Strategies for teaching digital literacy to students with multiple disabilities including vision impairment (MDVI): Combining evidence with expertise

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Abstract

For students with multiple disabilities including vision impairment (MDVI), the skilful use of technology can provide access to learning, yet research suggests that teachers need increased support to teach this capability. To assist teachers to accurately meet the digital literacy learning needs of students with MDVI, this study developed targeted teaching strategies and advice for these students whose Zone of Proximal Development (Vygotsky, 1978) was identified within an empirically validated digital literacy learning progression (White, 2019). Expert review of evidence-based strategies and advice resulted in the enhancement and endorsement of 101 strategies by those with expertise in MDVI and technology education. These strategies can support teachers to scaffold the digital literacy learning of their students with MDVI.

Key Words

Digital literacy, multiple disabilities including vision impairment (MDVI), teaching strategies, evidence-based teaching, learning progressions, technology.

Digital Literacy for Students with MDVI

For many students with disability, the nature and severity of their disability may impact on social inclusion, learning, and educational needs (Kuper, 2014; Tuersley-Dixon, 2016) due to interactions with physical, informational, and socio-cultural barriers. It could be argued that students with multiple disabilities including vision impairment (MDVI) face some of the most substantial barriers to accessing their rights to learning and to being able to interact with others for the purposes of learning (United Nations [UN], 2006), due to the “complex, interactional and multiplicative” (Bruce, 2011, p. 291) impacts of multiple disabilities that can affect performance in school (Heller, 2004). Digital technology use can play an important role in enabling students with MDVI to access learning and social interaction.

Students with MDVI

For the purposes of this study, students with MDVI are defined as those with a diagnosed vision impairment in addition to one or more other disabilities, which must
include intellectual disability. The caveat of intellectual disability is included as this study was situated within a broader research project by White (2019) that focused on students whose primary disability was intellectual, but who may have had additional disabilities, such as, but not limited to, vision impairment, d/Deafness or being hard of hearing (DHH), physical disability, and/or autism spectrum condition. Since the research community does not have a firm agreement regarding the nomenclature to describe students with multiple disabilities including vision impairment (McLinden & McCall, 2016), the term MDVI has been applied due to its current general use in research literature.

**Digital Technology Use to Access Learning**

While other areas of the general curriculum, such as literacy and numeracy, remain critically important to students with disability, many curriculum areas require the effective use of digital and/or assistive technology to access informational and social opportunities for learning in these areas (Israel, Marino, Delisio, & Serianni, 2014). Digital literacy capability, coupled with any digital and/or assistive technology required, is suggested to enable students with disability to access the same curriculum content as students without disability (Puckett, 2011; Starcic & Bagon, 2014). Achieving equitable informational access can have a positive effect on the educational success of students with disability (Draffan, Evans, & Blenkhorn, 2007; Subramaniam, Oxley, & Kodama, 2013) and with digital literacy capability, can support their curricular learning (Farmer, 2009; Stone-MacDonald, 2015) and improved post-school options (Wolffe & Kelly, 2011). Alper and Goggin (2017) considered that technology use could also help circumvent barriers to social inclusion in learning, as “digital technologies offer children with disabilities tools and platforms for belonging and cultural exchange hitherto denied” (p. 730). By addressing the capabilities needed to use digital technologies, digital literacy is thus proposed to enable social learning (Carrington & Robinson, 2009) and mitigate social exclusion (Warschauer, 2003), the latter noted as a common experience for students with disability (Diaz, 2010; Gold, Shaw, & Wolffe, 2010). As McKeown stated,

> When you reflect that, in the past, many young people with a sensory impairment rarely communicated with anyone who wasn’t in the same room as them, you begin to appreciate the impact that technology has had on their lives. It has opened up a whole world of contacts and experiences. (2000, p. 41)

**The Construct of Digital Literacy**

Substantial international discourse within the field of technology learning has sought to understand the nature of this learning; for an introduction to the complexity of the discussion, see Lankshear and Knobel (2015). White’s (2019) research to develop and validate an assessment and derived learning progression of digital literacy
learning for students with disability required a novel construct definition of digital literacy:

As a situated social practice, digital literacy is here defined as being able to interpret and use the symbols, text/graphics, and tools of digital technology and networks, and also the ability to do so in a culturally appropriate manner. Digital literacy, combined with any required assistive technology, offers an increased ability to access, create, share, and organise social, information, communication, and education opportunities, while participating in the digital, networked environment that has fast become a sociocultural norm in the 21st century. (White, 2019, p. 74)

For some students with disability, using digital technology may be difficult, if not impossible, without the use of assistive technology (Forlin, Chambers, Loreman, Deppeler, & Sharma, 2013; United Nations Educational Scientific and Cultural Organisation [UNESCO], 2006). Assistive technology can be understood as those technologies that serve to maintain or improve the capacity of a person with disability to function and participate (World Health Organisation, 2018). These may include specialised software or hardware, such as screen magnification software, or commonly used software or hardware, such as a computer. White’s (2019) research, from which this study is derived, was inclusive of assistive technology use to enable access to common digital technologies (e.g., tablets).

The Digital Literacy Learning Progression for Students with Disability

For teachers of students with disability seeking to teach digital literacy capability, an empirical learning progression, such as White’s (2019), can support teacher understanding of how this capability unfolds in students for the purpose of planning and teaching. Learning progressions describe a pathway of learning within a domain that occurs over an extended time period so to provide an understanding of how increased sophistication in thinking and skills can be expected to develop, with the support of a teacher (Heritage, 2008). Using this approach, learning is not described as being restricted to age or grade/year in school, so learning goals can focus on achieving the next step, or level, in the learning progression, rather than being compared to age- or grade-equivalent peers without disability, or peers who have different amounts of skill or knowledge. Empirical learning progressions rely on the statistical analysis of data to plot an expected learning pathway for those represented by the data sample. White’s (2019) empirical digital literacy learning progression was validated for use with students with disability regardless of age, gender, or the nature or severity of disability, including MDVI (White, Woods, & Poed, 2017). See Table 2 for a summarised version.
Targeting Teaching and Learning Using Learning Progressions

Since empirical learning progressions describe an expected trajectory of learning based on data, a teacher can use the descriptions of a student’s current and next level as described by the learning progression to determine what the student is likely to be ready to learn next – the student’s Zone of Proximal Development (ZPD) (Vygotsky, 1978). For example, a student ready to consolidate about half of the learning within a learning progression level should have learning goals set which support the achievement of that learning, while including goals drawn from the next level when the student has demonstrated achievement of those skills or knowledge at the current level. The student may also still need to build some skills or knowledge from a lower level as well.

Initial Development of Targeted Teaching Strategies

The learning and teaching cycle should include the determination of a student’s current abilities and point of readiness to learn, or ZPD (Vygotsky, 1978), in order to set targeted individualised learning goals (Griffin, Francis, & Robertson, 2018). To plan the attainment of these targeted goals requires the identification of evidence-based interventions to support the student’s learning, and determination of those most likely to be effective for that student. White’s (2019) research to develop and validate a digital literacy assessment tool and derived learning progression included the development of teaching strategies and advice that addressed each of the six identified levels of the learning progression, so to provide teachers with a holistic approach to planning for, and teaching, digital literacy to students with intellectual disability who may have additional disabilities. This list of teaching strategies and advice targeted to each level of the digital literacy learning progression was developed via a process which valued the input of teachers with experience in teaching technology use to students so described. The following sections describe the curation of these initial teaching strategies and advice, and their review by teachers with expertise in the education of students with primarily intellectual disability and in technology education. Further investigations were then undertaken to explore and improve the validity of the list of strategies and advice for use with students with MDVI via a review by professionals with dual expertise in the education of students who have vision impairment or MDVI, and in technology education.

Locating Empirically Based Teaching Strategies

The initial stage of developing a list of targeted teaching strategies and advice involved a review of empirical studies that identified practices likely to support digital literacy learning in students with disability. Published in peer-reviewed academic journals, these studies (e.g., Cihak, Wright, C. C. Smith, McMahon, & Kraiss, 2015; Edrisinha, O’Reilly, Choi, Sigafous, & Lancioni, 2011; J. L. M. Smith, Sáez, & Doabler, 2016; Jones & Hensley-Malone, 2015; Spooner, Knight, Browder, & Smith, 2012) identified teaching practices that supported gains in learning, particularly for
students with disability, and in digital literacy capability. Information from edited books (e.g., Archer & Hughes, 2011; Hall, Meyer, & Rose, 2012) was included which regarded the education of students with disability via teaching strategies appropriate to digital literacy learning. Further information on the sources of the strategies can be found in White (2019). The guidance from these resources was crafted into statements of teaching strategies and advice that were aimed at teachers of students with disability who may or may not be familiar with teaching these students, or teaching digital literacy capability. Suitable draft statements were allocated to levels within White’s (2019) learning progression according to how well they addressed the learning expected in each level. These statements were aimed at students with primarily intellectual disability, as per the focus of White’s (2019) larger study, though sought to be inclusive of students who had additional disabilities as well as intellectual disability.

Applying Teacher Expertise

To improve the quality of the teaching strategies and the accuracy of their targeting to the levels of the learning progression, review and drafting activities were undertaken with teachers with expertise in teaching digital technology use to students with primarily intellectual disability in a one-day panelling workshop. Ten specialist education teachers, four researchers in learning intervention and educational assessment, and a stakeholder representative from the Victorian Government Department of Education and Training’s Student Wellbeing Division attended. The teachers included three information and communications technology (ICT)/digital technology coordinators, a school curriculum leader, and a doctoral student researching digital technology use to support primary students’ learning, who was also a lecturer in ICT skills for teachers. The ten specialist teachers represented a range of specialist schools, including those dedicated to the education of students with mild, moderate, and profound intellectual disability, with physical disability/health impairment, and/or with autism spectrum condition. The four researchers and the government representative served as observers who asked questions during discussions.

In pairs, the teachers reviewed the collated teaching strategies and advice and drafted additional strategies based on their knowledge and expertise. As a group, the teachers reviewed the decision-making of each pair and added or modified strategies to support the relevance of the strategies for the range of students working within the digital literacy learning progression and their applicability to teachers regardless of school context or experience in teaching students with disability and/or technology use. Feedback from the ten participating teachers regarding the wording and targeting of statements was used to revise the strategies and advice. By the end of the workshop, consensus was reached among the specialist teachers for the list of teaching strategies and advice. They endorsed 113 draft strategies and advice as being:

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suitable to support the digital learning of students with disability within each learning progression level;

- respectful of students with disability, regardless of age or the nature or severity of their disability, and

- useful for teachers, regardless of educational setting or expertise in teaching students with disability and/or teaching digital literacy.

**Refining Teaching Strategies for Students with MDVI**

Specialist knowledge was sought from those with specific content knowledge and familiarity with sub-groups within the target population, as per advice from Wolfe and Smith (2007a) to support content accuracy and accessibility by all intended users. Professionals with expertise and experience in digital technology teaching and in the student sub-groups under-represented in the first workshop, such as students with MDVI, were thus engaged to further panel the draft list of 113 teaching strategies and advice for these sub-groups. A panel of three experts in vision impairment and technology education who had substantial experience in teaching technology use to students with MDVI reviewed and revised these strategies for students with MDVI.

**Panelling with Experts in Vision Impairment/MDVI and Technology Education**

Students who are not able to use vision well, or at all, to access and participate in learning may require alternative teaching approaches, such as those that use touch and/or sound to share information, as well as instruction in assistive technology use to access common digital technology (Ferrell, Bruce, & Luckner, 2014). As most students with disability experience multiple disabling conditions (Australian Institute of Health and Welfare, 2004), many students with vision impairment have additional disabilities. Due to vision impairment being a very low incidence disability in children (Solebo & Rahi, 2014), most teachers do not have experience or specialist qualifications in teaching students with vision impairment, including students with MDVI. Expert advice was therefore sought regarding teaching strategies and advice for the specific digital literacy learning needs of students with MDVI who were identified as working within White’s (2019) digital literacy learning progression levels, so to better support their teachers.

Three professionals with dual expertise in vision impairment education and in teaching technology use to students with vision impairment, MDVI, or d/Deafblindness were identified through their professional reputation. They were recruited from two of the leading centres in educational expertise for students with vision impairment in Australia, and from an international assistive technology company specialising in vision impairment and d/Deafblindness. One expert was a qualified specialist vision impairment teacher and former classroom teacher. Another
expert was a qualified specialist vision impairment teacher and an assistive technology professional. The third expert was an assistive technology professional who identified as a person who is blind and used assistive technologies. All three regularly taught digital and assistive technology use to school-aged students with vision impairment, MDVI, or d/Deafblindness and provided related professional learning to teachers. Each had over ten years’ experience in working with students who had vision impairment or MDVI, and with using digital and assistive technology for teaching and learning.

Each of the three experts on the panel was given the draft strategies and advice targeted to the learning progression levels, as well as a demographic questionnaire regarding their profession, use of digital and assistive technology for teaching and learning, and years of experience with working with students with disability, and experience with using digital and assistive technology for teaching and learning. Feedback was sought from the experts about the suitability of the draft teaching strategies and advice for students with MDVI. They were also asked to modify any strategies and advice and/or provide any additional strategies or advice as they saw fit.

**Scoring feedback**

The experts were asked to score the draft teaching strategies and advice with a 2, 1, or 0 regarding the applicability of the strategy or advice statement for school-aged students with MDVI working within the six levels of White’s (2019) digital literacy learning progression. A score of 2 was given to strategies or advice that the expert would use often or with most of these students, a score of 1 for those which the expert would use sometimes or with some students, and 0 assigned to those that the expert would not use. Table 1 depicts the scoring analysis outcomes, which indicated strong overall support from all three experts on the panel. Endorsement was analysed by recording the total number of 0 scores for each strategy. The infrequency of 0 scores indicated that the experts agreed that nearly every strategy was applicable to some, if not most, students with MDVI. Such strong endorsement provided a further argument for the consequential validity of the assessment tool and derived learning progression, since these general strategies could be applied to students with unique learning needs due to having MDVI.
### Table 1

Scores Assigned to the Teaching Strategies and Advice in Each Level by Experts in Vision Impairment/MDVI and Technology Education

<table>
<thead>
<tr>
<th>Level</th>
<th>Number of strategies/advice statements in level</th>
<th>Number of 0 scores in total</th>
<th>% of 0 scores</th>
<th>% of scores of 1 or 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24</td>
<td>1</td>
<td>1.4%</td>
<td>98.6%</td>
</tr>
<tr>
<td>2</td>
<td>19</td>
<td>2</td>
<td>3.5%</td>
<td>96.5%</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>1</td>
<td>2.0%</td>
<td>98.0%</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>1</td>
<td>2.1%</td>
<td>97.9%</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>4</td>
<td>6.7%</td>
<td>93.3%</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>2</td>
<td>3.9%</td>
<td>96.1%</td>
</tr>
</tbody>
</table>

Results of the Spearman correlation between the scores assigned to each of the teaching strategies by the three experts indicated a significant positive association between the first and second expert \((rs(109) = .41, p < .001)\), between the first and third expert \((rs(81) = 0.44, p < .001)\), and between the second and third expert \((rs(77) = 0.33, p < .001)\). These findings suggested strong agreement between the experts regarding the applicability of the strategies for students with MDVI. As each expert was experienced in the technology-specific education of students with MDVI, yet had different areas of additional expertise or experience, their agreement on the usefulness and quality of the strategies offered a substantial argument for the strategies’ validity for students with MDVI.

### Written feedback

Most comments from the three experts suggested slight wording changes to be more inclusive of the learning approaches common to students with MDVI, such as auditory feedback, tactile objects, and braille resources as appropriate. One expert addressed the challenge of teaching the use of technologies that are less accessible to students who use braille: “The iOS and computing environments are not so accessible for our very early users of braille as there is a literacy element. However, what about other tactual experiences, toys (vibrational), etc., which can be included with the development of technology skills?”. The experts emphasised descriptive language use when teaching this cohort of students, suggesting, “Introduce the student to common controls, allowing them to look at/feel/press them, and point out the typical features of them, e.g., ‘This is the space bar. It is usually long, going from left to right, and is in the centre and front of the keyboard’”. The experts encouraged regular repetition of learning experiences and connecting new experiences to familiar ones, such as using an audio recording of a family member’s voice on a new device.
Many comments included examples of technology use to support student access to information and communication, and recommended teaching touch typing as soon as practicable. Several comments suggested specific teaching activities, such as,

With the teacher using their own device and the student using theirs, take turns to initiate each step and then the other copies…. If the student does not know what to do at their turn, give prompts in the student’s preferred format such as verbal. This helps to make the process a game-like process and alleviates the pressure of the student recalling each step.

**Piloting with representative end users**

In addition to panelling with professionals with expertise in the education of students with low incidence disabilities, the teaching strategies were also piloted with representatives of end users, as recommended by Wolfe and Smith (2007b) to develop evidence for content validity. A piloting workshop was held for sixteen teachers from a specialist school that catered for students whose primary disability was mild to profound intellectual disability. The participants scored and provided written feedback on the strategies in the same manner as the specialist experts. This feedback was incorporated with that of the specialist experts in the final review of the teaching strategies and advice for students with MDVI, to provide strategies that were not only specific to the unique learning needs of students with MDVI, but easy for those without expertise in MDVI education to understand and implement.

**Applying Feedback to Finalise Teaching Strategies for Students with MDVI**

While the additional information provided by the three experts in teaching technology use to students with vision impairment/MDVI would be likely highly beneficial for less experienced teachers of a student with MDVI, to include all suggestions and modifications in a single document would have made the strategies too lengthy and detailed for most teachers to access readily. In addition, the specificity of many strategies targeted for students with MDVI may have meant that teachers would have found these inapplicable to students who could access visual information well. Two versions of the teaching strategies were thus devised. In the first version, a balance was sought to include sufficient strategies aimed at students with MDVI, while recognising that such approaches might be less useful or inappropriate for the majority of students who access information well through vision. As a result, this broader list of strategies in White (2019) are inclusive of students with MDVI, as well as those with other disabilities.

In the second version of the strategies aimed at students with MDVI, the advice of the experts in vision impairment and technology education was given a greater weight in the determination of strategies, and refined where appropriate with the feedback from piloting. This list aimed to provide detailed support to those teachers...
who may work mainly with students with MDVI, or who desire additional specific strategies to assist in teaching their student/s with MDVI. The list also sought to highlight, privilege, and promote the deep knowledge of those rare professionals with specialist experience, and expertise in vision impairment, including MDVI, coupled with technology education.

**Ranking and Ordering Strategies**

The mean of the scores assigned to each strategy by the experts in vision impairment and the piloting workshop participants was calculated and used to determine which strategies were considered the most useful for students with MDVI. Across all six levels, most strategies were ranked similarly by the two groups. Given the different focus of the groups, the most common and largest differences in opinion related to strategies designed for students with MDVI. As the means assigned by the two groups were very similar for most strategies, to determine the most highly regarded strategies for students with MDVI, the strategies were first ranked using the scores assigned by the experts in vision impairment education. Strategies that were scored less than 1.5 by these experts were removed, as these were likely to only be useful for a few students with MDVI. From the 113 original draft strategies and advice statements, 101 were endorsed by the three experts in vision impairment/MDVI and technology education for use with students with MDVI. Any strategies with the same score from the panel were then ranked by the score assigned by the piloting workshop participants from the specialist school.

An example of the outcomes of the ranking process is displayed in Table 2.
Table 2

Sample Draft Teaching Strategies for Students with MDVI from Level 2 as Compared by Mean Scores from the Panelling Group and the Piloting Group

<table>
<thead>
<tr>
<th>Draft teaching strategy</th>
<th>Vision impairment/ MDVI education experts</th>
<th>Workshop participants from specialist school</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean score</td>
<td>Mean score</td>
<td></td>
</tr>
<tr>
<td>As far as possible, provide a calm and comfortable environment for learning to explore and use digital technology in order to minimise unnecessary distractions.</td>
<td>2.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Have an assistive technology assessment completed by a qualified professional to see if the student can benefit from using assistive technology to improve his/her access to common devices and programs/apps.</td>
<td>2.00</td>
<td>1.63</td>
</tr>
<tr>
<td>As appropriate for the student, consider placing your hand under the student’s hand to help the student learn the hand shape and action needed to interact with a device or program/app, such as pressing a switch or swiping a screen, and to offer the student the choice of when to interact with the feature.</td>
<td>2.00</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Targeted Teaching Strategies for Students with MDVI

The teaching strategies and advice in Table 3 are a sample of the full list (see the Appendix) of the 101 endorsed strategies for students with MDVI working within the digital literacy learning progression levels. A brief description of each level is included for contextualisation. Some strategies are repeated across more than one level, as the experts determined these strategies were relevant for students working in multiple levels.
<table>
<thead>
<tr>
<th>Level</th>
<th>Level description</th>
<th>Targeted teaching strategy or advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The student attends and/or reacts to digital technology being used, and to the content on digital technology devices, such as images or sounds. S/he is starting to interact with features of digital technology with support.</td>
<td>Position the student in an environment which is optimal for focusing on a device or program/app. Consider and address the impact of any visual, hearing, or physical needs of the student when using digital technology, such as whether s/he can see or hear the content, if screen magnification or headphones are needed, or how the student might interact with the device.</td>
</tr>
<tr>
<td>2</td>
<td>The student is beginning to follow single-step directions and/or relies on adult support to explore and use digital technology. S/he is starting to make a choice between two familiar digital activities. The student may recognise when something new is introduced via digital technology, or when digital technology is not working.</td>
<td>Consider the student’s strengths, preferences, and interests, and how available technologies can be used to support his/her learning for a task at hand. If possible, incorporate familiar photos, images, or symbols into a familiar device or a program/app to increase the student’s opportunities to respond to them.</td>
</tr>
<tr>
<td>3</td>
<td>The student is beginning to use familiar digital technology to achieve his/her own ends, by working from directions, single-step routines, or prior experience. S/he is starting to request and may maintain interest in using familiar digital technology. S/he is learning to identify familiar digital technology symbols.</td>
<td>Use a range of content types and subject material to engage the student and help generalise his/her learning.</td>
</tr>
<tr>
<td>4</td>
<td>The student is learning to apply prior knowledge of familiar digital technology. S/he is starting to follow rules, group procedures, and</td>
<td>Give specific praise and targeted feedback (e.g., &quot;I like how fast you tapped the screen, now try with one finger&quot;), connecting actions with the</td>
</tr>
</tbody>
</table>
instructions to complete tasks, create and save own content, and explore new functions and symbols. S/he may express likes and dislikes about digital technology, and is beginning to use digital technology terms to describe actions or intentions.

5 The student is learning to identify strategies and guidelines to organise his/her own use of digital technology, including safe handling and care. S/he is starting to apply problem-solving strategies to determine the appropriate device for a task, and to resolve issues with digital technology. S/he is learning to attend to and persist in using familiar digital technology for a task.

6 The student is learning to control and manage his/her own use of digital technology, including device use, file management, and sharing and editing content. S/he is starting to explain the purpose and personal importance of strategies and reasons for using different features of digital technology.

Outcome (e.g., "You touched the close button, now the app is closed") to help the student know what s/he did well, what to work on next, and why a desired outcome did or did not happen.

Place visual, audio, and/or tactile supports for digital technology rules and guidelines where the student can easily access them to help him/her recall and follow expectations. Use pictures, symbols, and/or concrete objects to support the student's understanding of technical or difficult terms.

Break a digital technology procedure, such as uploading a file, into small steps, then explicitly teach each step systematically with frequent repetition, to help the student understand and complete each step. Ask the student to explain the steps in a task to determine his/her understanding of the process. Provide step-by-step directions with screenshots or other images of steps in a process, such as uploading a file. Offer repetition of skills over days and weeks to allow for practice and rehearsal of information.

These teaching strategies and advice were developed as a support for teachers to use in conjunction with their professional judgement regarding the appropriateness of each strategy or advice statements to scaffold the digital literacy learning of individual students with MDVI working within the levels of White's (2019) digital

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literacy learning progression. It is expected that not all strategies or advice will be useful for all students with MDVI, due to the individuality of each student, and that some strategies or advice may need to be further modified by a teacher to meet the learning needs of their student with MDVI. It is recommended that qualified specialist teachers in vision impairment are consulted when planning for the digital literacy learning of students with MDVI, so to provide expertise in understanding and addressing the complex learning profiles of these students, and promote the best outcomes for their learning.

Considerations for Validity and Next Steps

Drawing on the recommendations of Wolfe and Smith (2007b) to use a process of review by subject matter experts for the purpose of supporting validity claims, the refinement and endorsement of the strategies through panelling and piloting with those with specific expertise and experience provided evidence of content validity. Evidence of connections between the teaching strategies and advice, the learning progression, and the underlying modified taxonomy used (Dreyfus & Dreyfus, 1980) was found to support further validity arguments for the strategies (White, 2019). As these strategies were panelled and piloted by a total of 26 teachers from 17 specialist schools, and further panelled with three experts in technology education for students with vision impairment, including MDVI, piloting the strategies with classroom teachers in mainstream schools, and panelling with a greater number of experts in technology education for students with vision impairment, including MDVI, would allow the validity of the strategies for students with MDVI to be further examined. To explore their effectiveness, it is recommended that future research investigate the impact of the strategies on the learning of students with MDVI to determine which strategies support the greatest gains in learning. Lastly, research should be undertaken into the validity of the strategies in international contexts, including in non-English speaking areas, as Australian students with MDVI are not unique in their right to access equitable digital literacy teaching and learning (United Nations [UN], 2006).

During the panelling process with professionals with expertise in the technology education of students with vision impairment or MDVI, a comment from one expert noted the applicability and pragmatism of the strategies. The expert wrote, “I have a tendency to gravitate towards tools that are practical, intuitive and have a sense of purpose. This, I think your work does this.” This commendation, coupled with the endorsement of the strategies by the ten specialist teachers, and the three experts in vision impairment/MDVI and technology education, suggested several positive outcomes. Firstly, that arguments could be made for the strategies’ face validity for those with specific expertise in teaching digital technology use to students with primarily intellectual disability. Secondly, that arguments could be made for the consequential validity of the assessment tool, as the derived learning progression could support teacher decision-making for targeted learning interventions. Lastly,
that the holistic approach to planning and teaching provided by the integrated use of White’s (2019) derived digital literacy learning progression and the targeted teaching strategies was considered to be of substantial value as a support for teachers.

As a response to calls for increased supports for teachers of students with disability in teaching digital literacy in general, and the potential for effective digital technology use to enable these students, particularly those with MDVI, to access learning and social interaction, this work provides an important practical contribution in assisting teachers to meet the digital literacy learning needs of their students with MDVI. Teachers can be confident of the quality and validity of the targeted teaching strategies and advice to build the digital literacy capability of their students with MDVI, and, when used with White’s (2019) assessment tool and learning progression, can apply a comprehensive approach to understanding, planning for, and teaching this critical 21st century skill (Griffin, McGaw, & Care, 2012).

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References


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This paper underwent a blind peer review process before being accepted.

**Editor’s Note:** The online edition of this journal includes a number of Appendices related to this paper which outline specific teaching strategies. Due to the length of the Appendices, they have not been included in the print edition. They can be accessed at https://www.spevi.net/jspevi/
APPENDIX

Teaching Strategies and Advice Targeted at Students with MDVI
Working within the Digital Literacy Learning Progression (White, 2019)

Level 1 Description Summary
The student attends and/or reacts to digital technology being used, and to the content on digital technology devices, such as images or sounds. S/he is starting to interact with features of digital technology with support.

Level 1 Teaching Strategies and Advice

1. Position the student in an environment which is optimal for focusing on a device or program/app. Consider and address the impact of any visual, hearing, and/or physical needs of the student when using digital technology, such as whether s/he can see or hear the content, if screen magnification or headphones are needed, or how the student might interact with the device.

2. Offer extra wait time for the student to react to a device or program/app to allow the student to process and respond to the experience.

3. Model common interactions with digital technology by describing your interactions (e.g., “I like listening to this book on the tablet”, or “I’m taking a photo with my phone”) to reinforce the use of technology in day to day life.

4. Offer content which is related to the student’s preferences, home, and community life, such as photos, audio recordings, or videos of family members, to make the content relevant and engaging to the student. Seek advice from parents/carers, previous teachers, and others who know the student well about his or her interests and preferences, to help motivate the student to attend to the content on a device.

5. Use a variety of content types, such as still and moving images, videos, songs, sounds, and audiobooks, to provide multiple opportunities for engagement with digital technology.

6. Cue the student in to the device or program/app to be used, using the correct terms (e.g., “Let’s look at your iPad together”, or “It’s time to listen to the (app name) app”), to help the student prepare for the learning experience.

7. Use simple digital technology terms to describe the student’s interaction with technology to help the student develop language concepts (e.g., “You’re tapping the screen” or “Let’s turn on the computer together”).
8. Use simple language to recognise and assign meaning to the student’s behaviour when s/he shows engagement or interaction with a device or program/app (e.g., ‘You’re smiling. You like this app’).

9. Use modelling, hand-under-hand or hand-over-hand assistance, visual and/or verbal support to explicitly teach ways to interact with a device or program/app.

10. Encourage the student to demonstrate awareness and preferences about a device or program/app by offering regular opportunities to respond in the mode/s most suited to his or her abilities, and looking for a variety of response types. Give the student regular opportunities to express his/her awareness of and preferences about a device or program/app. Look for changes in behaviour such as looking away, reaching, vocalising, becoming still, or smiling to indicate awareness and preferences.

11. Describe to the student what is happening when another person is using a device, to help him/her understand the sounds and/or images that s/he might be experiencing.

12. Plan for frequent practice of a new skill with a device or program/app to help the student recall and reinforce his or her learning.

13. Show the student’s family/carers how to use his or her device/s and/or programs/apps. Encourage them to use digital technology with the student at home, such as engaging in a program/app together. As appropriate, offer the family/carers the opportunity to take a familiar device home, and/or assist them to download and use a familiar program/app on their own device, so the student can reinforce his or her learning at home.

14. As appropriate for the student, consider placing your hand under the student’s hand to help the student learn the hand shape and action needed to interact with a device, such as tapping a screen or pushing a button, and to offer the student the option of interacting when s/he is ready.

15. Have an assistive technology assessment completed to see if the student can benefit from using assistive technology to improve his/her access to common devices and programs/apps.

16. Give simple, specific praise and targeted feedback, using digital technology terms (e.g., “Good tapping the screen. Try with one finger”) to support language development and to help the student know what s/he did well and what to work on next.

17. Present new or unfamiliar programs/apps on a familiar device, or, use new or unfamiliar devices to access a familiar program/app, to help the student apply prior knowledge to a new learning experience.
18. Offer multiple occasions for the student to encounter familiar digital technology features, such as buttons, dials, and touch screens, to support generalisation of the skills needed to interact with them.

19. Use devices with touchscreens (e.g., tablets, interactive whiteboards) and/or programs/apps with a switch or button control for cause-and-effect-based activities which can provide the student with immediate visual and/or auditory feedback on even the smallest amount of effort.

20. Reward any purposeful interaction, or intent to interact with a device or program/app, consistently and immediately, to show the student you recognise his/her efforts.

21. Increase the student’s awareness of new or different devices or programs/apps by offering programs/apps that vary in content, sounds, and appearance.

22. Present a device or program/app at different times of the day and in different environments, including at home if possible, to maximise opportunities for the student to react and respond to it.

23. Make an activity schedule or task directions for the student using photos, tactile symbols and/or audio recordings of digital activities or actions (e.g., first touch the screen, then hear the sound) to emphasise the concept of sequencing steps. Audio recordings could include the voice of a significant person for the student as well as sounds relevant to the task (e.g., a zipper being zipped). Encourage the student to play, pause, and rewind the information to support learning and recall as well as the understanding of these functions.

**Level 2 Description Summary**

The student is beginning to follow single-step directions and/or relies on adult support to explore and use digital technology. S/he is starting to make a choice between two familiar digital activities. The student may recognise when something new is introduced via digital technology, or when digital technology is not working.

**Level 2 Teaching Strategies and Advice**

1. Consider the student’s strengths, preferences, and interests, and how available technologies can be used to support his/her learning for a task at hand. If possible, incorporate familiar photos, images, sounds, or symbols into a familiar device or a program/app to increase the student’s opportunities to respond to them.
2. As far as possible, provide a quiet, calm and comfortable environment for learning to explore and use digital technology in order to minimise unnecessary distractions.

3. Look for changes in the student’s behaviour when digital technology is not working, as these changes may be attempts to communicate. Use simple language to recognise and assign meaning to the student’s behaviour (e.g., “You’re calling out. Is your computer broken?”). Model appropriate responses to technology not working through role-playing and social scripts, such as taking a device to an adult and/or saying/signing “it’s broken”.

4. Try using new or unfamiliar programs/apps that have features, images or other aspects in common with familiar programs/apps, or that may be otherwise recognisable to the student, to help him or her apply previous knowledge when learning to use a new program/app. Look for any interest or acknowledgement of new or different programs/apps or devices, and provide structured opportunities to explore and experiment with them.

5. Provide learning activities involving new or unfamiliar programs/apps which can be undertaken in a small group setting, to provide the opportunity for peer modelling, peer teaching, and peer feedback to the student.

6. Help the student to understand when it is time to use digital technology, and when it is time to stop, by using an activity schedule in conjunction with social scripts, positive reinforcement and/or modelling of stopping the use of digital technology. Reinforce the stopping of technology use by using visual reminders and actions such as covering the computer with a cloth, placing a device into a box and putting it away, or using a countdown timer. As appropriate, these should be negotiated with the student so s/he understands the meaning of the reminder.

7. Show the student’s family/carers how to use his or her device/s, programs/apps and/or assistive technology. Encourage them to use digital technology with the student at home, such as engaging in a program/app together. As appropriate, offer the family/carers the opportunity to take a familiar device home, and/or assist them to download and use a familiar program/app onto their own device, so the student can reinforce his or her learning at home.

8. Have an assistive technology assessment completed by a qualified professional to see if the student can benefit from using assistive technology to improve his/her access to common devices and programs/apps.
9. Use simple technology terms to connect the student’s interaction with a device or program/app and its effect (e.g., “You pressed the power button. Now it is off”), and to offer specific praise and targeted feedback (e.g., “I like how you tapped the screen. Do it with one finger this time”) to help the student know what s/he did well and what to work on next.

10. As appropriate for the student, consider placing your hand under the student’s hand to help the student learn the hand shape and action needed to interact with a device or program/app, such as pressing a switch or swiping a screen, and to offer the student the choice of when to interact with the feature.

11. Describe when a device or program/app has stopped working using simple technology terms to support the student’s language development and understanding of what has occurred. If possible, have a second device or activity on hand to help minimise frustration for the student.

12. As appropriate for the student, consider placing your hand under the student’s hand to help the student learn the hand shape and action needed to interact with a device or program/app, such as pressing a switch or swiping a screen, and to offer the student the choice of when to interact with the feature.

13. Incorporate the student’s interests or classroom topics (e.g., favourite music, counting) into learning to use a new device or program/app, to engage the student in an unfamiliar activity. Use a range of different devices and programs/apps that vary in content, sounds, and appearance to increase the student’s awareness of new or different devices or programs/apps.

14. Always give the student the option that s/he chose to reinforce the outcome of his/her decision about a digital activity. Consider using the student’s name when describing his/her choice (e.g., “Tom chose the computer”) to gain attention and reinforce the outcome of the choice.

15. Build digital technology skills gradually by first introducing skills in isolation and then integrating them with other skills to enable the student to practice and to begin to generalise skills across different devices and programs/apps. Provide the student with a video or audio recording of him/herself, or another person, using a device or program/app, to reinforce and teach the skills required. Offer frequent practice of a new digital technology skill to help the student recall and reinforce his or her learning.

16. Support the student to generalise the use of digital technology by providing a range of different opportunities and/or environments to use a familiar device or program/app, as appropriate for him or her.
17. Create photos, visual or tactile symbols, or pre-recorded audio messages of common phrases or words, such as 'I need help', 'broken', 'computer', and 'more', that the student can readily access to communicate about the use of digital technology.

Level 3 Description Summary

The student is beginning to use familiar digital technology to achieve his/her own ends, by working from directions, single-step routines, or prior experience. S/he is starting to request and may maintain interest in using familiar digital technology. S/he is learning to identify familiar digital technology symbols.

Level 3 Teaching Strategies and Advice

1. As far as possible, provide a quiet, calm and comfortable environment for learning to explore and use digital technology in order to minimise unnecessary distractions.

2. Consider the student’s strengths, preferences, and interests, and how available digital technologies can be used to support his/her learning for a task at hand. Use a range of content types and subject material to engage the student and help generalise his/her learning. Link the creation of content, such as taking a photo or making an audio recording, to a curriculum focus or student’s area of interest to make the process and final product relevant to the student.

3. Provide clear explanations of an action or task, such as creating content using digital technology, using simple, consistent language which includes the correct terms. When presenting the student with a new task using digital technology, provide full support for the first action or skill, then gradually decrease support until the student can perform it without assistance. Give small amounts of new information about how to create content with repeated opportunities to practice to help the student retain new learning.

4. Describe the student’s action with digital technology, and connect it with the likely desired outcome (e.g., “You’re reaching for the computer. Do you want the computer?”). Reinforce his/her actions by using the correct terms, such as “You tapped on the close button, now the app is closed”, to connect actions and outcome, and to build his/her digital technology vocabulary. Give specific praise and targeted feedback (e.g., “I like how you tapped the screen. Do it with one finger this time.”) to help the student know what s/he did well and what to work on next.

5. Teach and use the words/signs of familiar devices, programs/apps and content, and include digital technology terms, symbols, devices and
programs/apps in the student’s communication system to support language development. Teach and model the use of a digital technology symbol, such as the play/pause symbol, in context with where the student might encounter it, to connect previous and new learning. As appropriate for the student, offer photos, visual or tactile symbols, or pre-recorded audio messages of common phrases or words, such as ‘I need help’, ‘broken’, ‘computer’, and ‘more’, that the student can readily access to encourage communication about technology.

6. Encourage the student to make a selection from content on a device, such as choosing a desired picture or sound from several on a touchscreen, by offering different combinations of preferred and non-preferred options. Ensure that the student always receives his/her chosen option, to reinforce the successful outcome for the student of making a decision.

7. Create a learning activity involving digital technology which can be undertaken in a small group setting, to provide the opportunity for peer modelling, peer teaching, and peer feedback to the student.

8. Have an assistive technology assessment completed to see if the student can benefit from using assistive technology to improve his/her access to common devices and programs/apps. As appropriate for the student, use accessibility features, such as screen magnification or text-to-speech, to make information or content more accessible.

9. Try teaching and reinforcing a digital technology procedure by modelling all steps but the last to the student, then assisting him/her to do the last one. Once confident with the last step, then teach and assist the student to do the second-to-last step, followed by the last step. Once confident with the second-to-last step, repeat this process for each preceding step until the student can complete the full procedure.

10. Use modelling, hand-under-hand or hand-over-hand assistance, visual and/or verbal support to explicitly teach ways to interact with a device or program/app. As appropriate for your student, consider placing your hand under the student’s hand to help him or her learn the hand shape and action needed to interact with a device or program/app, such as plugging in headphones or swiping a screen, and to offer the choice of when to interact with a function.

11. Show the student’s family/carers how to use his/her device/s, programs/apps and/or any assistive technology. Encourage them to use digital technology with the student at home, such as sharing a favourite book on a tablet, watching a preferred video on the computer, or engaging in a program/app together. As appropriate, offer the family/carers the opportunity to take a familiar device home, and/or show them how to download and use a familiar
program/app onto their own device/s. Learning and participating with family members will support the student to generalise the use of digital technology as well as to model actions after people who s/he knows well.

12. Make it easier for the student to locate desired content or programs/apps by using folders, colours, images, or labels to organise content or programs/apps on a device. Have a device ‘help box’ into which the student can place his/her device, to signal that s/he needs support.

13. Provide concrete representations of the amount of time a student is expected to focus on using a device or program/app, such as an audible and/or visible countdown timer, to scaffold the student’s awareness of expectations and his/her progress towards them. Help the student to understand when it is time to continue using digital technology, and when it is time to stop, by using an activity schedule in conjunction with social scripts, positive reinforcement and/or visual modelling of successfully stopping the use of digital technology.

14. Build digital technology skills gradually by first introducing skills in isolation and then integrating them with other skills to enable the student to practice and to begin to generalise skills across different devices and programs/apps. Use a visual and/or tactile image, video, and/or audio recording of a skill, such as zipping a tablet case, to support the direct teaching of following a single-step instruction. Offer frequent repetition and practice of digital technology skills over days and weeks to help the student recall and reinforce his/her learning.

15. Provide structured opportunities to explore and experiment with new or unfamiliar digital technologies to help the student develop curiosity about technology. Consider providing access to a new or unfamiliar app or program, with support, for a short amount of time to give the student the opportunity to develop an awareness of the app/program. Use device settings to control access to a program/app.

Level 4 Description Summary

The student is learning to apply prior knowledge of familiar digital technology. S/he is starting to follow rules, group procedures, and instructions to complete tasks, create and save own content, and explore new functions and symbols. S/he may express likes and dislikes about digital technology, and is beginning to use digital technology terms to describe actions or intentions.

Level 4 Teaching Strategies and Advice

1. Explicitly teach and model a digital technology skill using clear and consistent language and visual instructions. Give specific praise and targeted feedback
(e.g., “I like how you tapped the screen. Do it with one finger this time.”),
connecting actions with the outcome (e.g., “You touched the close button,
now the app is closed”) to help the student know what s/he did well, what to
work on next, and why a desired outcome did or did not happen.

2. Consider the student’s strengths, preferences, and interests, and how
available technologies can be used to support his/her learning for a task at
hand. Create opportunities for the student to use technology to create content
which is related to his or her interests, to make the process and product
motivating and relevant.

3. Encourage increased independence and initiation by gradually withdrawing
supports when the student demonstrates progress with a digital technology
skill. Plan for repetition and regular revision of digital technology skills over
days and weeks to reinforce new learning.

4. Provide opportunities to use different programs/apps on different devices to
support the student to generalise skills, such as saving information and
content. Help the student compare familiar devices or programs/apps with
new or unfamiliar ones, and highlight differences that change the way s/he
uses the new or unfamiliar technology. Encourage structured and
unstructured, supervised exploration and experimentation with new or
unfamiliar technologies by applying previous skills and knowledge to promote
curiosity about technology and generalise learning.

5. Show the student’s family/carers how to use his/her device/s, programs/apps
and/or any assistive technology. Encourage them to use digital technology
with the student at home, such as sharing a favourite book on a tablet,
watching a preferred video on the computer, or engaging in a program/app
together. As appropriate, offer the family/carers the opportunity to take a
familiar device home, or show them how to download and use a familiar
program/app onto their own device/s. Learning and participating with family
members will support the student to generalise the use of digital technology
as well as to model actions after people who he or she knows well.

6. As far as possible, provide a calm and comfortable environment for learning to
explore and use digital technology in order to minimise unnecessary
distractions.

7. Use the correct digital technology terms with the student when describing an
action or intention (e.g., “Put the headphone jack in the port”) to teach and
reinforce the use and meaning of terms. Promote a consistent learning
environment by encouraging others who use technology with the student to
use the same terms.
8. Have an assistive technology assessment completed to see if the student can benefit from using assistive technology to improve his/her access to common devices and programs/apps. As appropriate for the student, use accessibility features, such as screen magnification or text-to-speech, to make information or content more accessible.

9. Use simple visual and/or tactile graphic organisers with pictures, symbols, and/or words, to help the student consider how s/he feels about and uses different digital technologies. Offer opportunities to share feelings and preferences about digital technology use, and model approaches to making a decision about using technology for a task, to encourage thinking and decision-making skills.

10. Use word banks, visual and/or tactile graphic organisers, photos, symbols and/or audio recordings paired with digital technology terms to support the meaning of the terms and encourage recall. Incorporate terms that the student is likely to encounter in instructions from a device or program/app, such as ‘next’, ‘quit’, or ‘exit’ in games or writing activities, to support the student’s understanding of these words. Create activities with familiar devices or program/apps, role-playing, and storage/handling routines as opportunities to practice using the correct terms for actions or intentions.

11. Provide consistent instructions, signals, and/or procedures to help the student know what to expect each time s/he is asked to stop using digital technology. Use a simple countdown timer to show how much time s/he has left with the device or program/app, and/or an activity schedule in conjunction with social scripts, positive reinforcement, and/or visual modelling of successfully stopping the use of digital technology, to support transitions from a digital technology activity.

12. Explicitly teach the following of rules to use digital technology, such as keeping a password private, through modelling, visual and/or verbal supports, role-play, and repetition. Offer the student a copy of the rules, with images as needed, to have on his/her desk to help him/her learn and follow classroom expectations around digital technology use.

13. Break down a safe handling and storing procedure for digital technology into small steps, then teach each step systematically with modelling, visual and/or verbal support, and frequent repetition, to help the student understand and complete each step. Emphasise the concept of ‘first do this step, then do this step next’ by using photos, visual, and/or tactile symbols to show the student a depiction of each of the steps involved. As appropriate, consider placing your hand under the student’s hand to help the student learn the hand shape and action, such as unplugging a power cord, and to offer the choice of when to engage with an action.
14. If possible, show a familiar and unfamiliar digital technology symbol side by side to each other, in context (e.g., on the device or program/app) and encourage the student to look for what is similar.

15. Try teaching and reinforcing a digital technology procedure by modelling all steps but the last to the student, then assisting him/her to do the last one. Once confident with the last step, then teach and assist the student to do the second-to-last step, followed by the last step. Once confident with the second-to-last step, repeat this process for each preceding step until the student can complete the full procedure.

Level 5 Description Summary

The student is learning to apply prior knowledge of familiar digital technology. S/he is starting to follow rules, group procedures, and instructions to complete tasks, create and save own content, and explore new functions and symbols. S/he may express likes and dislikes about digital technology, and is beginning to use digital technology terms to describe actions or intentions.

Level 5 Teaching Strategies and Advice

1. Consider the student’s strengths, preferences, and interests, and how available digital technologies can be used to support his/her learning for a task at hand.

2. Give specific praise and targeted feedback, using correct digital technology terms (e.g., “I like how you tapped the screen. Do it with one finger this time.”) to help the student know what s/he did well and what to work on next. Offer frequent practice of a new digital technology skill to help the student recall and reinforce his or her learning.

3. Use modelling, visual and/or verbal supports, role-play, and repetition to explicitly teach safe handling expectations, such as typing gently, and behavioural expectations for cyber-safety, such as keeping personal details private. Provide visual, tactile, and/or audio supports for rules and guidelines for the safe use of digital technology where the student can easily access them, such as his or her desk, to help him/her recall and follow expectations. Use pictures, visual or tactile symbols, and/or audio recordings to support your student’s understanding of technical or difficult terms.

4. When introducing new strategies, skills, or content with digital technology, connect the current activity to past learning or information from the student’s life or interests, to help him/her use existing knowledge and skills. When possible, ’think aloud’ to show the student the steps you are taking to complete a digital technology task, such as an internet search, and explicitly
teach each step. Carefully watch and listen to the students’ responses, focus on the target skill, and include modelling of the target skill or concept using clear and consistent language.

5. Encourage focus when using digital technology for learning by incorporating student interests, skills and/or preferences when choosing new programs/apps. Use social scripts to help the student understand good focusing behaviours, such as ignoring classroom sounds. Provide supports, such as noise-cancelling headphones or fidget objects, to help minimise external or internal distractions. Help the student set realistic goals for focusing his/her attention on a device or program/app.

6. As far as possible, provide a quiet, calm and comfortable environment for learning to explore and use digital technology in order to minimise unnecessary distractions.

7. Introduce new programs/apps to the student initially for short periods with support, and match the program/app with the student’s skill level. Provide structured opportunities to explore and experiment with new or unfamiliar digital technologies to encourage curiosity about technology use and applying previous learning. Support the student’s readiness to extend time on a new or unfamiliar device or program/app by emphasising the concept of ‘first do this new thing, then do a preferred thing next’.

8. Have an assistive technology assessment completed to see if the student can benefit from using assistive technology to improve his/her access to common devices and programs/apps. As appropriate for the student, use accessibility features, such as screen magnification or text-to-speech, to make information or content more accessible.

9. Create a safe, suitable location for storage of devices to help the student organise the storage and care of technology. Support increased independence, planning and organisational skills by using visual, tactile, and/or audio supports, such as labels, symbols, pictures, or diagrams, to show the student where and how to store technology items.

10. Show the student’s family/carers how to use his/her device/s, programs/apps and/or any assistive technology. Encourage them to use digital technology with the student at home, such as sharing a favourite book on a tablet, watching a preferred video on the computer, or engaging in a program/app together. As appropriate, offer the family/carers the opportunity to take a familiar device home, or show them how to download and use a familiar program/app onto their own device/s. Learning and participating with family members will support the student to generalise the use of technology as well as to model actions after people who he or she knows well.
11. Use modelling, hand-under-hand or hand-over-hand assistance, visual and/or verbal support to explicitly teach manual skills with a device, such as plugging it in or putting it in a case. As appropriate for your student, consider placing your hand under the student's hand to help the student learn the hand shape and action needed to interact with a device, peripheral, or assistive technology, such as removing a USB drive, and to offer the student the choice of when to interact.

12. Break a digital technology procedure, such as an internet search, into small steps, then explicitly teach each step systematically. Use modelling, visual and/or verbal supports, role-play, and repetition to help the student understand and complete each step. Ensure easy access to learning supports such as his or her communication system and/or a step-by-step visual and/or tactile schedule, flow-chart or graphic organiser, or audio recording of the steps in a digital technology procedure, to encourage reliance on these supports while decreasing direct assistance from adults. Gradually withdraw assistance as the student progresses with a skill to promote greater independence and confidence.

13. Try teaching and reinforcing a digital technology procedure, such as for caring for devices or naming and saving files, by modelling all steps but the last to the student, then assisting him/her to do the last one. Once confident with the last step, then teach the second-to-last step, followed by the last step, and so on until the student can complete all steps independently.

14. Teach and promote the use of digital technology for learning tasks, such as the use of software with spell checkers or word banks to improve student writing. If possible, create simple digital content to which the student can contribute, such as a class blog, email list, or newsletter, to support connections between learning, communication, and the use of technology.

15. Encourage internet searches related to a curriculum focus or the student’s interests to make the process and results relevant and motivating. Use word banks and graphic organisers to help the student to brainstorm words or phrases related to information or content of interest to help the student undertake internet searches. Reinforce the correct spelling of search terms by using them as spelling words for improved search results.

16. Build skills gradually by introducing digital technology skills first in isolation and then integrating them with other skills to enable the student to practice and to begin to generalise skills across different devices and programs/apps. Try using new or unfamiliar programs/apps that have features, images or other aspects in common with familiar programs/apps, or that may be otherwise recognisable to the student, to help the student apply previous knowledge to a new program/app.
Level 6 Description Summary
The student is learning to control and manage his/her own use of digital technology, including device use, file management, and sharing and editing content. S/he is starting to explain the purpose and personal importance of strategies and reasons for using different features of digital technology.

Level 6 Teaching Strategies and Advice

1. Consider the student’s strengths, preferences, and interests, and how available technologies can be used to support his/her learning for a task at hand.

2. Have an assistive technology assessment completed to see if the student can benefit from using assistive technology to improve his/her access to common devices and programs/apps. As appropriate for the student, use accessibility features, such as screen magnification or text-to-speech, to make information or content more accessible.

3. Break down a digital technology procedure, such as downloading a file, into small steps, then explicitly teach each step systematically with frequent repetition, to help the student understand and complete each step. Ask the student to explain the steps required to complete a task to determine his or her understanding of the process. Plan for frequent repetition and distributed practice of skills over days and weeks to allow for sufficient practice and rehearsal of information.

4. Provide structured and unstructured, supervised opportunities to explore and experiment with new or unfamiliar digital technologies to help the student develop curiosity about technology use as well as opportunities to apply previous learning. Offer learning tasks which encourage the student to explore ways to combine different devices, programs and/or apps to achieve an intended outcome, such as a multimedia presentation.

5. Teach and promote the use of digital technology for student learning tasks, such as using software with word banks to improve writing, or software for mind mapping to organise thinking. Create student learning tasks which require the student to share responses, information, content and/or presentations in an online environment which other students can access.

6. Offer the student multiple ways to upload or download files, such as from different websites, web browsers, social media, and email programs. A class account managed by the teacher may be used instead of a student’s personal account. Use visual and/or tactile graphic organisers to help the student categorise and compare different ways to upload and download files.
7. Engage the student in helping to set rules and guidelines around controlling his or her use of digital technology, and using it safely. Place a copy of personal or school rules for digital technology use, with visual and/or tactile images as needed, on the student’s desk to help him/her recall and follow the expectations around cyber safety.

8. Link the student’s interests or classroom topics to the creation of a finished product with digital technology, or to internet searches to locate content to upload and download, to make the process relevant to the student’s broader learning objectives. Provide step-by-step directions which include screenshots or other visuals of steps in a process, such as uploading or downloading files. Use digital technology terms, such as ‘upload’, in literacy activities to encourage the student to use them when discussing technology use or tasks.

9. As far as possible, provide a calm and comfortable environment for learning to explore and use digital technology in order to minimise unnecessary distractions.

10. Teach and promote the use of digital technology for student learning tasks, such as using software with word banks to improve writing, or software for mind mapping to organise thinking. Create student learning tasks which require the student to share responses, information, content and/or presentations in an online environment which other students can access.

11. Teach and reinforce the learning of a digital technology procedure, such as sharing a file, by modelling all steps but the last to the student, then assisting him/her to do the last one. Once confident with the last step, then teach the second-to-last step, followed by the last step, until the student has learned all the steps in a procedure. Use modelling, visual, and/or verbal supports, and repetition to explicitly teach the use of folders, tags, and website bookmarks for organising files and content, using a consistent approach.

12. Show the student’s family/carers how to use his/her device/s, programs/apps and/or any assistive technology. Encourage them to use digital technology with the student at home, such as sharing a favourite book on a tablet, watching a preferred video on the computer, or engaging in a program/app together. As appropriate, offer the family/carers the opportunity to take a familiar device home, or show them how to download and use a familiar program/app onto their own device/s. Learning and participating with family members will support the student to generalise the use of technology as well as to model actions after people who he or she knows well.

13. Try using online collaborative environments, such as a class chatroom, as well as modelling, peer teaching, visual and/or verbal supports, role-play, and repetition to explicitly teach and practice safe and appropriate behaviours online. Provide information via visual charts, audio recordings, or tactile or
braille resources around the room to reinforce key messages, such as keeping personal details private. Encourage the student to share his or her understanding of safe and appropriate digital technology use with his or her peers through creating a game, presentation, or skit.

14. Provide opportunities for the student to apply digital technology skills for collaborative learning by teaching him/her how to share files for comment and/or collaborate with other students to secure online sites. Encourage collaboration with others when using technology by using peer teaching to teach and reinforce skills with editing content to create a finished product.

15. Use visual and/or tactile graphic organisers to help the student compare different digital technologies and to support his/her reasoning for choosing one over another for a task. Encourage the student to verbalise thinking or strategies, or even the explicit strategies modelled by the teacher, when making a decision to choose a device or program/app. Give the student extra time to consider the decision or task at hand and provide his or her approach.

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