

Enhancing first year university students' digital skills with the Digital Skill Development (DSD) framework.

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Abstract

Academics in the Faculty of Education at Monash University, Australia, were concerned that some students showed lower than expected levels of digital skills, which impacted their academic performance. In this study, a digital skill intervention for first year students was used to pilot the Digital Skill Development (DSD) framework. The DSD framework was developed by the Monash University library in conjunction with academics, and based on the Models of Engaged Learning and Teaching (MELT) frameworks. Student feedback indicated that the majority of students felt their digital skills had improved. Those who did not tended towards the extremes of the framework autonomy continuum: either meeting university assumptions as confident, unbounded users of technology, or having very low self-efficacy and requiring explicit, highly structured help. The pedagogy underpinning the DSD framework proved practical and suitable, providing faculty and library staff with a common language and a tool to respond to student needs. Successfully embedding the DSD workshop in a content unit signals the significance of using a pedagogical tool to guide educators in helping students to make a direct connection between their digital skills and the assessment task.

Key words: information technology, tertiary education, digital skill development, models of engaged learning and teaching, library-faculty partnerships

Introduction

While there is literacy, and often numeracy, prerequisites for entry into university degrees, established prerequisites for digital skills do not exist for entry into degrees at Victorian universities in Australia (Victorian Tertiary Admissions Centre, n.d.). The rapid changes in digital technology combined with uneven exposure in schools (Australian Curriculum, Assessment and Reporting Authority [ACARA], 2018) has made it difficult for educators to describe the digital skill expectations upon entry to university. Assumptions about “digital natives” has led to embedded rather than explicit instruction in schools and at university (ACARA, 2018; McLeod & Carabott, 2019). These assumptions include students' ability to navigate university systems, access online content, and complete assessment tasks. As a result, digital skills are implicitly assessed alongside content knowledge which disadvantages students with less developed skills (Burton, Summers, Lawrence, Noble, & Gibbings, 2015). In the same way that universities support students who lack the desired level of literacy, universities willing to admit students without a digital skill prerequisite should support development of the digital skills required for success at university and address the digital divide.

The DSD framework

The university, the library and faculties have provided many online self-directed resources on how to use the technology required for their degrees. However, students already struggling to navigate the university websites have difficulty finding these resources. Furthermore, over time website navigation has become jumbled and instructional material duplicated, outdated and conflicting, which is compounding the problem. After prompting from Faculty of Education academics, and in recognition of the importance of digital skills for student success, the university tasked the Monash University library with leading the development of a framework which could be used across the university to aid in the development of students' digital skills.

Library staff were already supporting student skill development using Models of Engaged Learning and Teaching (MELT - Willison, 2016), comprising the Research Skill Development (RSD) framework (Willison & O'Regan, 2006, 2018) and the Work Skill Development (WSD) framework (Bandaranaike & Willison, 2009, 2018; Revised

by Monash University Library, 2019). The MELT frameworks are empirically evaluated pedagogical tools based on constructivist approaches (Vygotsky, 1978), learner autonomy (Boud, 1988), and the Australian and New Zealand Information Literacy Standards (ANZIL, 2004). These are overlaid by Bloom's taxonomy (Bloom, Engelhardt, Furst, Hill & Krathwohl, 1956) and capture the affective (Anderson & Krathwohl, 2001) and psychomotor domains of learning (Dave, 1970), in addition to cognitive skills. It seemed pragmatic to create a framework with the same theoretical underpinnings and guiding parameters familiar to both library and faculty staff, and so the Digital Skill Development (DSD) framework (Torres et al., 2018) was created. The DSD framework helps conceptualise what it means to be digitally literate and can be used to incrementally and explicitly develop students' digital skills in a range of contexts. Although presented in a grid format, the DSD is not necessarily sequential, it is not an assessment rubric, and it is not prescriptive but flexible and adaptive. The DSD framework:

- provides a common language among educators to facilitate curriculum and assessment design;
- provides a pedagogical approach for managing assumptions about students' digital skills and how much educator guidance students require to become self-reliant and digitally savvy;
- assists educators in making digital skills explicit in unit and assignment expectations; and
- can be used by students as a reflective tool to identify skills and developmental needs.

On the vertical axis of the DSD framework, digital skills have been categorised into six facets. The descriptions of each facet include cognitive skills and processes, and an adjective describing the affective domain (which signals the attitudes and dispositions required for development of each facet). All facets include aspects of safe and ethical use of technology. The facets are:

- **Explore and Clarify** the purpose for and implications of using digital technology (curious)
- **Select and Use** digital technologies (experimental)
- **Evaluate and Reflect** upon the suitability of digital technology for purpose (discerning)
- **Organise and Manage** people and processes by using digital strategies and systems (harmonising)
- **Synthesise and Create** new products, understandings and solutions using digital technology (creative)
- **Collaborate and Communicate** safely using digital practices in digital settings (connected)

The horizontal axis of the DSD framework captures the 'Scope for Learner Autonomy' scaffolded within a learning continuum. It articulates a developmental view of learning by describing the degree of structure and guidance required for optimal learning rather than representing learning as a hierarchy of competence. Levels of learner autonomy are described as:

- **Prescribed:** Learners require highly structured directions and modelling
- **Bounded:** Learners work within prescribed boundaries
- **Scaffolded:** Learners work independently with scaffolding
- **Open-ended:** Learners use initiative and require minimal guidance
- **Unbounded:** Learners are independent and autonomous

The student autonomy for each facet depends on purpose and learner characteristics and is highly contextual, meaning that students can oscillate between autonomy levels. Within a single task a student may shift through varying levels of autonomy as they develop greater self-reliance (Willison, Sabir & Thomas, 2017). They may be at the prescribed level of autonomy in one context (e.g. coding), but unbounded in another (e.g. word processing) (Torres et al., 2018).

Assisting first year students to develop their digital skills using the DSD framework.

Monash University pathway diplomas are aimed at students who have experienced educational disadvantage and would benefit from additional support. The diplomas mirror the first year of, and lead into, the Bachelor of Education, Nursing, Science or Business. A Faculty of Education academic teaching into a diploma unit (a cohort of 124 students) asked the library for help developing digital skills for an upcoming group presentation assignment where students' level of digital competence would impact their results – a suitable pilot for the DSD framework. Students were told the workshop was to help them with their assessment task, but library facilitators, in consultation with the academic, structured it as a two hour face-to-face workshop introducing the DSD framework to students, using the assessment task as context.

The aims of the intervention were to evaluate the effectiveness of the DSD framework for:

- 1) Improving student understanding of what digital skills encompass
- 2) Drawing student attention and awareness to the digital skills they already have and how these apply to a learning context.
- 3) Improving student skills to enable them complete the assessment task to the expected standard and help them understand that there is a direct correlation between their digital skills and grades.

The workshop activities were designed around the following assessment task:

Task description: In groups of 3-4, give a presentation on a significant discovery/change of practice (knowledge) in your discipline (context). Example topics might be the discovery of the structure of DNA in science, the practices used to minimise the spread of disease in nursing, student centered approaches in teaching, or the current understanding of leadership in business.

In the workshop students completed a series of group activities to gradually increase their understanding of what digital skills are. The tasks were: drawing a digitally savvy student, creating and sharing a Google Doc, comparing ways to communicate and collaborate online, presentation skills, ways to find resources online, and finally reflecting on all the activities to then add words to their drawing to show how far they had developed their understanding of digital skills. The DSD framework was not presented to students in its entirety, rather, after each task students were asked to match their answers to flash cards informed by the DSD framework which prompted identification of and discussion about each skill. This guided students to make connections between digital skills used in everyday life and how these skills connect to skills required for the assessment task. The activities introduced students to less familiar technologies that would assist them to undertake each phase of the task, such as: finding academic references, group communication, and creating the presentation. In addition, students evaluated their own perceived ability for each skill facet to better understand how they might enhance their digital skills to improve their assignments. Encouraging reflection on learning was the guiding principle of the workshop and to enable this the workshop was designed using a discovery learning approach, where students create connections and make their own meaning by drawing on past experiences and knowledge (Bruner, 1961). The activities were in this way designed to provide students with the means to interrogate the assessment task and identify embedded digital skills for themselves.

To measure the effectiveness of the intervention in terms of improving student digital skills and piloting the DSD framework, qualitative and quantitative data was collected at these points:

1. A self-perception questionnaire with 25 items based on the DSD framework was administered to students at the start of the intervention to get an understanding of baseline self-efficacy levels. The questionnaire was adapted from an existing survey instrument for the Work Skill Development framework (Torres, Bandaranaike & Yates, 2014). Examples of statements include:

I am able to share in online environments

I know how to choose digital technology informed by criteria that matches my requirements

The questionnaire used a 5 point Likert scaled instrument based on autonomy descriptors in the DSD framework, where “With guidance from experts all the time” = 1, “With some guidance from others” = 3 and “With no guidance from others” = 5. A total of 68 students completed this questionnaire. Basic statistical analysis examining mean scores and distribution of data was conducted.

2. An online form was used to collect feedback after the workshop followed by an analysis of the results.
3. Five weeks later, after the assessment task was finished, 37 students completed the questionnaire again. Statistical analysis of the results, mean scores and distribution of data, was conducted and results were compared with the initial questionnaire results.
4. Students were interviewed (66) about whether they believed their digital skills had improved. A thematic analysis of the results was conducted, followed by an analysis of the results using the DSD framework as an interpretive lens.

Questionnaire results

When looking at student mean scores for the initial questionnaire, students appeared to be quite confident with their digital skills, with the lowest mean at 3.43, indicating students only require some guidance from others. However, mean scores do not tell the whole story, and when examined more closely, at least 10% of students indicated they required “guidance from experts all the time” or “a lot of guidance from others” for 11 out of the 25 questions. This is in line with previous research on first year student digital self-efficacy (McLeod & Carabott, 2019). Overall, students were most confident about participating in online environments and least confident about using unfamiliar digital technologies. There was a clear divide between students, exemplified by responses to the item “I am able to choose the appropriate digital technology for my needs”. While 76% of students indicated they required little to no guidance, 13% required a lot of guidance or guidance from experts for this item.

The follow up questionnaire, conducted after the students had completed the assessment, showed an increase in mean scores for every item, ranging from 0.12 to 0.68. Keeping in mind that participant numbers were too small to accurately determine whether the changes were significant, independent t-tests suggested a significant change for 13 of the 25 items. Data from future iterations of the workshop may help support this finding. Pleasingly, when examined more closely, there was only one item where more than 10% of students reported that they still needed guidance from experts or a lot of guidance. For six items, no students indicated they needed guidance from experts or a lot of guidance. Students were most confident in sharing in online environments, with 94.6% indicating that they needed little to no guidance. While it is tempting to attribute the improvements to the intervention (the workshop and requirement to use the digital skills introduced in the assessment task), the improvements may simply be because students had spent more time at university, or perhaps, because of the workshop, students had a better understanding of what each statement meant.

Feedback on the workshop

Much of the feedback was general comments about the way the workshop was delivered (engaging, informative, interactive, fun). There were, out of the 23 responses, some that related directly to the workshop aims of introducing technology that would help students in their assessment tasks: Three students specifically mentioned learning to use Google docs; two mentioned using technology for teamwork; improved searching skills and understanding how to use technology as a management tool also were mentioned.

Three students mentioned “breaking things down” or improved understanding of how to approach a task, with one reporting that the “activities made me think about how I would approach the task more carefully”. As the focus was on approaching the task with technology in mind, this was positive feedback.

Two students mentioned that they wanted more detail on the assignment, indicating that perhaps they had not understood the activities in the way they were intended. Only one student mentioned that “some of the activities didn’t teach me much”.

Student interviews

In response to the questions “Do you think your digital skills have improved? In what way?” 52% of students answered yes, 23% answered no and the remaining 25% did not clearly indicate whether they believed their skills had improved. A typical response from those who indicated that their skills had improved was:

Yes, [before] I didn’t know how to use Google Docs or Google Slides, I didn’t know they existed, so like that’s really cool because group assignments are going to be way easier now. Google Scholar, the automatic citation, it saves time because you copy and paste and just have to double check. Little things like that. How to use Moodle - I know heaps are confused with that, it really helped me.

This comment, when viewed through the lens of the DSD framework, corresponds with the “Select and Use” facet as the student is now aware of additional programs and their advantages, helping the student better choose the appropriate technology for the purpose. Other students offered similar comments indicating they were “more aware of different programs to use for different tasks” or they were “just realising those resources exist and how to use them”. Now that the students are aware of the advantages of different programs, when “Reflecting and Evaluating” which program is best for group work (another facet of the framework) they may be more discerning. In addition, this awareness of collaborative programs such as Google Docs clearly relates to the “Collaborate and Communicate” facet.

Students also suggested that they had learned more about “organising everyone and the ways you can do that” which relates closely to the “Organise and Manage” facet of the DSD framework, as does the following comment about managing resources:

Yes, I'm still vague as to what a digital skill is - I think [I have improved in] managing digitised content and resources.

The following response indicates an understanding of social and ethical protocols for e-safety and well-being of self and others, taking account of digital profile, footprint and impact, which is an overarching element across all facets. This comment also shows the influence of affective domain when the student suggests this is scary.

Yes. It's different from high school. You have to agree to all these terms and conditions before you submit – daunting - it can always be shared, scary. I'd prefer to not use technology, I'm not the best. I'd rather go paper based. I still hand write my notes, I can't learn using technology.

Some of those who answered no to the question did so because they believed they already had strong digital skills, even though they may not have used the programs introduced in the workshop before. Responses such as the following indicated a high level of confidence or self-efficacy as, in their own estimation, students appeared to sit high on the autonomy continuum of the DSD framework. With the continuous changes in technology, this is a quality all students need and something the DSD framework hopes to scaffold.

No, but I've used a lot of tools and programs I'd heard of in high school but never used. Google drive, Prezi, stuff like that. I'm generally pretty good at working out technology on my own.

Conversely, other “no” responses indicated a lack of confidence, sitting low on the student autonomy continuum, which may be a barrier to improvement. This indicated the students did not seem to have the desired attitudes or dispositions suggested by the affective domain couplets in the DSD framework – curious, experimental, discerning, harmonising, creative, or connected:

No, because I'm horrible with technology and I'll never improve no matter how hard I try. But I appreciate them trying.

Students with this mindset will struggle to cope with the digital demands of university and highlight the importance of explicitly teaching digital skills (Google slides was explicitly taught in the workshop).

Typical responses from those who did not clearly indicate whether they believed their skills had improved included a suggestion that because of their age, they believed they should have high levels of digital skills:

We were brought up in a digital generation, we learned from a young age - that hasn't changed. I learned Google Docs and Google Slides, but it's just another form of PowerPoint. It's still beneficial, easier to connect with others.

In terms of the “Synthesise and Create” facet of the DSD framework, the students most often specifically mentioned improved skills in using the library website or Google scholar to find references, closely followed by Google docs which echoes the workshop feedback findings. Students also mentioned better understanding of Moodle and other university websites.

Conclusion

To efficiently and equitably access academic programs and opportunities, disadvantaged students sometimes need help to improve their digital literacy. More than half of the students clearly indicated that they felt their digital skills had improved. For many, this was because they were required to use a new technology (such as Google docs) which they may have heard of, but never used. This, along with an explicit discussion of the benefits of using technology when collaborating with others, had an impact on many students. Tips on improving existing skills – such as search skills – also proved valuable.

Around a quarter of students did not feel their digital skills had improved. These students fell into two groups. One felt they already had high levels of autonomy and were confident that they could teach themselves to use any new programs - the desired level of digital skills at university. The other group who did not feel their skills had increased had very low autonomy and did not show the disposition or attitude required to improve their skills on their own.

In terms of piloting the DSD framework, the findings indicate that the framework does capture digital skills required for assignments and the range of student autonomy. As far as the students were concerned, the workshop was about their assignment, not about improving their understanding of digital skills, yet their feedback suggested they had gained an awareness of digital skills. This suggests that the framework is suitable for student digital skill development.

The DSD framework requires further trialing with Faculty of Education academics (and, later, across the university) to help them unpack the facets of digital skills required for the assessment tasks they set and examine their assumptions about the digital skills, and as pedagogical tool for curriculum design. Current suggestions include champions to raise awareness of the DSD in each faculty to model how it can guide embedded and explicit skill development in the curriculum and how the library can collaborate in such initiatives. Challenges include sustainability and scalability of face-to-face, personalised and customised instruction. The DSD framework suggests a way to address a concerning and largely ignored educational issue affecting student retention and success.

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