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# Digital Literacy and Digital Self-Efficacy of Australian Technology Teachers

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**Abstract:** Agriculture is being increasingly transformed into a technological industry and calls for a greater need for digitally literate employees. To ensure school students are best placed for this requirement, the development of teacher digital literacy, self-efficacy, and the awareness of agricultural technology is essential. The current study explores the digital literacy and self-efficacy of Australian Technology Mandatory teachers who were participants in a one-day workshop ($n$ = 185). The workshop introduced participants to the GPS Cows module, a complete teaching resource specifically designed to cover agricultural aspects of the Technology Mandatory syllabus. Data were collected by way of classroom 'clickers' during the workshop and by a post-workshop survey. Teachers were found to have reasonable basic digital literacy but lacked the confidence to conduct more detailed analytics. There was also some evidence that a teacher's own digital literacy may also impact their perception of their students' skills. Professional development workshops, such as the GPS Cows workshop, can improve teacher digital literacy and self-efficacy through hands-on learning in a collaborative, team environment.

**Keywords:** agriculture; digital literacy; professional development; secondary education; technology



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## 1. Introduction

Digital literacy refers to the ability to use information and communication technology (ICT) to achieve outcomes [1]. It has also been described as an individual's ability to access, process, understand and create information in a digital environment [2]. Digital literacy is often reported as a high priority area in school education, equipping students with foundational skills for life and work. According to the Australian Industry and Skills Committee [3], technology and digital skills ranked fourth out of twelve generic skill types and can relate to skills relevant to a specific software or technology and generic digital skills applicable to a number of industries. As we continue to progress to a more digital economy, digital literacy continues to be important to ensure Australian employees remain competitive on the world stage, instead of relying on skilled migration [1].

The problem is that although the use of ICT have relatively transformed Australian classroom teaching, most applications are 'low-skill', and the high innovative use of technologies by teachers and students is less common [4]. For example, as reported in the 2018 Australian National Assessment Program—ICT Literacy [5], students most frequently used word-processing, presentation software and websites to gather information (60% of Year 6 and over 70% of Year 10 students used these programs at least once a month, respectively). Comparatively, the use of simulation software, computer-aided design and data logging tools was infrequent (between 15 and 21% of those same students used these programs at least once a month) [4,5]. Furthermore, the report noted that more than 60% of students from both year levels received instruction 'to a small extent' or 'not at all' for tasks related to algorithm development, writing and evaluating code or in the development of applications (range 62–79%) [5]. More than half of Year 6 students also reported a low level of

instruction for the creation of visual information displays, including graphs and flow charts. Another significant finding was the lack of evidence to support the notion that student digital literacy generally increases over time. This was shown by the relatively stable digital literacy scores of Year 6 and Year 10 students between the years of 2005 and 2017 [5], and disproves the well-established idea that each generation is becoming more digitally literate than the one before. With these results in mind, the question then becomes a matter of what is causing this disconnect between access to technology and digital literacy, particularly when student perception of digital technologies remains positive and confidence in using devices is high [4,5].

In comparison to other countries, Australian students have high levels of access to digital technologies, both inside and outside of the classroom [6]. Nevertheless, it appears that simple access to technology is not sufficient to improve digital literacy. Instead, "digital literacies need to be taught" [4]. In research by the National Centre for Vocational Education Research, Gekara, Snell, Molla, Karanasios and Thomas [7] found that the digital skills of vocational education graduates were lacking, and that their training was only addressing basic digital literacy and skills that are not current enough to meet industry requirements. This is mirrored in Australian schools, with reports of the system failing to provide the required ICT learning needed by students to progress to further education or into the workforce [1]. Within today's context, remote learning due to the COVID-19 pandemic is expected to exacerbate these deficiencies, with many students likely unable to use technology without guidance, and therefore suffering from further impacts to both their digital skill development and general learning capacity due to their inability to engage [6]. Although the introduction of Digital Technologies in the Australian curriculum is "a step in the right direction", Fraillon [4] argues that professional support by teachers is also essential so that teachers have the digital literacy skills necessary to be confident and capable to teach the digital technologies in the Australian curriculum.

A digitally literate teacher is one that has the knowledge of different technologies and the skills to apply them in the classroom. That is, digital literacy requires both technical knowledge and operational skills [8]. Teacher digital literacy and the training of pre-service teachers has been examined in the previous literature [9–11]. In general, most higher educators either expect that pre-service teachers will already have the necessary digital skills [12], or deliver isolated ICT courses early on in the academic program [9]. However, this approach has been criticised in the past due to focus on isolated skills without consideration of the broader context (Ottestad, Kelentrić and Guðmundsdóttir [13], cited in Falloon [9]). In a comparative study of pre-service teachers in Australia and Israel, Petrea and Yehuda [14] found that technology knowledge, that is, knowledge of how to use technological tools, and technological pedagogical and content knowledge, that is, knowledge required to effectively teach with technology, were higher in Australia and for students over the age of 26 (compared to 18–25 years). However, teachers generally expressed a lower confidence level in their technology knowledge, compared to other pedagogical or content knowledge. Ongoing professional learning was indicated for improvement by Petrea and Yehuda [14], primarily through experiential learning. This is similar to research by Sadaf and Gezer [11], who reported a lack of adequate training, and digital resources significantly impacted technology use in American classrooms. Although a framework of digital skills for Australian teachers is unavailable, the framework for students published by the Australian Curriculum, Assessment and Reporting Authority (ACARA) [15] provides an idea of the requisite skills of teachers, including skills needed for data investigation and analysis and the ability to communicate this information.

Supplementary to adequate digital literacy, teacher digital self-efficacy or the self-assessment of one's ability to use different forms of ICT is also important. Self-efficacy can impact an individual's willingness to use technology either initially or long-term [16], particularly if confronted by difficulties in application [8]. Teacher self-efficacy, as well as a positive attitude and perception of a technology's usefulness, are also reliable indicators of teachers' intentions to integrate technology into the classroom [11]. Increased

self-efficacy has been reported in people that use technology at home [17]. Heightened technological confidence has also been reported by young people [18], although this has been a subject of dispute [5,19]. While being digitally confident may not necessarily equate to proficiency, self-efficacy is still an important component to consider when examining the ability of teachers to implement technology-based lessons. Furthermore, according to Bandura [20], corresponding levels of self-efficacy and actual ability are important, as the over-estimation of the former could lead to negative interactions with technology and thus reduced confidence.

In New South Wales (NSW), Australia, the teaching of digital technologies is addressed through various board-developed courses for all year levels [21]. This includes the compulsory teaching of "Technology Mandatory" (Tech Mandatory) for Years 7–8 students [22]. Tech Mandatory engages students in production and design activities through the practical application of Agriculture and Food Technologies, Digital Technologies, Engineered Systems and Material Technologies [22]. Developed in collaboration by the NSW Department of Education and CQUniversity Australia, the GPS Cows module is a complete teaching resource that can be easily implemented into a Tech Mandatory teaching program to address aspects of the Agriculture and Food Technologies and Digital Technologies outcomes [23]. The module aims to increase the "knowledge and skills of high school students in emerging agri-tech" [24] through the introduction and use of livestock tracking technologies.

To ensure adequate teaching of digital technologies and preparation of students for the workforce or further education, teacher digital literacy and self-efficacy are crucial. Therefore, this paper aims to explore these aspects, including how teachers' self-assessed digital literacy and self-efficacy may potentially impact the learning of students. Specifically, this paper engages teachers of Tech Mandatory across NSW and explores teacher digital skills with regard to their ability to understand an existing digital resource: the GPS Cows module. The research questions to be addressed in this paper are: (i) to what extent are NSW Tech Mandatory teachers digitally literate? and (ii) what is the digital self-efficacy of NSW Tech Mandatory teachers? Although the study focuses on a single cohort of teachers in Australia, this research will provide a fundamental understanding of how teacher digital literacy may impact their ability to implement digital learning programs, even if they are provided with complete resources and lesson plans. This has broader implications for the education community, particularly for the resource development and planning of professional development programs.

## 2. Materials and Methods

This research reports on the digital literacy of teachers that participated in professional development workshops in 2018 and 2019. The aim of the workshops was to introduce teachers to recently developed full teaching resources, the GPS Cows module. To contextualize this for the readers, a brief introduction to the GPS Cows module is provided in the following section, followed by further detail on the workshop itself.

### *2.1. The GPS Cows Module*

GPS Cows is an online module that introduces students to emerging technologies in agriculture, requiring the use of a range of digital technologies to complete. Specifically, the module explores how location tracking technologies (i.e., GPS) can be used on farms to monitor animal movement and behaviour. Further information on the use of professional development for the implementation of the GPS Cows module can be found in the work of Manning, Cosby, Fogarty and Harreveld [25].

### *2.2. GPS Cows Workshops*

Sixteen one-day workshops were conducted at locations throughout metropolitan and rural NSW in 2018 and 2019 with the purpose of introducing Tech Mandatory teacher participants to the module and providing them with the skills required for implementation in the classroom. The workshops were delivered by industry experts in the field of

new and emerging agricultural technology and incorporating these tools and systems in the classroom. A qualified teacher was also present and facilitated discussions around curriculum links.

A total of 185 teachers attended the workshops which were open to all NSW secondary teachers. Of the 185 teacher participants, most were female (61.4%; $n$ = 113) compared to male (38.6%; $n$ = 71). One teacher did not provide this detail. Most teachers had over 16 years (40%; $n$ = 74) or 10–15 years (23%; $n$ = 42) of teaching experience. This was followed by an experience of 4–7 years (13%; $n$ = 24), 8–10 years (12%; $n$ = 22), 1–3 years (9%; $n$ = 17) or less than one year (2%; $n$ = 4). The experience level of two participants was unknown as they did not answer this survey question. A similar proportion of participants had either a university-level degree in agriculture (45.9%; $n$ = 85) or no formal qualification in agriculture (44.9%; $n$ = 83). The remaining participants had a diploma level or TAFE certification in agriculture (9.2%; $n$ = 17).

This research was approved by the CQUniversity Australia Human Research Ethics Committee (approval number 21324).

### 2.3. Data Collection and Analysis

Workshop participants were asked to self-assess their digital literacy, digital self-efficacy and understanding of the GPS Cows module throughout the workshop. This was achieved using classroom 'clickers' during workshop activities to gauge participant understanding. The 28 questions were staggered throughout the workshop and ranged from ascertaining self-efficacy and digital literacy (e.g., confidence using computers, frequency of Microsoft® Excel use in the classroom), knowledge and comprehension (e.g., ability to analyse the data correctly), and participant confidence (e.g., confidence using formulas provided after an activity).

A 25-question evaluation survey was also emailed to participants following the workshop and completed online. The survey contained both open- ($n$ = 4) and close-ended ($n$ = 21) questions and collected information on participant demographics, views towards agriculture and evaluation of the GPS Cows module. Specific to the present paper were demographic and open-ended questions (e.g., "Are there any aspects of the module that you may have difficultly implementing into your teaching?"). The remaining survey questions, including teacher views towards agriculture and an evaluation of the GPS Cows module, were considered outside the scope of this research and were not presented.

Data from the clickers and survey were anonymous and participation in both activities was voluntary. There was a mean response rate of 69.3% from the clickers (range 9.7–100.0%), equating to an average of 128 responses out of 185 per question. For the post-workshop survey, the mean response rate was 94.5% (range 63.2–100.0%).

Following data collection, data from both the clickers and survey were transcribed into Microsoft Excel for further analysis, including calculation of frequency and descriptive statistics.

### 2.4. Assessment of Digital Literacy Required for the GPS Cows Module

This research reports teachers' self-assessment of digital literacy and digital self-efficacy. To provide further context, we have framed this within an existing digital capability learning continuum. To date, there is no framework of digital skills for Australian teachers. Instead, we have used the ACARA [15] framework for general capabilities in student digital literacy as a proxy for assessment. The digital skills required to successfully complete the GPS Cows module are shown in Table 1. To ensure teachers can confidently teach the module, it is expected that their digital literacy covers, or exceeds, these specific areas.

**Table 1.** Elements and sub-elements of the digital literacy framework. Adapted from ACARA [15].

| Elements | Sub-Elements | Applicable to the GPS Cows Module |
|---|---|---|
| Practising digital safety and wellbeing | Manage digital wellbeing | • Not applicable |
| | Manage online privacy and safety and manage digital identity | • Setting up of password-protected accounts |
| Communicating and collaborating | Communicate | • Communicating the practical implications of using digital technologies in agriculture, including livestock tracking |
| | Collaborate and exchange | • Sharing of data from a range of schools and farms<br>• Comparing results between students |
| Investigating | Locate information | • Accessing ArcGIS online and GPS Cows on Moodle<br>• Accessing information related to each activity, including technology advances in livestock production and data collection techniques |
| | Collect and collate data | • Collect and collate their own animal location data |
| | Interpret data | • Analyse and interpret data in ArcGIS Online and Microsoft Excel, including investigation of GPS error and key aspects related to livestock production (e.g., water visitation) |
| | Evaluate information | • Examine the interactions between livestock tracking data and weather using graphs and pivot tables in Microsoft Excel |
| Creating | Plan and design | • Tool selection in ArcGIS and Microsoft Excel<br>• Plan and deploy livestock tracking data |
| | Create content | • Collect their own animal location data<br>• Create maps of tracking data |
| | Respect intellectual property | • Available under Creative Commons Share-a-like by Attribution license |
| Managing and operating | Manage content | • Managing users<br>• Importing and saving data<br>• Creating links |
| | Protect content | • Saving data |
| | Select and operate tools | • Tool selection in ArcGIS and Microsoft Excel |

## 3. Results and Discussion

This paper explores the self-assessed digital literacy and self-efficacy of NSW Tech Mandatory teachers that participated in a one-day professional development workshop. The results show that teachers have good basic digital literacy but lack the confidence to conduct more detailed computer-based data analytics. Professional development workshops, such as the GPS Cows workshop, have been shown to improve teacher digital literacy and self-efficacy through a hands-on learning and supportive team environment [25].

### *3.1. Self-Assessment of Digital Literacy and Digital Self-Efficacy*

As outlined in Table 1, the implementation of the GPS Cows module requires numerous digital literacy skills, particularly those related to communication, collaboration, and investigation. In the current study, basic computer skills appear commonplace for teachers.

This was supported by the participants reporting relatively high median and mean scores when asked about their general confidence in using a computer (7 and 7.2, respectively, out of 9; Figure 1). However, when asked about their use of a computer to analyse data, the self-rated scores were lower (median = 6; mean = 5.2; Figure 1).

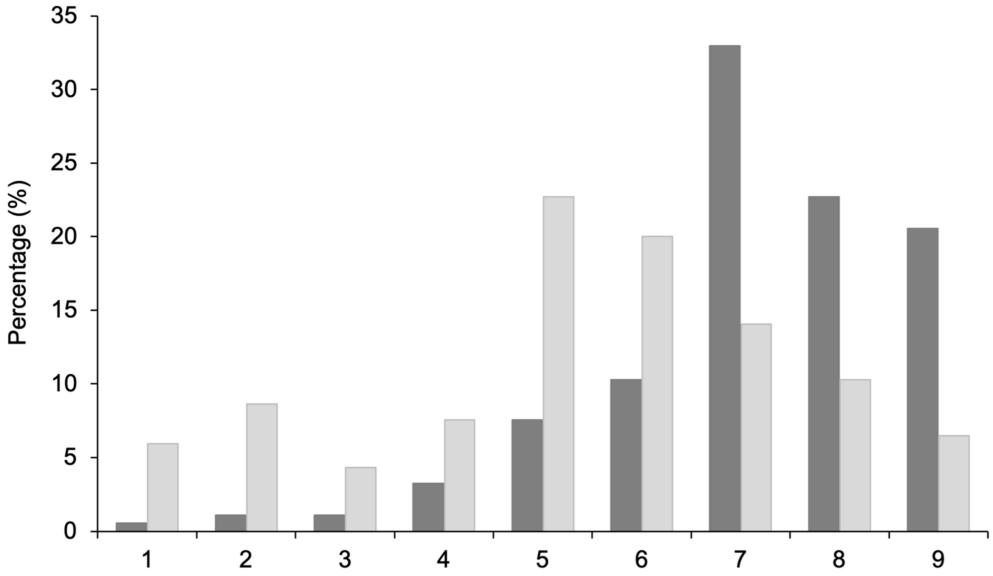


**Figure 1.** On a scale of 1 to 9, teachers self-rated their confidence at using a computer (dark grey; median: 7; mean: 7.2) and analysing data on a computer (light grey; median: 6; mean: 5.2). Data collected by clicker response, represented as a percentage of total responses ($n$ = 185 for both questions).

Contextualising this within the ACARA framework (Table 1), this suggests that teachers are confident in their ability to use digital technologies to communicate and exchange information but lack confidence to further investigate data. This was further supported when asked about their use of Excel. Excel is a common spreadsheet program used for the investigation and basic analysis of data. However, only 11.7% of participants ($n$ = 19) use Excel in their classroom at least once a week (Figure 2). Conversely, nearly one-third of participants (32.7%; $n$ = 52) have never used Excel in the classroom. Additionally, 91.1% of participants have never used pivot tables. Pivot tables are commonly used to summarise and analyse data. For example, in the context of the GPS Cows module, pivot tables are used to summarise livestock visitations to water and to analyse the impact of weather.

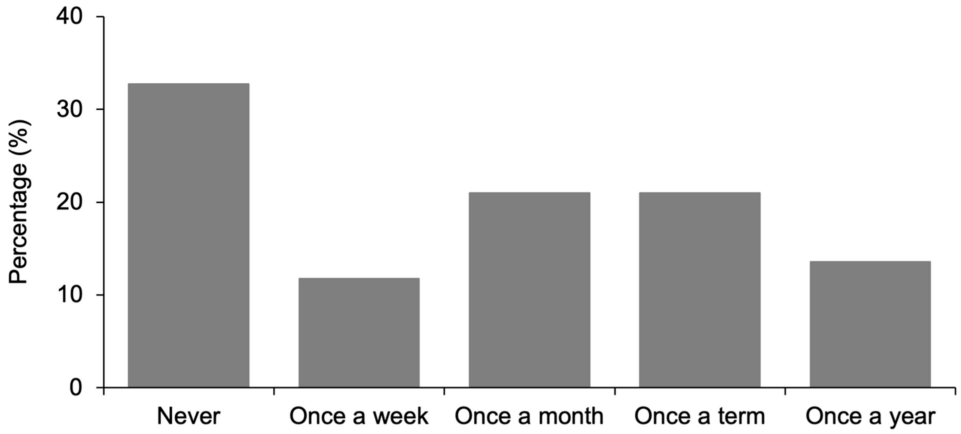


**Figure 2.** The frequency of teachers using Microsoft® Excel in the classroom. Data collected by clicker response, represented as a percentage of total responses ($n$ = 162).

Data analysis skills are important for teachers to effectively interpret and understand the meaning and implications of data. This could refer to data used to facilitate a specific lesson or syllabus (e.g., Tech Mandatory). It could also refer to data collected from school-based examination or national assessment programs (e.g., NAP [26]). In this way, teacher data analysis skills are fundamental for effective teaching, planning and classroom decision making [27]. The requisite skills are broad (Table 1), but can include the ability to interpret information in a table or graph, identify trends from data and potential anomalies, understand statistical concepts, and being able to compare classroom data with school, state or national sources [28]. In the current study, although participants were competent in using computers, the use of computers for data analysis purposes is far less common. This has also been reported by Polly [29], where ICT tools are generally used for low-level tasks and not for student learning outcomes. Similarly, Ng [18] reported that undergraduate students ($n$ = 51 of which 84% were pursuing a Bachelor of Education/Arts or Science double degree) were highly proficient in word processing softwares (mean score 3.8 out of 5) but considered themselves less proficient in spreadsheet systems (mean score 2.8 out of 5). Many participants in the current study also noted a similar lack of knowledge and confidence with spreadsheets acknowledged in the post-workshop survey, including, *"I really need to improve my Excel skills before teaching it to the students"* and *" . . . some of the Excel manipulation may be a challenge until I become more confident with it"*. This was reiterated by statements such as *"getting my head around Excel and demonstrating the new skills successfully"* and *"getting my head around Excel when things don't work the way it is meant to"*.

While most of the workshop participants appear to have lower levels of digital literacy concerning data analysis, this was not a consistent rule for all. For example, one participant indicated their surprise that their fellow colleagues in the workshop had *" . . . a very basic level of Excel"*. Another participant stated that the workshop could have been improved by *"address[ing] the wide range of teacher expertise in the room. Some were at a very basic level of Excel . . . and others may have been able to extend a little"*. In a study of NSW mathematics teachers, Boris, Campbell, Cavanagh, Petocz and Kelly [30] found that teachers self-reported a high technological content knowledge when using Excel to make calculations and create graphs (mean score 4.45 out of 5.0). Technological pedagogical content knowledge [31] was also high, with mean scores of 4.1, 4.0, and 3.8 when self-reporting the ability to collect, analyse, and interpret data, link symbolic, numerical, and graphical data, and incorporate authentic tasks in the learning of mathematics, respectively [30]. Unsurprisingly, this suggests that prior training and specific content knowledge, in this case, in mathematics, is beneficial for understanding data analysis concepts. In contrast, for the Tech Mandatory teachers in the current study, this disparity in digital skills may relate to previous education and general subject matter knowledge.

According to Times Higher Education University Rankings [32], the top three NSW universities for undergraduate degrees in initial teacher education are The University of Sydney, The University of New South Wales, and The University of Technology Sydney (UTS). However, the examination of each university's course structure reveals that 'technology' is not an offered major [33,34]. The exception to this is UTS, which allows for majors in Industrial Technology and Information Processes and Technology [35]. Thus, many teachers in Tech Mandatory may be lacking specific subject matter knowledge in this area. In Australia, approximately 26% of Years 7–8 and 15% of Years 11–12 teachers are teaching subjects within which they are not formally trained [36]. This phenomenon, known as out-of-field teaching, is a common solution to address teacher shortages in a particular subject area [37]. However, key issues associated with out-of-field teaching are the lack of pedagogical content knowledge and subject matter knowledge [38], making it difficult for teachers to confidently introduce students to new concepts. Therefore, the knowledge of the potential impact of teacher digital literacy, previous education, and general subject matter knowledge on student learning is key to understand where further support may be required.

### 3.2. Impact of Teacher Digital Literacy on Perceived Student Digital Literacy

Teacher digital literacy, or rather a lack of, may also influence teacher perception of student digital literacy. In the current study, this was suggested in statements such as, *"using Excel with students to analyse data will be a pain"*, *"Excel will be difficult to administer to low level students"*, *"students will need some upskilling in basic computer skills"* and *"[student] computer literacy [will be a challenge]"*. Discussion on the impact of generational differences in digital literacy is evident in the literature, including the debate surrounding the teaching of digital concepts to 'digital natives'. Digital natives are said to be the generation of people born after 1980 that have lived their lives being immersed in digital technologies [39]. In comparison, 'digital immigrants' refer to those that have not been born into the digital age, but instead are later adopters of technology [39]. Although there are some arguments surrounding the lack of empirical evidence to support this concept [5,18,19] the theory is, in general, widely accepted. For example, Ng [18]'s research of undergraduate students that fall into the 'digital native' generation found that although literacy in particular areas may not be present initially, when given the opportunity to engage with digital tools, the students were able to use them with "*minimal fuss*". In this way, the question arises whether teachers that are digital immigrants may underestimate the ability of their students to learn digital skills quickly and easily. In the current study, almost half of the teachers had over 16 years of teaching experience (40%). Assuming a starting age of 20 when beginning a teaching career (1.8% of teachers aged 20–24 in NSW [40]); this represents a relatively large proportion of surveyed teachers over 36 years of age. Given that digital immigrants are now over 40 years of age, we postulate that many participants in this study may be underestimating their student's digital capabilities, and thus, this represents a significant limitation potentially impacting student learning. This should be further examined in future research.

### 3.3. Impact of Workshops on Teacher Digital Literacy

Exploration of the impact of workshops on teacher digital literacy was not a key objective of this research. Nevertheless, a discussion on the potential impacts is warranted. As part of the workshop, teachers were introduced to a variety of digital literacy concepts (Table 1). One of these was the use of formulas in Excel to interpret livestock tracking data. In the current study, following the completion of the formula activity, most teachers indicated that they were now confident to perform a basic function in Excel (median and mean of 7; Figure 3). Some participants even requested " . . . *more time to play/figure out Excel formulas*". Additionally, multiple participants stated that the engagement with the analytics, such as the formula activity, was one of the best aspects of the workshop ($n$ = 53), including "*generating data, use of data and analysis of data*" and "*using data analysis in real world situations*". This suggests that hands-on learning and professional development opportunities can be used to introduce teachers to new technological concepts over a short period of time, including how the content can be taught in the classroom [41].

Teacher workshops can also be used to encourage collaboration, including peer coaching. The collaborative aspect of GPS Cows was well received by participants who stated, *"sharing ideas and helping each other through exercises"* and *"support from fellow teachers and facilitators"* was beneficial. This suggests that teacher professional development by way of workshops could be a method of improving in-service teacher digital literacy in a supportive environment. Support of teachers post-workshop, for example, through a dedicated 'chat room' on 'Statewide Staffroom', a digital forum for NSW Department of Education Teachers [42], could also provide an opportunity for further networking, including discussions on how module implementation was achieved in the classroom and the troubleshooting of issues.

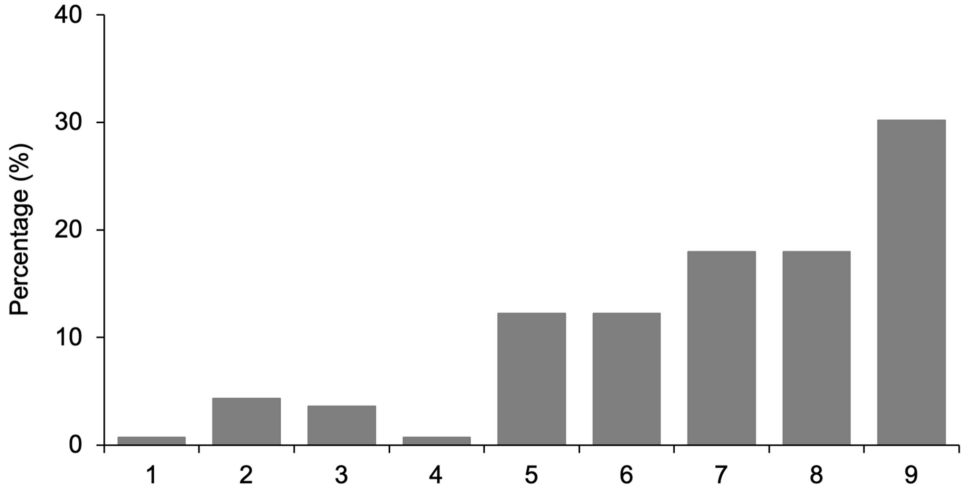


**Figure 3.** The confidence of teachers (on a scale from 1 (not confident) to 9 (very confident)) using formulas in Excel after the completion of a GPS Cows module activity. Data collected by clicker response, represented as a percentage of total responses ($n$ = 139).

## 4. Conclusions, Limitations, and Future Research

As technology continues to develop, the onus is on teachers to stay up to date on the latest trends and progress. This includes the required digital literacy skills needed to ensure students gain adequate knowledge, experience, and are digitally literate. This paper explored the digital literacy and self-efficacy of Tech Mandatory teachers, who require both technical knowledge and operational skills to apply these concepts in the classroom. The research questions addressed in this paper were: (i) to what extent are NSW Tech Mandatory teachers digitally literate? and (ii) what is the digital self-efficacy of NSW Tech Mandatory teachers? For the former, teachers were found to have basic digital literacy for general computer use. However, they lack the skills for more detailed computer-based data analytics, including the use of Excel for basic formulae and data manipulation. For the latter, teachers were found to lack self-efficacy to conduct higher level analytics, noting that their low confidence with using basic spreadsheet programs such as Excel limit their use for classroom demonstrations. In addition, there was some evidence that teacher digital literacy skills and confidence influenced their perception of their students' digital literacy skills, although this requires further examination.

The limitation of this study is that it focuses on a single cohort of Stage 4 technology teachers in NSW, Australia. Data were also not collected on participants qualifications in technology education, only agriculture. However, the outcomes provide a fundamental understanding of how a teacher's digital literacy impacts their ability to understand digital programs developed for use in the classroom. Previous research suggests that professional development should concentrate on the development of lesson plans with digital content, and that the provision of resources and technical support may encourage technology integration [11]. However, unless teachers have the skills and confidence to use those resources, this alone may not be sufficient. Future resource development and the planning of professional development programs should consider the current digital literacy and self-efficacy of teachers, as well as the skill development opportunities required to ensure teachers are digitally literate. This may require a prior test of teachers' digital literacy to ensure that they have sufficient skills to implement the program. For example, although GPS Cows was developed in conjunction with the NSW Department of Education and trialled extensively with current NSW Tech Mandatory teachers, it was clear through this research process that the range of digital skills and self-efficacy possessed by Tech Mandatory teachers was larger than anticipated by the development team. In a future application of the module, or any similar digital module, prior digital literacy assessment and, if required, preparation of teachers is recommended.

Future research is required to examine the potential impact of teachers' digital literacy on their perceived understanding of student digital literacy. Evaluation of professional development programs, such as the one in this study, and the ongoing impact on student outcomes should also be examined. Additionally, as this research was conducted prior to the COVID-19 pandemic, it is possible that teacher digital literacy and self-efficacy has improved with their increased use of remote teaching technology over this time and should be considered in future research.

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**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Select subsets of data are available from the corresponding author upon reasonable request.

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