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Research Article

A Workshop on Social Media Apps for Year-10 Students: An Exploratory Case Study on Digital Technology Education in Regional Australia

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ABSTRACT

A designated hands-on workshop on social media apps was conducted for two groups of Year-10 students from three schools in or near Rockhampton, an outer regional city in Australia, before the COVID-19 pandemic. It was hosted in a computer laboratory on the Rockhampton campus of the Central Queensland University of Australia. Statistical analyses of the students' responses to the interactive practices during the workshop indicated that social media apps were widely used among the school students living in Australian regional communities, but their general digital literacy seemed below the educational goals for Year-10 students required in the national digital technologies curriculum (DTC). The encouraging sign was that some students expressed a genuine desire and interest in learning more digital technologies and creating purposeful digital applications. In Australia, however, there is no national specialist DTC for students in Years 11 and 12. Hence, it may be worthwhile to consider designing and implementing advanced national specialist digital curriculum for senior students in Years 11 and 12 who are true lovers of digital technologies. Some thoughts on improving STEM education outcomes in secondary schools in regional areas are also shared.

Keywords: digital technology education, social media apps, digital literacy, digital technology curriculum, secondary schools in regional communities

INTRODUCTION

Deep into this information age in the 21st century, digital communication and information technologies have been at the center of almost all the advancements that change our real world and people's life every day. Hence, digital technology education has been included in the school curriculum in the developed and many developing countries in the world for the past 20-30 years. For example, in the Australian Curriculum of Digital Technologies for Years 9 and 10 (ACARA, n. d.), students are expected to:

- Develop techniques for acquiring, storing and validating quantitative and qualitative data from a range of sources, considering privacy and security requirements;
- Analyze and visualize data to create information and address complex problems, and model processes, entities and their relationships using structured data;
- Define and decompose real-world problems precisely, taking into account functional and non-functional requirements and including interviewing stakeholders to identify needs;
- Design the user experience of a digital system by evaluating alternative designs against criteria including functionality, accessibility, usability, and aesthetics;

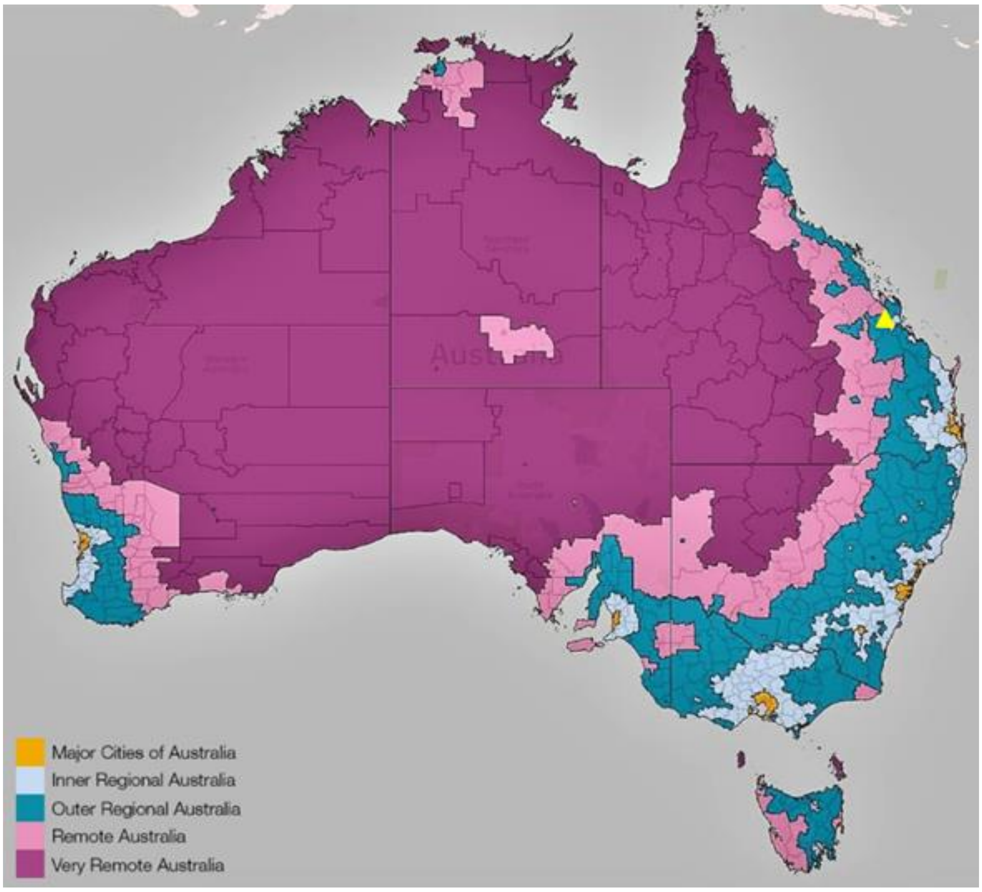

Figure 1. Regional classification of Australia (modified from REEAG, 2019). The yellow triangle indicates where Rockhampton is located

- Design algorithms represented diagrammatically and in structured English and validate algorithms and programs through tracing and test cases;
- Implement modular programs, applying selected algorithms and data structures including using an object-oriented programming language;
- Evaluate critically how student solutions and existing information systems and policies, take account of future risks and sustainability and provide opportunities for innovation and enterprise;
- Create interactive solutions for sharing ideas and information online, taking into account safety, social contexts and legal responsibilities; and
- Plan and manage projects using an iterative and collaborative approach, identifying risks and considering safety and sustainability.

However, implementation of this national curriculum is diverse in schools largely depending on where they are located over the nation. Australia has a large territory with relatively a small population just over 25 million people, among whom two-thirds live in less than 20 major cities mainly along the coastal zones (**Figure 1**).

There are many regional classification systems in Australia developed by different government agencies for various purposes since 1990s (Dadpour & Law, 2022), such as the Rural, Remote and Metropolitan Areas (RRMA), the Australian Standard Geographical Classification (ASGC), the Rural, Remote and Metropolitan Areas (RRMA), and the Australian Statistical Geography Standard (ASGS). One commonly used set by researchers and academics and well-known by the general public classifies Australian regions into five categories of Major Cities, Inner Regional, Outer Regional, Remote, and Very Remote areas (AIHW, 2004; Dadpour & Law, 2022; REEAG, 2019). Except Major Cities, the other four regions are commonly referred to as the regional, rural, and remote (RRR) areas. It can be seen in **Figure 1** (REEAG, 2019) that more than 95% of the nation are classified as RRR areas or communities.

Compared with educational status established by schools located in or near the major cities, achieving the similar educational output in schools located in most RRR areas is extremely challenging due to various issues, such as shortage of experienced STEM teachers, higher cost to run small classes, outdated infrastructure, lack of opportunities for STEM-oriented excursion and engagement outside the school, just naming a few.

In terms of achieving the requirement set in the Australian Curriculum of Digital Technologies for Years 9 and 10, the learning objectives are always challenging for both the teachers and students of 14-15 years of age in the secondary schools even in major cities equipped with necessary and sufficient digital resources for teaching and learning. It is even more challenging to achieve the same level of learning outcome for the digital technology teachers and students in the RRR communities with inferior digital infrastructure and resources (Duncan-Howell, 2012; Fraser et al., 2019; Murphy, 2020; Wilson et al., 2013).

It was reported that school students in the RRR communities had a low participating rate in digital technology education and hence in tertiary education after schooling (Vichie, 2017). In addition to the inferior digital infrastructure and resources in the RRR communities, dull and seemingly irrelevant activities in teaching digital technologies to school students may be an influential factor that has discouraged students to engage with digital technology education (Courtney & Anderson, 2010). Learning a new digital technology without connecting it to real applications or without providing students with any real application is likely to alter the attitude of students towards learning digital technologies.

To explore whether the relevant and interactive hands-on practices with a popular digital technology in people's daily lives could inspire young school students to engage with learning digital technologies and creating new digital applications, we designed and conducted an interactive hands-on workshop on social media apps for two groups of Year-10 students from three public schools located in or near Rockhampton, a regional city in Australia, before the COVID-19 pandemic. The workshop was hosted in a computer laboratory on the Rockhampton campus of the Central Queensland University as part of an engagement project for the school students to experience and explore potential university life prior to completing their study in high schools. As part of the interactive hands-on activities, students were able to response to a few questions sent to individual students just like online texting they used in real social media apps.

We acknowledge that no formal research model and experimental control were provided in this exploratory case study because the result of this case study was not resulted from a formal research project involving human beings. Conducting repeatable formal experiments with a satisfactory number of participants from RRR schools would be an extremely challenging task. A class for a specific year (grade) at a RRR school in Australia usually has 20-30 students, among whom only less than a half may be interested in one or more STEM subjects to some extent.

The likely composition of participants in an experiment would come up with a combination of students of the same year from multiple schools in synchronous manner. It is likely that individual participant's interest may change anytime, which would make any repeating experiment more difficult. This is similar to the situation reported in this case study, in which forty Year-10 students from three public schools were interested in one or more STEM subjects but only 26 students who had an interest in digital technologies completed the workshop activities. Even for these 26 students, only twelve were keen to answer the repeated questions after completing the workshop activities. Furthermore, any formal research involving humans, especially school students, would need ethics approvals from both the involving secondary schools and the tertiary institutions. The seriousness of such a formal process, though necessary, may drive more students away from the already limited number of potential participants of 14-15 years of age.

Hence, we still think the findings from this exploratory case study, arguably the first ever successful attempt of engaging RRR school students with our specifically created social median app, is worth sharing with ICT education professionals and advocates in the world. We analyzed the students' responses to the questions from the workshop, and some statistical facts and implications associated with the digital technology education in secondary schools in the RRR areas are discussed. More importantly, new thoughts of addressing the implicated problems in digital technology education for school students and teachers, particularly living in the RRR communities, are shared in this case study.

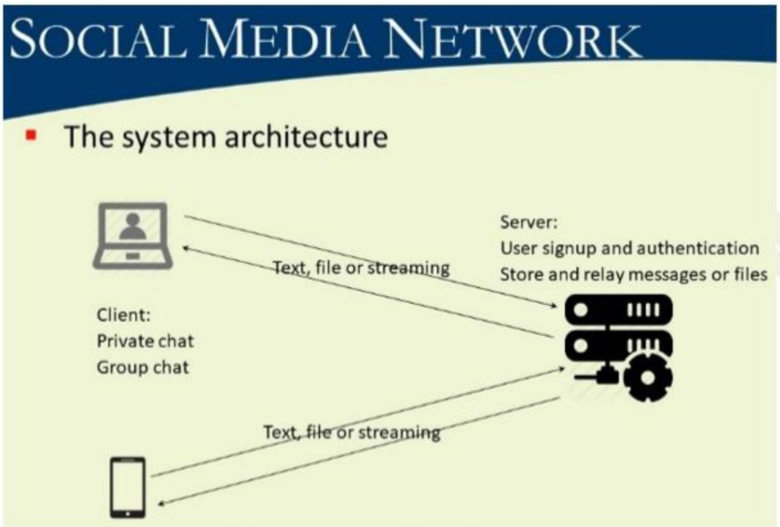

Figure 2. The skeleton of social media systems

THE DESIGN OF THE INTERACTIVE WORKSHOP

The Workshop Design

The workshop aimed at providing the Year-10 students (15 years of age) with hands-on practices in the university computer laboratory to taste possible university life in tertiary education in 2-3 years. The students came from three public schools in or near the regional city where the university resides. In Australia, Year 10 is pivotal for all school students because it is the time when students choose their career paths that will be gradually enabled in Year-11 and Year-12 by undertaking different subjects. Particularly, if a student wants to advance to tertiary education in some specific STEM programs, such as engineering, they must choose the designated senior mathematics subjects in Year 11 and Year 12 to be eligible for those programs. To inspire as many students as possible to choose a program related to digital technologies as their future career, this hands-on workshop must not only be related to their daily digital experiences and be easy to follow and instantly see the output of their work, but also be enjoyable without over stretching their existing capability to complete the activities. The latter is particularly important for the students from the RRR communities as their access to telecommunication and digital learning resources may be constrained by the inferior ICT infrastructure in the schools. Thereby, the design of this interactive workshop considered the following key factors.

An attractive topic for all: How does your social media app work?

Social media apps, such as Facebook, Twitter, and Instagram, have become part of the daily life for many people, particularly in the age bands from the teens to the sixties in all developed nations and many developing countries in the world. Using a simple digital application to facilitate social media communications would be an attractive option to engage many Year-10 students about 15 years of age. Hence, a designated demo chat app was created especially for this workshop.

Linking hands-on activities to digital literacy: The structure of social media systems

As students often interact with a social media app through their mobile devices, their understanding of the app is intuitively about communications from one digital device to another digital device. The missed link between the devices is the server that facilitates communications through the communication networks, either wired or wireless, or mixed. Such middleware is invisible to students and may be too abstract for them to understand in any technical capacity. Hence, a simplified skeleton of the client-server model is used to display the structure of the general communication systems (**Figure 2**), with the social media app as one of many specific applications of such model. This foundation knowledge is important for the hands-on activities as what students will modify is often on the server side, rather than on their own digital devices.

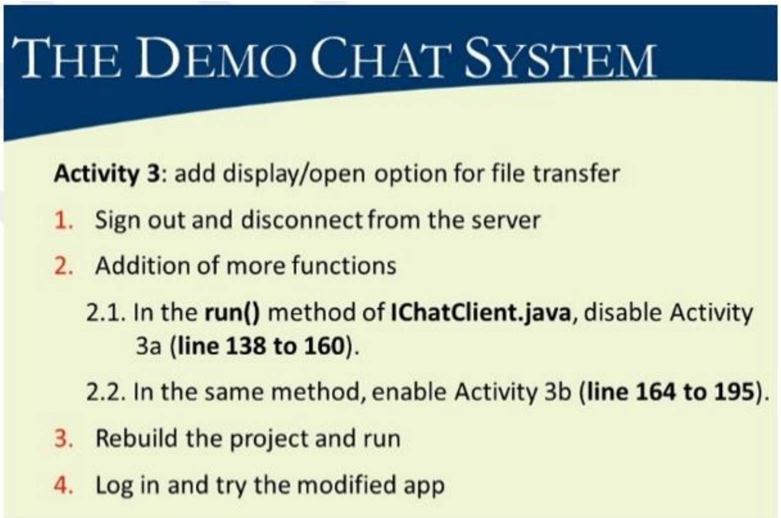

Figure 3. Instructions to Activity 3 to add "save/open/reject" function for file received

Figure 4. The immediate outcome after making the changes instructed in Activity 3

An experience in modifying a social media app: What you see is what you did

In the simple demo chat app provided, students can send plain text messages to each other or the whole group. Although it works well for text communications, students would be guided to identify anything they do not like or want to improve. Considering that most students do not have the required skills in Java programming, in the Java code for the server, all the hands-on programming tasks are already included in the code for relevant methods but initially disabled. Students are instructed to follow a designated process to make changes to a chosen item. For example, by making changes in Activity 3 illustrated in **Figure 3** on the server, the modified app allows the receiver to open or save or reject an image file sent by the sender as shown in **Figure 4**.

Security in digital communication is a key issue for all communication systems. Activity 4 in the Workshop is about encrypting the vital information for transmission. By following through the instructions on Activity 4 (**Figure 5**), students can immediately see that their password usually in plain text is encrypted to a string of meaningless characters shown in **Figure 6**.

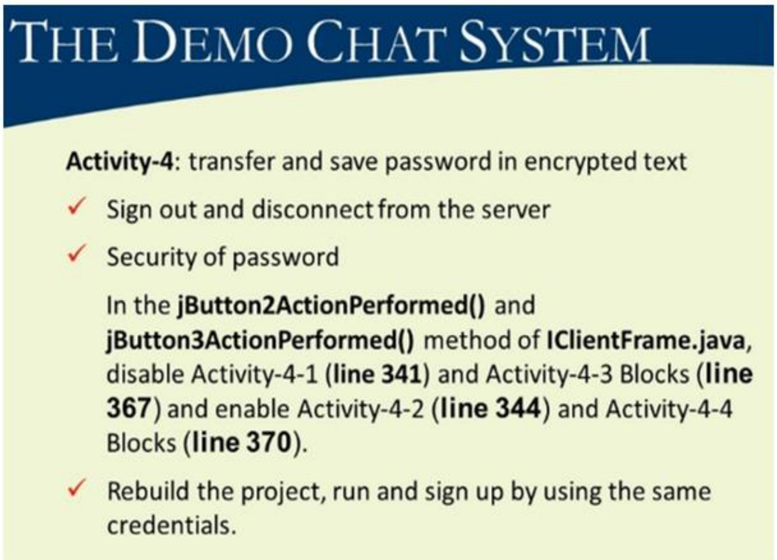

Figure 5. Instructions to Activity 4 to encrypt plain text message

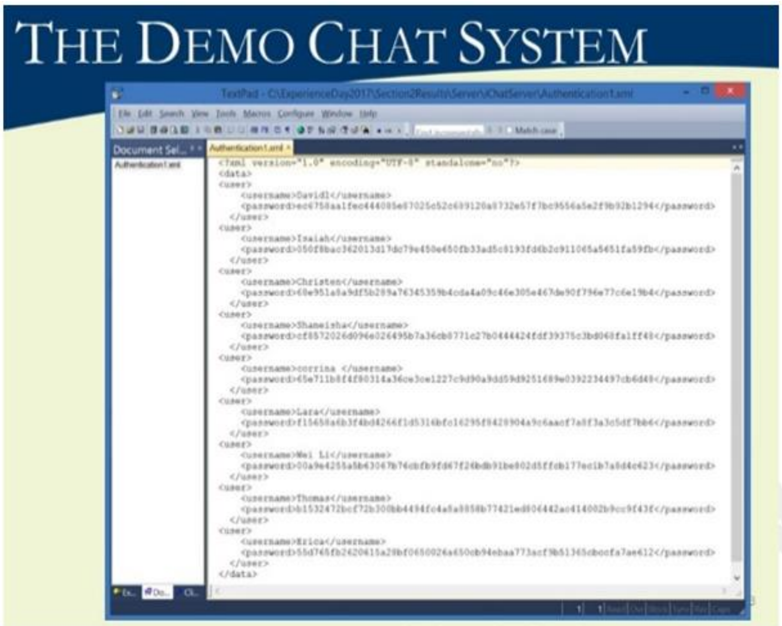

Figure 6. The immediate outcome after making the changes instructed in Activity 4

The Feedback from the Participants

As the workshop was delivered mostly through interactive hands-on activities, anonymous and voluntary informal feedback from the participants could be naturally collected through the embedded interactive activities without putting any extra pressure on the students. These activities were scheduled in both the beginning and the end of student's hands-on exercises for different purposes.

The initial feedback

Immediately after illustrating the system structure for social media systems, an interface of the simple chat application would appear on the screen of the computer that a student logged in (**Figure 7**) and the student's anonymous input was instantly projected onto the large screen in front of the computer laboratory so that all students could see the outcome. Note that this simple interface would be modified by students in the first workshop activity.

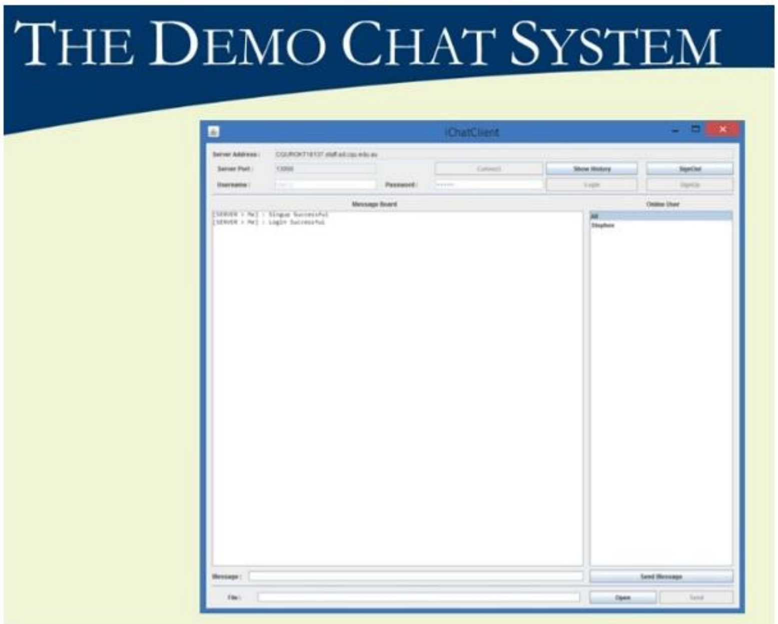

Figure 7. The initial interface of the demo chat app for the Workshop

The following three questions would be pushed to students individually for their inputs. Students could type either a number or the corresponding words into the interface provided.

1. Q1: How often do you use social media apps?
    a. Not at all
    b. A few times per month
    c. A few times per week
    d. A few times daily
    e. Frequently everyday
2. Q2: How much do you know about the communication process behind your social media apps?
    a. Not at all
    b. A little bit
    c. Somewhat
    d. Well
    e. Very well
3. Q3: How much would you be interested in creating own social media app for your group/family?
    a. Not at all
    b. A little bit
    c. Maybe
    d. Likely
    e. Certainly

These questions were designed to collect student's background information in using social media apps and associated digital technology literacy, and individual's intent to create social media applications for themselves. The information from the initial feedback would be a benchmark to compare with the feedback from students after completing the hands-on activities.

The final feedback

Immediately after completing all interactive exercises, the Question 2 and Question 3 were pushed out again for students to reflect their experience in and practices with the hands-on activities in social media apps.

Table 1. Frequencies and medians of the initial responses to Questions 1-3 (n=26)

	Frequency					Median
	1	2	3	4	5	
Q1	2	2	2	8	12	4
Q2	14	8	2	2	0	1
Q3	5	5	6	7	3	3

This final feedback was optional for the participants as some students might not be able to properly reflect what they just completed in about 30 minutes. This final feedback could be used to compare with the initial feedback to explore how students felt about the hands-on practices and how much such activities might have changed their mind about creating social media apps for themselves (hence continuing engagement with learning digital technologies) in the future.

THE WORKSHOP AND PARTICIPANTS

This workshop was introduced to about 40 Year-10 students from three public schools in or near the regional city where the university is located before the COVID-19 pandemic. The students were selected by the school teachers according to individual's interests in STEM subjects. The workshop was hosted in a computer laboratory of the university that is also used for undergraduate ICT students. The venue was deliberately chosen for the school students to have a taste of the real university experience. As the hands-on activities required a secure client-server development environment, all participants were granted a special account to 'legally' log into the computing system in the computer laboratory as a 'system developer'. This also allowed any inappropriate action with the system to be monitored and swiftly fixed by the facilitator should such action occur during the workshop.

The forty students were split into two groups as the computer laboratory can host about 20 students per workshop, with a consideration that their teacher(s) who accompanied the students may want to participate in the workshop. Male and female students were roughly balanced but in each workshop some students (more girls) were chosen not to do any hands-on activities. Hence, more boys (about 70%) were effectively participated in the workshop. Eventually, 26 students from the two sessions managed to complete the workshop. This was about 65% of the forty students in total, and none of the school teachers participated in the workshop activities.

As the workshop was designed as simple and intuitive as possible according to the digital literary level that most Year-10 students should have achieved, the workshop tasks were performed by students relatively smoothly with minimal interruptions during the workshop. Of course, the facilitator was always ready to help.

THE FEEDBACK AND INTERPRETATION

The responses are the ordinal Likert-type data for each of the questions (Boone & Boone, 2012; Joshi et al., 2015). The frequencies and medians of the initial responses for the questions are summarized in **Table 1**, based on the responses from the 26 students. Some facts can be seen from this table, which are discussed one by one in this section.

Frequency of Using Social Media Apps in Regional Schools

The initial responses to Questions 1 had a median of 4, meaning most students were daily users of social media apps. In fact, 20 out of the 26 students responded with either 4 or 5 as '*frequent daily users*' and only two answered with 1 for '*not using social media at all*'. One student who responded with 1 also noted that 'he does not use Facebook at all'. This might be a misunderstanding of social media apps which include more applications than just Facebook. In general, social media apps are commonly used among the students of 15 years of age in regional schools.

Understanding of the Digital System Structure behind the Social Media Apps

The Australian Curriculum of Digital Technologies for Years 9 and 10 (ACARA, n. d.) states that "*by the end of Year 10, students explain the control and management of networked digital systems and the security implications*

Table 2. Pairwise statistics of responses to Question 1 and to Questions 2 & 3

	Q1 vs. Q2	Q1 vs. Q3
Chi-square value	28.2	54.838

Note. Critical Chi-square value=9.488 (df=4, α=0.05)

Table 3. Frequencies and medians of responses to Questions 2 & 3 (n=12)

	Frequency (initial)					Median	Frequency (final)					Median
	1	2	3	4	5		1	2	3	4	5	
Q2	9	1	1	1	0	1	1	6	2	2	1	2
Q3	2	4	2	2	2	2.5	3	3	3	1	2	2.5

Table 4. Pairwise statistics of responses to Questions 2 & 3 (n=12)

	Q2 (initial) vs. Q2 (final)	Q3 (initial) vs. Q3 (final)
Chi-square value	11.638	0.876

Note. Critical Chi-square value=9.488 (df=4, α=0.05)

of the interaction between hardware, software and users." As the participants of the workshop were in the middle of their Year-10 studies in schools, the activities in the workshop seemed appropriate to the students.

The simple statistics for the initial responses to Question 2 showed that most students were not familiar with the client-server structure behind the social media apps they used frequently. The lowest median of 1 to Question 2 indicated that the student's digital literacy in system structures or organizations leaned towards the level of '*knowing nothing at all*'. This means that the students had a low level of digital literacy even though they were frequent users of social media apps. The pairwise statistics between the responses to Question 1 and Question 2 were conducted using the Chi-square test and the result is shown in **Table 2**. The Chi-square value of 28.2 between Q1 and Q2, much higher than the critical Chi-square value of 9.488 at α=0.05 significant level, indicated that statistically the response patterns between '*the frequent social media users*' and '*their level of digital literacy*' were vastly different. This seems reasonable because most people only use social media apps for communications with no interest to know how the apps work internally.

Students' Willingness to Create Social Media Apps for Themselves

The initial responses to Question 3 had a median of 3, meaning most students were unsure on creating social media apps for themselves. However, the individual responses implied a bimodal pattern from all students, ten students each for answers of 4 or 5 and 1 or 2. This pattern might indicate that some students were keen to get involved in creating purposeful social media applications for their families or group of friends should such an opportunity be provided to them. This might be driven by a personal interest in or curiosity of using digital technologies to create new things for a purpose. However, the equal number of students might only want to be a social media user without any desire to know and use digital technologies that enable the social media apps. A similar pairwise statistics between the response patterns to Question 1 and Question 3 shown in **Table 2** also indicated that statistically the patterns between '*the frequent social media users*' and '*their interest in creating social media apps for themselves*' were largely different.

Impact of Hands-on Activities on Improving Student's Digital Literacy

There were only twelve students who provided responses to the final feedback during the workshop. For the purpose of making comparisons on the influence of the hands-on activities before and after the workshop, **Table 3** shows the statistics of the responses to the initial feedback and the final feedback from the students who provided answers to both sets of questions.

Intuitively, the median of 2 for the final feedback to Question 2 was higher than that of the initial responses of 1. To assess whether this difference was statistically significant, pairwise statistics were conducted for the initial and final responses to Question 2 using the Chi-square test and the result is shown in **Table 4**.

The Chi-square value was against the critical chi-square value of 9.488 at α=0.05 significant level. There should be a significant difference in the response patterns between the two sets of responses as the Chi-square value of 11.638 is greater than the critical Chi-square value for Question 2. In other words, there was an improvement on students' understanding of the client-server model that facilities the social media apps after completing this hands-on workshop. Therefore, this improvement in students' digital literacy in social media apps indicated that students in Year 10 can learn new digital concepts and improve digital skills quickly if the lessons and practices in Digital Technologies are properly set up and more importantly related to their daily experiences with ICT hardware and software.

On the other hand, the hands-on workshop had little impact on increasing students' interest in creating social media apps for themselves, indicated by the small Chi-square value of 0.876 between the initial responses and the final responses to Question 3 (**Table 4**). In fact, both sets of responses had the same median of 2.5. This might reflect the students' new understanding of the complexity of the real system structure behind the social media apps, which they did not realize before knowing the client-server structure for networked systems.

DISCUSSION AND CONCLUSION

Almost all the participants used social media apps frequently, but most students knew little about the basic digital system structure behind the social media apps. Of course, it is not necessary for each of every social media user to know the basic digital system structure behind the apps, however, by the Australian Curriculum of Digital Technologies for Years 9 and 10, most Year-10 students would be expected to know such basic digital knowledge for most internet-based systems if the curriculum was properly implemented.

If implementation of the Digital Technologies Curriculum for Years 9 and 10 in regional schools is considered a key factor for improving student's digital literacy, a more appropriate strategy would be required to incorporate both abundant engaging hands-on activities and necessary explanations for the basic conceptual principles behind the relevant hands-on activities for students, just like how the workshop about social media apps was designed and conducted. An engaging hands-on activity may be associated with what is currently used by the students, e.g., Instagram or Twitter, or what is useful in student's daily learning and general life, e.g., Word and Excel, or what is emerging in the real-world applications, e.g., drones (Li et al., 2021), virtual/augmented reality (Marín-Díaz et al., 2022; Memik & Nikolic, 2021; Sirakaya & Cakmak, 2017), robotics (Daniela & Lytras, 2019; Wang et al., 2021), digital games (Durak et al., 2017; Kirginas, 2022; Wang et al., 2022). Some of these activities may have been included in the existing teaching and learning plan for digital technologies, but the early exposure of the emerging digital technologies that may not be specified in the existing teaching and learning plan for digital technologies would be more important for and attractive to the students. Repeating the digital tasks students already knew can drive more students away from engaging with learning digital technologies due to boredom (Courtney & Anderson, 2010). Showing students how to use software packages or advanced technologies is the first step to engage students with learning digital technologies. Stimulating their curiosity about what makes the new digital technologies work would lead them into the digital world gradually or onto the trajectory to a future career in ICT industry (Murphy et al., 2019).

Such a dynamic implementation of the digital technology curriculum would require the digital technology teachers in the regional schools to be adaptive to frequent upskilling to catch up the rapid advancement in ICT technologies. Digital technology teachers in the regional schools can inspire their students to further engage with learning digital technologies by linking the technologies with the local knowledge and applications (Morris et al., 2021). The reality is that most regional schools had difficulties in recruiting knowledgeable STEM teachers and a more challenging task to retain the experienced STEM teachers (Fraser et al., 2019; Murphy, 2020; Wilson et al., 2013).

Hence, it is more critical for the tertiary institutions, particularly the regional universities, to develop tailored short course(s) in ICT (STEM in general) to facilitate continuing professional development for the digital (and STEM) teachers in all regional schools. Such short courses must be delivered flexibly so that the digital technology and STEM teachers in the schools can engage with learning easily without more constraints on time, venue, travel, and costs, particularly for the teachers in the remote areas. However, creating new tailored ICT curriculum for digital technology teachers is costly for any university. More importantly, the viability and sustainability of such new programs is dependent on multiple factors (Guo et al., 2021). Thus, such effort must be made collaboratively by the tertiary institutions, secondary schools, and both federal and state governments.

Although not the majority, there were some students (about 35%) who expressed a genuine desire and interest in learning more digital technologies and creating purposeful digital applications. However, in Australia there is no national specialist Digital Technologies Curriculum for Years 11 and 12. Digital technology curriculum in Years 11 and 12 is set by individual state education agencies; hence many RRR schools could choose not to offer senior digital technology courses due to various constraints. Hence, it may be worthwhile to consider designing and implementing advanced specialist digital curriculum nationwide for senior students in Years 11 and 12 who are true lovers of digital technologies, given the fact the entire world has been increasingly dependent on the adoption and effective use of advanced digital technologies in this information age. Both the digital technology professionals and workers who are skilful and knowledgeable in digital technologies will be required in the future no matter where they live, in major cities or RRR communities.

This exploratory case study is based on one workshop with two groups of students conducted before the COVID-19 pandemic. The issues identified from this exploratory study should be validated and investigated in a series of experiments with purposeful research questions supported by a proper set of measurement scales and well-suited formal research methods. We see the opportunities to carry out such following-up experiments come in the near future as the relaxation of the COVID-19 restrictions is gradually progressed in Australia, particularly the RRR communities where more indigenous people who are more vulnerable to infectious viruses live in.

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Data availability: Data generated or analyzed during this study are available from the authors on request.

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