insights regarding strategies for digital trainers. The suggested approaches are intended to highlight areas of interest and focus for trainees. These approaches should benefit skills development and delivery for a large population of non-IT based professionals.

Keywords: Digital skills assessment, Digital training, Individual differences

1. Introduction

As technology and its use in the world changes, it is unsurprising that a lot of businesses need to move with technology to survive (Rayna and Striukova, 2016). However, reliance on technology requires that professionals are at an implicitly presupposed level of digital literacy. The precise employer expectation is rarely articulated and frequently employees require on-hand support. Examples of on-hand support can range from employment inductions, annual CPDs (Continuous Professional Development) to day-to-day live support services. The professionals considered in this paper are exactly those who are non-IT based Professionals (NITBPs) but are presumed to be digitally literate. Examples of NITBPs are working professionals that are not in traditionally IT specialist roles such as physio therapists and food technicians whose work context indirectly benefit from good IT related skills.

Consequently, technological reliance requires that the training given to NITBPs by their employer is understood and meets employer defined standards. Unfortunately, a lot of digital training does not consider the specific needs of the individual, which leaves a lot of gaps in knowledge and skill, necessary to utilise training given (Barbosa et al., 2022). Some of these gaps might have been addressed through already established on-hand support (likely in-person), including getting started hurdles such as connecting securely using a VPN.

Although digital skills training methods and materials have improved in recent years according to the growth of technology (Marra, 2022), identifying individual needs through assessing and baselining digital skills and digital literacy prior to training is still not commonplace (Martínez-Gutiérrez et al., 2023).

The main goal of this paper is to report preliminary findings from active research examining how to identify and meet the individuals' needs. This is achieved by utilising a modified digital skills instrument (DSI) from van Laar and others (2018), and collecting and analysing qualitative observations and, participant narrations. Data from six digital skills appraisals, involving both pre and post training, is focused upon.

This paper introduces a framework being developed by this author, which is currently in progress. Initial findings from that wider work are reported and discussed in this paper.

2. Theory

To understand the impact of "gaps in knowledge" (Barbosa et al., 2022) NITBPs are likely to have, an assessment relevant to the specific individual must be identified. However, the concepts of "individual needs"

and "individual's needs" within the digital training research area often used synonymously while also defined in several ways. Lee et al. (2021) defined individual needs by focusing on the general implementation of learning tools and strategies, including students, technology devices and emerging learning processes. Further, their definition of individuals needs is scoped at the macro level, particularly the "student" entity, not the person, being generalised. Lee et al.'s (2021) approach is useful when assessing a larger volume of participants based on the common interactions had with mobile devices, though this method lacks the granular detail and nuances.

Reyes-Millán et al. (2023) discuss individual needs through focusing on pedagogical approaches such as, follow-up tools and sessions offered to their students and, having digital resource easily available. Their suggestions would support the need for granular detail and afford some customisation to the individual, however that depends on the individual being able to fit in categories where there is resource, and the individuals being able to identify their own needs.

A combination of definitions (Barbosa et al., 2022; Lee et al., 2021; Reyes-Millán et al., 2023) is used to partially identify the generalised individual needs NITBPs would have, for example: a laptop, a user licence to software, or access to learning material which would be common across participants. This includes the specific needs of the individual such as extra tutoring or role specific work instructions. This research focuses on the specific needs of NITBPs. Identifying and addressing identified individual needs, requires a method of assessment and measurement. To achieve this, a boundary for identifications must be set where there is commonality between NITBPs, and a tool widely used by NITBPs. For this research, the tool "Microsoft Excel" was chosen, as working with spreadsheets is common across most industries (Broccardo et al., 2024; Del Val Núñez et al., 2024) and most devices used by professionals being Microsoft based (StatCounter Global Stats, 2024).

Recognising that although gaps in knowledge and individual (NITBP) specific needs, are nuanced to them, some generalisations and assumptions must be made to establish a framework for assessment that can be used across all NITBPs that participate in this research. A further boundary based on common "topical" interactions with spreadsheets, for example, basic arithmetic, data presentation and bookkeeping (Reid et al., 2023) must be defined for this research. Topics in these areas include functions such as "SUM," "AVERAGE," "IF" and, other functions for formatting such as, highlighting and merging cells.

The functions within topics require a delivery method from researcher to NITBPs to check if they can perform the set activities, and then appraise their skills accordingly. However, research shows that references to Excel "functions" by name is often considered technical jargon to NITBPs, even though they may already know how to perform the activity (Amran et al., 2017; Pals, Tolboom and Suhre, 2023). This identifies a need that NITBPs would have to understand the requirements of the task in the same context as the intended delivery. However, ensuring that the context is understood as intended is not guaranteed. A strategy to address this need is to check understanding of the underlying functions through different activities. Consequently, employing this strategy introduces a risk where the researcher should be mindful that stimulus satiation is more likely to occur, and result in diminishing returns (Association for Computing Machinery, 2013).

2.1 Summary

To assess NITBPs individual needs and understand the gaps in their knowledge, a digital skills instrument (DSI) needs to be devised. The DSI would need to be scoped to Microsoft Excel, support multiple areas (topics) that check for fundamental understanding of an Excel function (skill). Additionally, performing these checks through multiple activities (sub-task) that require NITBPs to use the same functions in different contexts to validate gaps.

3. Methods and Methodology

To perform the appraisal, NITBPs were recruited through opportunistic responses to NITBPs enquiries focused mainly upon SMEs where formal training programmes and support mechanisms are less likely. Eligible participants were given an initial skills appraisal to highlight their individual needs. The research results reported later, focuses on the skills appraisal process which is shortened to "the process of setting participants a series of skill-based sub-tasks for the purpose of assessing their digital skills needs." This results in an individualised account of needs and how to identify them by implementing the skills appraisal. To organise, structure and implement the skills appraisal, the skills appraisal was separated into "Blocks." The design and delivery of these blocks were the product of van Laar et al.'s (2018) instrument and modified to address this

paper's aims. The details of block design and delivery are to be reported elsewhere. Here we focus primarily upon findings from the skills appraisals.

3.1 Qualitative Approach

Although the skills appraisal highlights individuals' differences and needs through performance, highlighting individual needs from the perspective of the participant is needed as participants may understand the skills, but lack confidence within their own skills. Observations and participant narrations offer a unique perspective into participants thought process under simulated conditions, to inform areas of focus which may not be objectively skill-based issues.

3.2 Skills Appraisal Development

The skills appraisal was developed based on the digital skills instrument by van Laar et al. (2018) and then refined through piloting. Van Laar et al. (2018) adapted a framework with "core 21st-century digital skills" list, developed by Van Dijk and Van Deursen (2014). The list had seven main topic areas: Technical, Information Management, Communication, Collaboration, Creativity, Critical thinking and, Problem Solving. Each were defined along with operational components such as, "…The skills to use ICT to transmit information to others, ensuring that the meaning is expressed effectively. -Skill: transmitting information…," when defining the "Communication" topic area. Van Laar et al. (2018) 's adapted framework kept some of the topic areas however, they included new and additional topics specific to their interest in creative industry professionals. Some existing topic areas were modified slightly and, a key difference is that they collected their data quantitatively through survey results. This was to measure "skill factors" consistency, while supporting their initial "cognitive interviews" (van Laar et al., 2018).

This paper utilises parts of Van Laar et al. (2018) 's "…digital skills assessment…" framework and approach; however, further developing their framework to the needs of this research. A key difference between this research and, van Laar et al. (2018)'s is the participant focus area. This research focuses on individual differences and needs, and according to the perspective of trainer and trainee. Whereas in contrast, Van Laar et al. (2018) s and Barbosa et al. (2022) focused on the generalised skill and performance metrics.

3.3 Pilot Study

To validate and verify the framework changes and application, a pilot study was conducted. The data gathered was from observations of participants attempting a list of applied spreadsheet problems. The selection criteria for the five pilot participants included that they must work in an IT based profession (e.g. IT Manager). Piloting the framework also allowed task complexity to be reviewed and, the scale and scope of the skills appraisal to be validated.

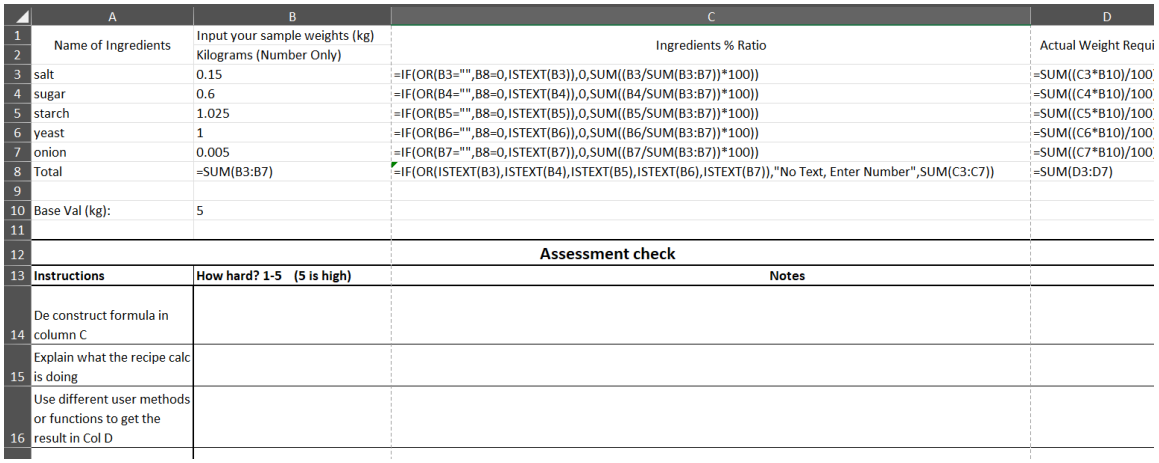
A discovery in the pilot study showed that, pilot participants were looking up functions and guides using their own mobile devices e.g. laptop and mobile phone, during the skills appraisal. In response to this, more time was added while the skills chosen were simplified. When pilot participants asked which browser to use, the adjustment was made to pre-open apps needed. When instructions and description were accidentally confused, the pilot participants were given instructions in a separate application to Excel.

These discoveries are expanded:

- The initially allocated time is not long enough which was a target time between 5 and 10 minutes.
- Some of the Excel functions chosen were too complicated e.g. XLOOKUP() function.
- The delivery of the appraisal had to be in-person as these participants had used their mobile devices to search for answers or help, which would be difficult to observe via webcam.

Changes were made with each iteration and the result is shown in figure.1. Substantive features were:

- Increased allotted time to 15 minutes to complete the appraisal, providing enough time for the participant to make a realistic attempt and not be rushing.
- Selecting simpler skills and changing topics to be more approachable, so participants would consider an attempt rather than be deterred by the complexity of the sub-task.
- To simplify the appraisal process and prepare for a consistent experiment, participants were handed an appraisal ready Windows laptop. The laptop required no configuration and set-up by participants.



	A	B	C	D
1	Name of Ingredients	Input your sample weights (kg)	Ingredients % Ratio	Actual Weight Requi
2		Kilograms (Number Only)		
3	salt	0.15	=IF(OR(B3="",B8=0,ISTEXT(B3)),0,SUM((B3/SUM(B3:B7))*100))	=SUM((C3*B10)/100
4	sugar	0.6	=IF(OR(B4="",B8=0,ISTEXT(B4)),0,SUM((B4/SUM(B3:B7))*100))	=SUM((C4*B10)/100
5	starch	1.025	=IF(OR(B5="",B8=0,ISTEXT(B5)),0,SUM((B5/SUM(B3:B7))*100))	=SUM((C5*B10)/100
6	yeast	1	=IF(OR(B6="",B8=0,ISTEXT(B6)),0,SUM((B6/SUM(B3:B7))*100))	=SUM((C6*B10)/100
7	onion	0.005	=IF(OR(B7="",B8=0,ISTEXT(B7)),0,SUM((B7/SUM(B3:B7))*100))	=SUM((C7*B10)/100
8	Total	=SUM(B3:B7)	=IF(OR(ISTEXT(B3),ISTEXT(B4),ISTEXT(B5),ISTEXT(B6),ISTEXT(B7)),"No Text, Enter Number",SUM(C3:C7))	=SUM(D3:D7)
9				
10	Base Val (kg):	5		
11				
12			**Assessment check**	
13	**Instructions**	**How hard? 1-5 (5 is high)**	**Notes**	
14	De construct formula in column C			
15	Explain what the recipe calc is doing			
16	Use different user methods or functions to get the result in Col D			

Figure 1: Skills appraisal used and refined in the pilot study.

With these adjustments, the implementation process became: A skills appraisal given face-to-face, on an windows laptop with Microsoft Excel, Word (365) and a Firefox browser open and visible. A windows laptop is given to participants with Excel open on one side of the screen (70%), Word (30%) on the other. Firefox was on top of Excel and Word.

3.4 Skills Appraisal Design and Structure

The skills appraisal involved "Blocks" of exercises and, each block has a shared goal of checking the basics of each skill and, application of the intended skill within each block. The blocks and their components are shown in Table.1-3, and are described below in terms of Topics, Sub-Tasks and Criteria:

Topics are groupings of sub-tasks but within a generalised scope. For example, one topic is arithmetic which has three sub-tasks: adding two whole numbers, finding an average of five numbers, and adding two floating numbers.

Sub-Tasks are the skills assessments' instructions to the participant, completion of which demonstrates a skill. For example: a participant would be asked to find the average of a set of numbers using Microsoft excel functions and formula. Sub-tasks are a key element of the framing of this research, as they are the indicators of individual needs.

Criteria are the correct result of the sub-task instructions and are also per sub-task. Criteria are defined below to give the researcher indication of completion and guidance of skill acquisition. To identify individual needs, criteria is not given to participants as that introduces the risk of participants only focusing on the criteria, rather than the sub-tasks. During the skills appraisal, only sub-task instructions were given to participants, not the criteria.

Following an initial skills appraisal, training was provided to each participant and then a second skills appraisal. The same appraisal process was followed each time and all iterations of skills appraisals given to the participants, are identical in process, instruction, and behaviour, to minimise the variation and influence, while maintaining a consistent experiment. This was done even in cases where the participant timed out for the allotted time (Van Laar et al., 2018). Materials provided for the appraisal are shown in figure.2 and figure.3.

Block A & B	
Questions	
1. Add two numbers	
a.	58 and 98
b.	158+76
2. Find average of 5 numbers	
a	43
b	66
c	34
d	78
e	117
3. Check IF number is below 20	
a.	Floating number
b.	IF(A1<0,yes,no)
c.	Value greater than 120
4. Write a recipe	
5. Format recipe	

Figure 2:Questions given to particpants after refinement

Block C & D			
Name of Ingredients	Input your sample weights (g)	Ingredients % Ratio	Actual Weight Required
	Grams (Number Only)		
salt	150.00 g	6.58 %	65.79 g
sugar	600.00 g	26.32 %	263.16 g
starch	1,025.00 g	44.96 %	449.56 g
yeast	500.00 g	21.93 %	219.30 g
onion	5.00 g	0.22 %	2.19 g
Total	2,280.00 g	100.00 %	1,000.00 g
Base Val (g):	1,000.00 g		

Explain what you think the presented spreadsheet is doing
Check values are correctly calculated
Reproduce any of the formula
Deconstruct the nested IF formula
Correct formula

Note: The below is to demonstrate to research the formula used. The participants only saw Col.A-D			
Name of Ingredients	Input your sample weights (g)	Ingredients % Ratio	Actual Weight Required
	Grams (Number Only)		
salt	150.00 g	=IF(OR(B22="",B27=0,ISTEXT(B22)),0,SUM((B22/SUM(B22:B26))*100))	=SUM((C22*B29)/100)
sugar	600.00 g	=IF(OR(B23="",B27=0,ISTEXT(B23)),0,SUM((B23/SUM(B22:B26))*100))	=SUM((C23*B29)/100)
starch	1,025.00 g	=IF(OR(B24="",B27=0,ISTEXT(B24)),0,SUM((B24/SUM(B22:B26))*100))	=SUM((C24*B29)/100)
yeast	500.00 g	=IF(OR(B25="",B27=0,ISTEXT(B25)),0,SUM((B25/SUM(B22:B26))*100))	=SUM((C25*B29)/100)
onion	5.00 g	=IF(OR(B26="",B27=0,ISTEXT(B26)),0,SUM((B26/SUM(B22:B26))*100))	=SUM((C26*B29)/100)
Total	=SUM(B22:B26)	=IF(OR(ISTEXT(B22),ISTEXT(B23),ISTEXT(B24),ISTEXT(B25),ISTEXT(B26)),"No Text, Enter Number",SUM(C22:C26))	=SUM(D22:D26)
Base Val (g):	1,000.00 g		

Figure 3: The recipe calculator and questions related. Both user and formula view

The *training between* skills appraisals, was the same content for each participant, however with emphasis on the individual's needs to account for their developing skills. Participants often asked for clarification to sub-tasks, which was not given as it would invalidate the experiment. Consequently, almost all participants asked for clarification on some of the intentionally ambiguous sub-tasks which were left to the participants to infer meaning on their own. This was to encourage participant resourcefulness (Reyes-Millán et al., 2023). Once participants realised, they would not get clarification from the researcher, most assumed understanding of the nature of the appraisal and stopped asking the researcher and started exploring functions and tools within their reach. The tables below (Table 1, 2 & 3), are the summarised skills and criteria from figures 2 and 3. Skills are grouped into topics and delivered as sub-tasks to check the skills under multiple contexts. This offers multiple results for the same skill without the participant repeating the same answer. The criteria are only for the assessor as an indication to what the participant can do.

Table 1: Topic area and criteria for questions given to participants.

Block A	**Instructions given within a word document, at the beginning of the appraisal. Checking for basic skills (Maths, functions in general and IF () function specifically)**	
Topic	**Sub-Tasks**	**Criteria**
Arithmetic	Add two numbers	Can add any two numbers
	58 and 98	Can add specified numbers
	158 + 76	Can recognise variation
Tool Functions	Find average of 5 numbers (43,66,34,78,117)	Understands how average works in mathematics
	Write in cell	Can recognise technical jargon and use a cell
	Function	Can use average() function
	Ribbon	Can find and use the average() function from the Ribbon
Core functions	Check IF number is below 20	Can recognise a logical test: IF() Function
	Use a floating number	Can use IF() function with fractions
	IF(A1<0,yes,no)	Can use IF() function with a cell reference
	"IF" Use any value greater than 120	Can use IF() function in their own way

Table 2: A more challenging version of Block A topics.

Block B	**Open ended instruction given at the same time as Block A. Checking for participant awareness of the context. Using Excel functions vs Manual entry**	
Topic	**Sub-Tasks**	**Criteria**
Complexity & Combination	Write a recipe	Can apply knowledge from Block A and write a recipe
Complexity & Dissemination	Format a recipe	Can apply knowledge from Block A and use formatting functions

Table 3: Criteria for Figure 3, for both Blocks C and D.

Block C & D	**Challenging "Recipe Calculator" given to participants after Block B is complete. Checking for transference of skills acquired in Blocks A &B in a new context.** **Block C unit of measurement = Grams** **Block C unit of measurement = Kilograms**	
Topic	**Sub-Tasks**	**Criteria**
Arithmetic	Explain what you think the presented spreadsheet is doing	Show understanding of task being formula based
Tool Functions	Check values are correctly calculated	Understanding the use of cell reference
	Reproduce any of the formula	Understanding of how to build a formula
Core functions	Deconstruct the nested IF formula	Understanding of combining a cluster of formula
	Correct formula	Correcting an issue within the formula

4. Findings and Results

Although the data collection was successful, analysis of observation data showed that some participants did not demonstrate understand of the overall topic within a block but were still able to meet sub-task criteria. This was particularly an issue as it was not clear if participants had guessed and got lucky or, if participants already knew the skill but did not demonstrate or articulate well. Groupings like these examples were noted down and created a theme, such as "Guessing."

4.1 Pre- Analysis and Emergent Themes

As the data is qualitative in the form of researcher notes, observations, and participants narrations, NVivo 14 was used paired with manual (by-hand) thematic coding to check the validity and reliability of data coded in NVivo 14. After performing manual coding by hand on a small subset of data (Patil, 2023), much of the data could then be entered into NVivo 14 for manual (non-AI) tool assisted coding. Tool assisted codes were compared against manual coding to ensure validity and minimise any loss of insights, by confirming consistency between both sets.

4.1.1 Brief analysis of some themes

To understand if individual needs were identified and addressed, coded data is thematically organised and analysed (Patil, 2023). In Appendix-3, emergent themes are outlined and described some of which are analysed below:

Resourcefulness in this research is utilisation of tools and functions available to participants. This includes using Excel in-built functions or searching via the internet. Most participants demonstrated resourcefulness after training given, particularly within Block A: Core Functions, where the "IF()" function as introduced. However, this was expected as the training given demonstrated ways to find and use functions in the sub-tasks, and the "IF()" function was found challenging, due to the vagueness of the function title "... bit vague, what do you mean 'if'?" (P3).

Coping Mechanisms are actions or strategies that participants use when they are unsure of what to do. In the appraisals, coping mechanisms are identifiable through abandoning a sub-task attempt method, in favour for another more familiar strategy. Coping mechanisms are evident across all sub-tasks, for example: participant 4 (P4) could not find the function to complete the average() sub-task within Block A:Tool Functions, P4 expressed the calculation manually, then wrote the answer after "...shrugging their shoulders…".

However, the frequency of the "coping mechanisms" theme poses a commonality issue with a theme later defined: "Given up," as using a different strategy can be interpreted as giving up on a previous strategy.

Given Up is defined as abandoning a sub-task, which was commonly found in more challenging blocks such as block C and block D. This was expected, particularly before training was given, as participants new to those functions and their complexity, would likely attempt the sub-task partially, or not attempt at all. Coincidentally, "skipping" a sub-task could also be interpretated as giving up, for example: after training given, participants ignored sub-tasks they had already done within their first skills appraisal stating "… I've already done this one last time …" (P4&1) and moving on to challenging sub-tasks they did not complete within the first appraisal.

Skipping is defined as not attempting a sub-task at all in skills appraisals and, is an expected theme because of the assumption by participants that the answers within the first appraisal did not need repeating within the second appraisal. Skipping was prevalent within the simpler blocks A and B, during the second skills appraisal.

Manual effort is where participants resorted to manually calculate answer instead of using functions required by the sub-task. This was common with blocks that had simpler arithmetic as some participants, used that manually calculated result to check the validity of an answer using core functions in Excel, such as, mentally adding all the numbers and comparing that result against a result from the SUM() function. P4 commonly described the function and wrote down the answer, as opposed to using the required excel function. However, P3 stated that they did not understand what the task required, but still attempted to use the formula after having an answer to "…work back from…". Although done incorrectly, P3 demonstrated understanding the core concept through manual intervention.

4.2 Findings and Results Summary

Current findings and analysis show that participants do recognise that they are not confident in their abilities, irrespective of actual skill and task completeness. Most observations note that participants revert to what is comfortable when faced with a problem they do not understand. However, counter-intuitively, once participants understand the problem, there is a high chance that when presented with the exact same problem, are likely to intentionally skip repeating the task, and want to focus on an interest area.

An example is when P1 was more interested in further training after the last skills appraisal but specifically for skills they found interesting or fun. Another example is where observations of P5 highlighted an unintended consequence of explanation limitations. P5 was more motivated to fixing a formula issue rather than the meaning behind the task. For instance, P5 had already understood a combination of Excel functions (IF, SUM and ISTEXT), and spent the remainder of the appraisal fixing that combination rather than to move on to the next task which utilised those functions with an example.

Furthermore, identifying individual needs was much simpler once the initial baseline skills appraisal was conducted, and in some cases, the participants recognised their own individual needs because of the appraisal.

5. Discussion and Conclusions

5.1 Framework vs Emergent Themes

When comparing emergent themes against the delivery of the skills appraisal, it is unsurprising that participants that were observed to have struggled the most, attempted the most that they could within the given timeframe and showed more careful thought of the task at face value. Observations noted that they were understandably visibly stressed but they followed through the intended framework. When comparing the sentiment of each theme, the baseline appraisal would be mostly negative, particularly as an explanation as to why participants won't get the "Correct answer", before participants attempted the task.'' I don't know what this means but I know how to add these two. So, which of these are the bit that I need." (P4). However, after the short training session, the sentiment to theme was largely positive, even when the result was failing to solve the task. These participants largely fit into the Coping Mechanisms theme.

Interestingly, the participants that were more confident with Excel, irrespective of their measured skills, guessed more often on the easier sub-tasks and topics to save time. Their efforts were more directed toward the harder challenges they noticed during their initial task appraisal. This resulted in these participants not getting the benefit of the framework structure which is designed to encourage the use of the skills they would need. Some of these participants did not necessarily perform much better than those with lesser knowledge of Excel, though observations note that their confidence and resourcefulness was much higher. The researcher noted that this unintended outcome was surprisingly positive, as these participants were more willing to take the challenge, albeit more difficult as they had skipped the sub-tasks that built the foundations of said skill.

5.2 Why Individual Needs Matter

As expected, each participant had prior knowledge or at least awareness of the core tool Excel. Each participant had unique experience with Excel prior to the appraisal process, which meant that each participant had a unique starting point. For example, some understood the Microsoft 365 design language and could navigate the "ribbon", even though they had hardly ever used Excel, these participants were more likely to be positive as the learning curve appeared to be simpler. Other participants such as P4 had worked in previous versions of Excel so they understood the structure for functions and how to diagnose issues they had, even though they may not have understood the mathematical and logical requirement to each task. However, none of the participants had expressed familiarity with the more complex topics of deconstructing a cluster of formulae.

Every participant within this paper, had at least one topic they struggled to complete or attempt within the baseline skills appraisal. This made the training given relatively linear as it was already obvious to the researcher which topics the participants would focus the most on. Irrespective of the above, all participants received training in the skills in the exact same way. This ensured that all participants could still be measured in an identical fashion for the purpose of this research.

It is important to note that the training given did not address any of the sub-tasks directly, but rather focused on the skill without explicitly stating the skill (Patil, 2023). For example: The researcher demonstrated accessing an IF() statement in three separate ways: Ribbon and then functions menu, typing a basic IF statement within a cell to reference another value (text based instead of arithmetic), using the inbuilt

functions shortcut to access the IF() functions help blurb. Most participants recognised what they had misunderstood or got wrong.

Wider research that this researcher is actively involved in applies an adapted framework on the digital skills training portion as well as the digital skills appraisal, the intention being to target the participants individual needs outlined in both interviews and skills appraisals (Barbosa et al., 2022).

5.3 Face-To-Face VS Online Training

Some of the challenges in providing digital training are the differences in the different versions of the same software as some functionalities vary with each iteration of the Microsoft suite. Additionally, the different experiences of the participants posed a challenge, for example those who are used to Windows versus Mac. To ensure a consistent experience for participants we had to make sure that everyone used the same version of the same software.

The considerations to mitigate the challenges were either; face-to-face via a physical device that is prepared ahead of time and, that is handed to the participant and used exclusively for the allocated tasks, or to have online participation through a virtual machine that simulates the appraisal parameters required. However, the challenges of online training include participant connectivity for virtual assessment could not be guaranteed, which may cause additional stressors to participants, and it would be impossible to know if participants have lost connection or just quit. With these considerations, the appraisal process had to be face-to-face.

Additionally, the appraisal process being face-to-face also allowed recording of observations such as narration of actions and thoughts, monitor physical interactions with the supplied device, keep track of when participants used pen and paper to write out their plan or questions to ask during the training phase of the assessment and finally, when participants did calculations on familiar devices such as a mobile phone.

5.4 Strategies for Digital Trainers

Digital trainers should consider using the following suggestions when formulating their strategies; regardless of experience or profession, making broad assumptions is ill-advised without first ensuring that the demographic knows how to use both the device and applications required. Additionally, results from this study suggest that there are three key problems that need to be mitigated:

5.4.1 Reinforcement of skills

Results suggests that participants that recognise repetition, are likely to skip the necessary step of repeating or practicing the newly acquired skill; as a result, skills should be checked and reinforced through differing topics and contexts.

5.4.2 Language barrier

Technical language is not ubiquitous, meaning that words and phrases could be misunderstood. E.g. “Install an app” could mean tapping on an app icon on a tablet versus using an installation wizard on a desktop. To mitigate this, all communication and instructions should be done so in plain language.

5.4.3 Awareness

Recognising the individual needs that the trainees themselves may not be aware of, or able to articulate, may cause trainees to give up when not addressed. To identify and address these needs, trainee observations should accompany all technical tasks.

6. Limitations / Future Research

For future research, the impact of learning styles and how they affect trainees during the appraisal process and subsequent training given could be considered. For instance, measuring the implications of online learning on trainees that might be kinaesthetic learners. Further, If the appraisal process within this research were to be modified to accommodate online appraisals and training, we would need to consider certain qualifiers such as ensuring that participants can all access the same version of software and are comfortable with the differences between the two methods of delivery.

6.1 Resource Management

An unintended outcome highlighted in 6.1 where participants skipped questions to save time, demonstrated that research parameters introduced a limitation, as in the industry; the appraisal process would likely have more accommodating parameters such as extended allotted time. Removal of this limitation should make the appraisal process versatile enough to accommodate emergent individual needs that are to be addressed within the training process. Consequently, finding a balance of addressing individual needs (versatile) with linear provisions of training becomes a question of resource availability.

6.2 Basic Assumptions and Motivations

In research reported elsewhere, basic assumptions and further identification of weaknesses are partly indicated through key-informant interviews conducted prior to the skills appraisal, which inform the researcher what skills to focus on within the training given. Another aspect to consider in future research is what are the motivations of participants in training and what skill they want to attain. This is also addressed in interviews that were conducted, which will be reported separately.

Acknowledgements

This author would like to thank the institution and colleagues for their resources and affordances.

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