Towards a thriving digital resource ecology with teachers

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Towards a thriving digital resource ecology with teachers

Contents

6 Terms of Reference

7 Executive Summary
8 Definitions of Key Terms

10 Section 1: Towards a Thriving Model
11 Introduction
12 Background
12 Strategic Partners for Content
12 FUSE: Learning and Teaching Resources
13 eduSTAR- School Technology Architecture and Resources
13 Digital Learning News
14 Global2 — DET Blogging Platform
14 DIGiPUBS
15 Department of Education and Training Website
15 Education Services Australia
16 Scootle
16 Digital Technologies Hub
18 Victorian Curriculum Assessment Authority (VCAA)
18 ABC Education
19 Problem Statement
19 Methodology

20 Section 2: Technologies in the Classroom
22 Melbourne Declaration
23 Personalised Learning
23 Pedagogy and Learning
24 21st Century Digital Learning (21CDL) Model
26 TPACK
29 What Role Can the Digital Hub Play in the Adoption of Technologies in the Classroom?
31 Communities of Practice in Occupations
32 Teacher Participation in Online Communities
33 Service Design for Accessing Online Resources
34 Emerging and Enabling Roles of DET
35 Supporting Communities of Practice in Teaching
36 Emergent Fellowships of Practice in Teaching
37 Responsive Digital Content
Section 3: Digital Curation

Definition and process
The Digital Curation Lifecycle Model
The Digital Curator
Open Educational Resources
Strategic Partners
Who is Meeting the Needs of Teachers?
Search Tools from a Design Anthropology Perspective

Section 4: Examples of Other Digital Hub Platforms

New Zealand Education Department
UK. GOV Department of Education
Departments of Education Across Canada
Finland Ministry of Education and Culture
Ministry of Education Chile
Ministry of Education Singapore
Santa Clara County Office of Education
State of Israel Ministry of Education
The Learning Place – Queensland Government
Key Learnings from other digital hubs

Section 5: Is DET Ready?

DET’s Role in Provision of Digital Support to Classroom Teachers
Recommendations and Options for DLS

References

List of Tables
Table 1: Definitions of key terms in this report
Table 2: Overview of TPACK model
Table 3: Modes of human grouping identification
Table 4: Implications and questions for digital curation lifecycle model for the Digital Hub

List of Figures
Figure 1: 21CDL Model (Keane et al., 2016)
Figure 2: Diagram of the TPACK model
Figure 3: A concept of a digital supply-based hub management
Figure 4: Diagram of the digital curation lifecycle
Towards a thriving digital resource ecology with teachers

This scoping and co-design research project establishes how teachers in Victorian Government schools and key stakeholders engage with digital educational resources primarily in teaching and learning and, to a lesser extent, in professional learning contexts.

The final report articulates directions towards the delivery of innovative and potentially disruptive models for the Department of Education and Training in establishing a thriving and trusted digital resource ecology for its teachers.

The goal of the Department of Education and Training is to facilitate teacher access to online teaching and learning resources that accommodate the creativity and diversity of curriculum delivery needs across K-12, for urban, rural and remote schools.
EXECUTIVE SUMMARY

Teachers are engaged in diverse and dynamic work environments to provide quality education across all Victorian schools.

Teachers are after easily found, targeted curriculum digital resources for their classes.

New demands driven by teacher expectations have raised the opportunity to explore innovative models for future development. We include social innovations along with digital platform solutions in this exploration. One example of social innovation is the way the Department of Education and Training (DET) enables its workforce to become curators and leaders of their curriculum areas of interest.

We summarise background resources for teachers to date, noting that some have recently closed such as DIGIPUBS. The value of platforms such as FUSE, eduSTAR, Digital Learning News, and Global2 are briefly critiqued.

Comparative domestic and international information-seeking behaviour, platforms, and social drivers are cited with screen captures. These case examples offer a foundation for appreciating both the very limited information available on how teachers access digital learning resources, and surprisingly, the shallow depth of literature on how classroom teachers specifically tend to go about finding, building, sharing and transforming online learning resources for their respective needs.

We note that to date, two different modalities have emerged. The first is the historical mode of a supply-driven model of public-private partnerships, often with little cross-resource relationship guidance for teachers. The second is a teacher-driven or demand-driven model. In this second mode, teachers are connecting with each-other and reaching out to new, often international platforms. However, constraints with international resources related to curriculum and policy alignments in Victorian classrooms have not been addressed.

We found there is value in exploring a new approach, one that combines the quality assurance of DET’s supply-driven public-private partnership model, with a teacher-based, self-curated model. In addition to their Digital Hub services, we have identified a key opportunity for DET to explore an expansion towards the social innovation dimension of their role. DET can enable teachers to be self-curating through examining future ways to provide them with the tools and skills to become high achievers in finding, filtering, adapting, and sharing resources via teacher communities and fellowships of practice. Typically, resources will be shared through teacher communities of practice.

If DET were to curate digital resource in-house the cost of keeping the repository current and demand driven may prove to be unsustainable. Exploring organisational and social innovation solutions is likely to be more sustainable as well as embed thriving regenerative strategies more adaptive to emerging demands.

We highlight that the use of information and communication technologies (ICT) has both evolved and become normalised within the past decade. We assert it is increasingly apparent in schools that teachers engage with online resources as part of daily practice. The development of a new innovative digital platform strategy in this context is both viable and vital.
## DEFINITIONS OF KEY TERMS

### Table 1: Definitions of key terms in this report

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Complex socio-technical service systems</td>
<td>This expression is attributed to how a service that relies on functioning technological eco-systems will progressively yield human accommodating behaviours that may range from predictable, complicated, complex and only generally predictable, to chaotic and unpredictable.</td>
</tr>
<tr>
<td>Complex systems and complexity</td>
<td>Often related to the Cynefin Model of situational complexity in a workplace, complex systems are self-adapting and are responsive to subtle changes in the workplace organisation.</td>
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<tr>
<td>Communities of practice</td>
<td>Communities of practice are temporary or long term. They share a common social-professional network that thrives on trading ideas in classroom practice. Based on the human trait to form groups and relationships on place or curriculum territory and/or affection, communities of practice trade value around shared information related to common operational matters pertaining to the place of work (such as teaching resources) and affection (such as shared emotion and empathy).</td>
</tr>
<tr>
<td>Design Anthropology</td>
<td>This is a body-of-knowledge used at the executive level of technology innovation companies such as Xerox Parc, Google, Apple, and Intel. It draws on human grouping behaviour around technologies based on human values, cultures and social relationships. It represents a highly developed and predictive level of expertise for understanding how humans form groups, communities, and values in relation to the designed world of things and structures around them.</td>
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<tr>
<td>DET</td>
<td>Department of Education and Training, Victoria</td>
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<tr>
<td>Digital curation</td>
<td>Digital curation refers to activities that are related to the maintenance of digital resources and their long-term value.</td>
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<td>Digital learning</td>
<td>Digital learning is any type of learning that uses digital technology.</td>
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<tr>
<td>Digital technologies</td>
<td>Digital technologies are electronic tools, systems, devices and resources that generate, store or process data. Well-known examples include social media, online games, multimedia and mobile phones.</td>
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<tr>
<td>DLS</td>
<td>Digital Learning Services</td>
</tr>
<tr>
<td>Fellowship of practice</td>
<td>Fellowships are a nuanced higher conceptual level of relationship that engages much more with ‘affection’ drivers rather than common experiences of place or curriculum territory. Key evidence of fellowship is that the common empathy engages in general philosophy of education and teaching, in order to bond with others on a more human level of meaning-making. Philosophy is a key indicator.</td>
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<tr>
<td>Term</td>
<td>Description</td>
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<td><strong>Foresighting</strong></td>
<td>Foresighting seeks to identify the enduring and logical systemic factors that most influence the short, medium and longer terms future of a service or product, or the context in which these objects operate. Methods may include back-casting, roadmaps, weak signals and wild cards, trends, game theory, horizon scanning, Delphi method and ‘scenarioing’.</td>
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<tr>
<td><strong>Human-Centred Service Design (HCD)</strong></td>
<td>Human Centred Service Design (HCD) has its origin in Human Computer Interaction (HCI) design. These approaches typically draw on common human cognitive processes as people engage with products, spaces and services. HCD is also used as an umbrella phrase to refer to the range of user experience (UX) and HCI research methods.</td>
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<tr>
<td><strong>ICT</strong></td>
<td>Information and Communications Technology (ICT). See Digital technologies definition.</td>
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<tr>
<td><strong>Open educational resources (OER)</strong></td>
<td>Teaching and learning materials that are in the public domain and have been released under an open license that permits no-cost access, use and adaptation.</td>
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<tr>
<td><strong>Regenerative</strong></td>
<td>To establish in the workplace, digital platforms, tools and social innovation strategies that are designed to be highly adaptive and learning oriented.</td>
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<td><strong>Socio-technical systems</strong></td>
<td>First attributed to the Tavistock Institute in 1947 as a way of understanding organisational behaviour in technology-based companies. The term has matured to describe a unique phenomenon observed when people engage with technologies. The phenomenon refers to a pattern where technological systems predictably induce human social behaviour and corresponding social organisation to accommodate the quirks of the technology in order to form a functional human-technology relationship. The term implies that these reactions are mutual and become complex, leading to unexpected social outcomes that may or may not be beneficial.</td>
</tr>
<tr>
<td><strong>Teacherpreneur</strong></td>
<td>A teacherpreneur is the term given to a K-12 teacher who is entrepreneurial and shares teaching resources through online websites.</td>
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<td><strong>TPACK</strong></td>
<td>The TPACK framework is a theory that focuses on technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK).</td>
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<tr>
<td><strong>User-Centred (UC)</strong></td>
<td>User-centred is an approach to service and product design that identifies who the end-users are and selects a representative sample of that cohort. Typically, participatory methods using face to face problem solving and ideas drafting processes may be workshopped. How people actually attempt to fulfil tasks using current products and services are core ideas to illicit in such workshops and related methods.</td>
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<tr>
<td><strong>User Experience (UX)</strong></td>
<td>Typically, part of a user-centred approach, user experience seeks to interpret emotional and sensory insights as authentically experienced by a small sample of end-users interacting with a product or service. Representative samples of users are utilized in small case groups.</td>
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Section 1: towards a thriving model
Teachers in Victorian government schools work in diverse contexts.

Whether they are beginning or established in their careers, teach in the early or later years, or in urban, peri-urban or regional schools, all teachers seek resources that map to the Victorian Curriculum and at the local level, their curriculum requirements. This, in conjunction with a need to provide for a variety of student learning needs, necessitates accessible, effective and useful online resources. This project has provided baseline research and insights into teacher behaviour, and importantly, their human motivations and driving queue, for finding a range of online resources to inform the Digital Hub.

The Department of Education and Training (DET) offers a range of digital tools and platforms such as FUSE, software catalogues, virtual tools and professional learning options. Part of a broader digital road map for DET and Digital Learning Services (DLS) is to bring these resources together into a central online platform, provisionally named Digital Hub. While DET offers these central resources, the dynamic combinations of the diversity of the teachers, the diversity of stages in learning through the Victorian Curriculum, variability in the digital technology eco-systems in schools, and their geo-regional factors make effective delivery of these resources complex. The above problem requires an innovative, complex systems framing to accommodate representative data and insights. A socio-technical systems approach of information-seeking behaviour helps to map where teachers locate valuable online resources alongside critical points in their learning and planning, and how resources are used by teachers to improve student learning outcomes.

While DET’s digital tools, resources and platforms may be viewed as online products for Victorian teachers to access and consume, the research team believes that viewing the issue this way is less likely to yield important systemic and relational behaviours necessary to adequately understand the challenges faced by teachers and content providers than if it were viewed as a service.
All Victorian teachers and students have access to a suite of digital tools and resources supported by DET.

Additionally, teachers and students in DET schools have access to software including licensed and procured content. These resources aim to enhance and support learning and teaching in both primary and secondary settings. Until recently, DET offered teachers four discrete platforms to access resources and information:

- FUSE
- eduSTAR
- Digital Learning News
- DIGIPUBS

Established in 2009, FUSE is an online repository of digital educational content, containing approximately 25,000 searchable digital resources. These resources are a collection of websites, videos, interactive resources, PDFs and images to support learning and teaching that are aligned to the Victorian Curriculum (F-10). The FUSE portal is open to the public and provides access to information and resources to the early childhood sector, and primary and secondary students and teachers. For teachers employed at DET schools, additional functionality, such as uploading their own resources, sharing resources and access to restricted licence resources, are provided by signing in with their DET issued email.

Fuse can be accessed through:
https://fuse.education.vic.gov.au
EDUSTAR – SCHOOL TECHNOLOGY ARCHITECTURE AND RESOURCES

eduSTAR was established in 2011 and requires a DET-issued username and password to access this restricted site. The eduSTAR portal has six distinct areas that provide resources and advice in ICT planning and management, access to the software catalogue and hardware, ICT services and support, educational content, collaboration and Cloud, and guides and resources. Schools can create their eLearning plan through the online ICT planning tool, encompassing the infrastructure and technologies available in their school and aligning it with strategies to support improved learning and teaching. Professional learning through the provision of “how to” videos about using software is also available through Lynda.com. eduSTAR provides tools to deliver an effective mix of educational software and tools including freeware and licensed software applications including Microsoft Office 365, Google apps for education, Adobe Software, and Wolfram Software Suite.

eduSTAR can be accessed through: https://www.edustar.vic.edu.au

DIGITAL LEARNING NEWS

Established in late 2014, the Digital Learning News (DLN) first started as a broadcast email and then progressed to a blog. It is designed to provide information about digital learning such as school stories and upcoming events. The site also houses a professional learning calendar, opportunities for virtual professional learning for teachers, classroom virtual learning opportunities for students and digital learning resources for schools. The site is open access and does not require a username or password. Users can subscribe to receive a monthly newsletter. This blog is developed on the Global2 - DET blogging platform.

Digital Learning News can be accessed through: http://diglearning.global2.vic.edu.au
Towards a thriving digital resource ecology with teachers

STRATEGIC PARTNERS FOR CONTENT

GLOBAL2 — DET BLOGGING PLATFORM

Global2 is based on the Edublog platform with technical support provided by Edublogs. The blogging platform is managed by DET. Initially, teachers and students used this platform for blogging; however, it is now used for digital portfolios. It is a safe space to encourage students to blog, facilitate online collaboration and publish. DET has a licence for all Victorian Government and Catholic Schools to use the service; however, it was noted that the Global2 blogging platform was being reviewed at the time of this writing, with a decision pending as to DET offering the platform.

Global2 can be accessed through:
http://global2.vic.edu.au

DIGIPUBS

Established in 2015, DIGIPUBS are digital publications which provide practical advice and resources that can be accessed online on any device through any browser. A small number of VCE studies had their Advice for Teachers content provided by the Victorian Curriculum and Assessment Authority (VCAA) published through DIGIPUBS. DIGIPUBS was discontinued, with the information under review at the time of this writing for inclusion in the new DET Department Policy Advisory Guide or the Digital Hub.

The former URL for DIGIPUBS is:
http://www.digipubs.vic.edu.au
STRATEGIC PARTNERS FOR CONTENT

DEPARTMENT OF EDUCATION AND TRAINING WEBSITE

Alongside the four platforms mentioned above, the DET website provides practical information to the public, including, parents and schools. This website along with the Victorian Curriculum website from the VCAA (see below for details) are the two highest ranked websites that drive traffic to FUSE according to Google Analytics. The DET website directs 38% of this traffic — whilst the Victorian Curriculum refers 22%.

DET website can be accessed through:  
https://www.education.vic.gov.au

EDUCATION SERVICES AUSTRALIA

Education Services Australia (ESA) was established by education ministers in 2010 as an education service provider, working collaboratively with all Australian education jurisdictions to provide technology-based services for education. ESA develops cost-efficient products and services that can be adapted in response to emerging technologies and changing needs of the education and training sector. ESA also provide digital teaching and learning resources, tools and services.

ESA can be accessed through:  
https://www.esa.edu.au
STRATEGIC PARTNERS FOR CONTENT

DIGITAL TECHNOLOGIES HUB

The Digital Technologies Hub was established in 2016 to support the Australian Curriculum Digital Technologies F-10 subject. The hub enables educators to browse topics, provide inspiration for lessons and how to go about teaching the Digital Technologies curriculum. The hub contains exemplar case studies and advice from teachers and webinars to support teachers. The hub is also aimed at students, school leaders and families providing both activities and digital resources. It is a place to go to when looking for all education resources for the Digital Technologies curriculum.

Digital Technologies Hub can be accessed through: [http://www.digitaltechnologieshub.edu.au](http://www.digitaltechnologieshub.edu.au)

SCOOTLE

Scootle is the national digital repository and sharing space provided to support Australian teachers using the Australian Curriculum. Available to all Victorian teachers, Scootle is home to digital resources developed and/or aligned to the Australian Curriculum. Access to Scootle is through a username and password. Resources are made available by Education Services Australia and other providers, including the Australian Government Department of Education, Skills and Employment and numerous other providers of educational resources. It was developed to give all Australian schools access to content developed by The Learning Federation, an initiative supported by the Australian and state and territory governments. However, there is no further funding to develop new content and the funding available is only for maintenance of the Scootle portal.

Scootle can be accessed through: [http://www.scootle.edu.au](http://www.scootle.edu.au)
STRATEGIC PARTNERS FOR CONTENT

ABC EDUCATION

ABC Education provides a digital platform that has free educational resources for primary and secondary students. The platform is aimed at teachers, students and parents providing, videos, competitions, games and articles about topics of interest.

The ABC Education website can be accessed through: http://education.abc.net.au

VICTORIAN CURRICULUM ASSESSMENT AUTHORITY (VCAA)

The Victorian Curriculum Assessment Authority (VCAA), is a statutory authority primarily accountable to the Minister for Education, serving both government and non-government schools. The VCAA develops and implements curricula and assessment for the Victorian Curriculum (F-10) and the Victorian Certificate of Education (VCE).

The VCAA can be accessed through: https://www.vcaa.vic.edu.au

STRATEGIC PARTNERS FOR CONTENT

ABC Education provides a digital platform that has free educational resources for primary and secondary students. The platform is aimed at teachers, students and parents providing, videos, competitions, games and articles about topics of interest.

The ABC Education website can be accessed through: http://education.abc.net.au
THE PROBLEM STATEMENT AND METHODOLOGY

Problem Statement

Each of the four platforms (FUSE, eduSTAR, Digital Learning News, and DIgIPUBS) were developed to provide a digital solution that was much needed at the time. Since then, the needs of the users have evolved; yet, the platforms have remained static with considerable overlap between them. As a consequence, teachers do not go to these as their first choice for information and resources. Given the lapse of time since the inception of these platforms, it is an opportune time to explore new innovative models for future consideration when developing the new Digital Hub.

Methodology

This research was conducted using qualitative methods to conduct review of relevant literature and a desktop review of other online educational digital hubs.

The literature review drew on a socio-technical systems framework, with analysis of emergent themes to produce actionable insights that inform how teachers engage with and use digital tools and systems, primarily in teaching and learning. DET’s current digital tools and systems were reviewed within this framework and through the lens of the findings from the literature review. The research also captures the spectrum of user search behaviour to make recommendations for best practice when designing a new searchable Digital Hub for teachers.
Section 2: technologies in the classroom
Attempts to infuse technology into education over the past 30 years

Attempts to infuse technology into education over the past 30 years have resulted in mixed success. Schools have chosen to implement computing in the curriculum through a variety of methods, highly dependent on the type of technology available at any given time. Initially, schools deployed computers in special purpose rooms which quickly became computer laboratories. Later on, some schools opted for highly regulated one-to-one programs. More recently, as technology has increasingly become mobile and affordable, schools are offering variations on traditional one to one programs to accommodate the changing landscape of technology usage.

The introduction of the Digital Education Revolution funding from the Commonwealth Government in 2008 was the catalyst for increasing the ratio of computers to students in secondary schools. Over the past decade, many secondary schools embarked on a one-to-one program where students have personal access to their own device in the classroom. The integration and normalisation of this technology has in turn resulted in changes such as the embedding of ICT in learning and teaching programs. The use of computers in classrooms has changed from being teacher-focused to student-centred and requires a contemporary approach to learning and teaching (Keane & Keane, 2019). Keane, Lang, and Pilgrim (2013, p. 32) identified that mobile technologies “influenced and enthused teachers and students, allowing more student-centred pedagogies to be developed, improving communication and literacy of students as well as improving collaboration between staff.” This significant shift requires teachers to understand that they are influential and important leaders in the adaption of technologies in the classroom (Keane et al., 2013). What they do in the classroom directly impacts how students learn.

Two crucial factors in assisting teachers to develop their ICT skills in the classroom is delegated leadership and collaborative professional learning (Keane & Keane, 2017). Leadership – typically principal leadership - is often identified as an important factor in the implementation of ICT in schools. School principals are ‘critical people’ for maintaining environments that are conducive to teaching and learning (Moyle, 2006). While principal leadership remains important, it is those who work more directly with teachers in the planning of teaching and learning activities with ICT whose leadership is also critical to successful implementation (Keane & Keane, 2017).

Although professional development has long been identified as a key factor in using ICT in the classroom this should not mean a focus on individual skill acquisition alone. Decades of courses and/or in-services about software packages, electronic reporting, web 2.0 and the like have not had the desired impact at the school level (Keane & Keane, 2017). What makes the difference in implementation is collaborative professional learning where teachers can learn from each other as they develop effective teaching and learning in a 1:1 program.
Melbourne Declaration

The combined Australian Commonwealth and State Government body, the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) created the Melbourne Declaration (MCEETYA, 2008). The main findings of the Declaration stated that successful learners for the 21st century needed:

- To have the essential skills in literacy and numeracy and be creative and productive users of technology, especially ICT, as a foundation for success in all learning areas.
- To be able to think deeply and logically, and obtain and evaluate evidence in a disciplined way as the result of studying fundamental disciplines.
- To be creative, innovative and resourceful, and be able to solve problems in ways that draw upon a range of learning areas and disciplines.
- To be able to plan activities independently, collaborate, work in teams and communicate ideas.

This Declaration has guided the development of the national Australian Curriculum (Australian Curriculum Assessment Reporting Authority (ACARA), 2013). The Declaration also explicitly states that students need specific 21st century skills which can be developed through the use of digital technologies/ICT. These 21st century skills, also known as the 4Cs, include critical thinking, communication, collaboration and creativity (Keane, Keane, & Blicblau, 2016).

Critical thinking is vital for problem solving, as often situations are complex, uncertain, have no precedent and require a solution. Whilst students take for granted that they can communicate with others, explaining complex ideas in a concise, organised and measured approach can be challenging. As we increasingly move towards encouraging students to work in teams, their communication skill development becomes a necessity in order to function. Often these teams can interact through a combination of face-to-face and online spaces. Collaboration is a process through which a group of people productively explore their ideas to search for a solution that extends into the exploration and generation of new concepts. Creativity may be defined as pushing the boundaries to develop new ideas, and innovation is the development of these ideas into actuality.

While basic skills such as reading, writing and arithmetic (3Rs) remain essential building blocks for learning, higher order skills such as the 4Cs are equally important for learning and future employment in the 21st century alongside the importance of ICT/digital technologies for learning.

This is illustrated in the Melbourne Declaration which emphasised that it is not just competence in ICT/digital technologies that is a necessary foundation for success but creative and productive use which is essential for contemporary learning. This clearly has implications for how ICT/digital technologies should be delivered in the classroom. The power of ICT/digital technologies is to transform learning, partly on the basis that the use of ICT/digital technologies shifts control of learning to the learner (Papert, 1993).
Personalised Learning

Conceptual understandings of learning, including the importance of the learner in the learning process, the focus on deep learning for understanding and the transformative power of ICT, has led to the development of the concept of personalised learning (Keamy, Nicholas, Mahar, & Herrick, 2007). This applies equally to the teacher and the student who are both learning.

The key features of personalised learning are:
- Learners are central.
- Information and communications technology (ICT) is a key enabler of learning.
- Learning is lifelong.
- Communities of collaboration are created.

Personalised learning requires the connective power of ICT to develop ways of thinking and learning which empower the learner. It has become increasingly apparent that the transformative potential of ICT for learning presents a challenge to traditional conceptions of pedagogy (Park & Oliver, 2008; Webb, 2014). The challenge is to not only ensure the effective use of ICT in an educational setting but also to understand that ICT will change the learning environment itself (Underwood & Dillon, 2011).

Pedagogy and Learning

The use of ICT is central in each of the 21st century skills; however, the question remains as to how ICT should be used to advance these skills. Far from being straightforward, the effective use of ICT is dependent on the different ways that teachers make use of the resources available (Webb, 2014). It can be argued that ICT use in an educational setting needs to be understood in relation to pedagogy as practised by teachers. This interplay between teaching and learning is important.

Using the SOLO (Structure of Observed Learning Outcomes) taxonomy provides a means to classifying learning outcomes in terms of their complexity, enabling students’ work to be assessed in terms of its quality as well as providing guidance to teachers in how to structure questions to achieve learning outcomes. Simply put, the SOLO Taxonomy allows for the distinction between surface and deep learning. For example, surface learning is typically quantitative in nature where students recall facts or put together lists, whereas deep learning is essentially qualitative in which students are required to form judgements and think conceptually on tasks that are often longer and more complex. It is tempting to think that the simple way to address the development of the 4Cs and ICT use is by providing students with computers. However, this alone will not develop these skills. What a teacher does in the classroom with these devices is important for students adopting ICTs (Keane et al., 2016).

Another model that is often referenced is the SAMR Model developed by Puentedura (2011) which divides technology usage into four distinct levels: substitution, augmentation, modification and redefinition. Many teachers do not move past the two lowest levels; substitution and augmentation where pen and paper are substituted for a computer. This is often known as the enhancement phase. The other two levels identified, modification and redefinition, is where deeper learning occurs, and is often described as transformative. As mastery of the 4Cs requires deep learning, ICT use needs to be transformative to provide the ideal conditions for powerful learning. According to (Oostveen, Muirhead, & Goodman, 2011, p. 83), "It seems that meaningful learning is far more likely if the new technologies are recognized as providing transformative opportunities."
Figure 1: 21CDL Model (Keane et al., 2016)
21st Century Digital Learning (21CDL) Model

The 21CDL developed by (Keane et al., 2016) is a model to illustrate how digital technologies are a central enabler to learning and teaching (Figure 1 page 24). The model incorporates higher order thinking of the kind embedded in the Melbourne Declaration.

The 21CDL model describes the elements of the frameworks in relational rather than hierarchical terms. One way in which this can be understood is to realize that, in the 21st Century framework, the acquisition of the critical skills of the 4Cs are dependent on the learner possessing the fundamental skills. This is not the only way in which this model is relational. If the higher order skills illustrated here are dependent on the lower order skills, it is also true that there is no requirement to fully master the lower order skills in order to move to the higher order ones. This is true not only of the SOLO Taxonomy, where both surface and deep learning can occur more or less simultaneously, but even more so with respect to the SAMR framework where students can undertake transformative ICT tasks at the beginning of learning about a topic. Nevertheless, ICT practice at the enhanced phase will only be of benefit for surface learning and the reinforcement of fundamental skills. For the development of deep learning and the 4Cs, ICT practice needs to be transformative.

What happens in the classroom with technology usage in schools too often occurs at the enhancement rather than the transformative stage and is therefore more aligned with surface rather than deep learning. Therefore, we need to provide the appropriate situations that will allow students to develop a mastery of the 4Cs. This can be done by ensuring there is quality digital resources available to teachers to enable them to challenge their students learning.
Towards a thriving digital resource ecology with teachers

TPACK

Teachers are able to combine their thorough knowledge of subject content with their understanding of learning. This has been described as Pedagogical Content Knowledge (PCK); though it is more than having content and pedagogical knowledge. The 21st century has brought different expectations and requirements, and digital technologies/ICT is providing different ways to access and process knowledge in subject areas. It is also providing new ways to engage learners and transform teaching and learning.

Contemporary expectation is that teachers also integrate ICT/digital technologies with their content and pedagogical knowledge. This combination is described as Technological Pedagogical Content Knowledge (TPACK). The TPACK framework extends on Lee Shulman’s work and is a theory that focuses on technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK).

The theory integrates technology, pedagogy and content through a visual Venn diagram representation for teachers to use in a classroom. Teachers are more likely to develop technological knowledge and skills when learning addresses technology, content and pedagogy (Mishra & Koehler, 2006; Schrum, 1999). Effective use of ICTs/ digital technologies in the classroom requires the combination of the three types of knowledge: technological, pedagogical, and content.

A brief overview of TPACK is summarised below in Table 2.

<table>
<thead>
<tr>
<th>Initialism</th>
<th>Stands For</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TK</td>
<td>Technological Knowledge</td>
<td>Knowledge about technology and how to use specific hardware and software</td>
</tr>
<tr>
<td>PK</td>
<td>Pedagogical Knowledge</td>
<td>Knowledge about pedagogies</td>
</tr>
<tr>
<td>CK</td>
<td>Content knowledge</td>
<td>Knowledge about subject content</td>
</tr>
<tr>
<td>TPK</td>
<td>Technological Pedagogical Knowledge</td>
<td>Knowledge about how to teach with specific technologies</td>
</tr>
<tr>
<td>TCK</td>
<td>Technological Content Knowledge</td>
<td>Knowledge about how technology aligns to various concepts</td>
</tr>
<tr>
<td>PCK</td>
<td>Pedagogical Content Knowledge</td>
<td>Knowledge about how to teach specific concepts</td>
</tr>
<tr>
<td>TPACK</td>
<td>Technological Pedagogical and Content Knowledge</td>
<td></td>
</tr>
</tbody>
</table>
Figure 2: Diagram of the TPACK model
Diagram recreated from the original by tpack.org
Towards a thriving digital resource ecology with teachers
What Role Can the Digital Hub Play in the Adoption of Technologies in the Classroom?

The effective use of digital technologies is dependent on the different ways that teachers make use of the resources available. The Digital Hub (project name of DET) has the potential to be an influential repository for teachers in relation to the adaption of digital technologies in the classroom. As identified in the Grosvenor Presentation (2019), 80% of survey respondents used digital content in most of their lessons, whereas almost 30% used it every lesson. Given secondary students have access to their own mobile device in the classroom, and some primary school students also have this access, “one-to-one computers and related technologies have enriched students’ learning experiences, expanded their horizons, and opened more opportunities and possibilities” (Jing & Yong, 2008, p. 118). Bebell and Kay (2010, p. 21) also found that “student engagement increased dramatically in response to the enhanced educational access and opportunities afforded by 1:1 computing.” Using digital resources is an effective way for teachers to connect with their students.

The Digital Hub can offer a broad service for all teachers on how to use technology in their classroom. The Victorian Curriculum no longer stipulates a separate general capability of ICT, as these skills are embedded into the content descriptors from F-10 for subjects such as Mathematics, Media Arts, Geography, English and Digital Technologies. This is not to say that other subjects do not need to utilise ICT; schools have flexibility on how they integrate it in their curriculum.

Therefore, the Digital Hub is an important conduit in the provision of digital resources to assist teachers in using technologies in the classroom. By using digital resources that have been carefully curated and specifically designated for students, these high-quality resources can be targeted to a particular theme or year level.

Additionally, the Digital Hub can store how-to guides on specific software use as well as information that is currently stored on EduStar in relation to policies and procedures about hardware and software availability to DET teachers and schools. The Digital Hub should be a comprehensive solution for teachers as a go-to to find quality resources, and specific information on hardware, software and DET policies in relation to digital technology use.
A community of practice or CoP can assist with creating an environment that fosters both innovation and positivity towards emerging technologies.
Communities of Practice in Occupations

Orr (1995) describes one of the earliest forms of communities of practice through his writings on Xerox technicians in the 1990s sharing knowledge with the introduction of photocopiers. It was reported that the technicians were passionate about their jobs and spoke to each other quite significantly about how to go about repairing these machines rather than consulting manuals. In effect, the technicians were sharing and disseminating information through informal networks. Through their engagement with each other, they had a sense of belonging, were collaborative in nature and the improvised conversations were intertwined with stories about people (Cox, 2007). The learnings from this seminal case study shows many similarities when applied to teachers who are forming their own informal networks to work with other teachers.

It should be noted that Orr did not use the term communities of practice instead referring to an occupational community (Van Maanen & Barley, 1984). The occupational community is founded on the idea that people from the same line of work want to associate with each other, since they think in similar ways. It is also taken into account that they are geographically spread. A community of practice expands this definition requiring three aspects: a domain, a community and the practice (Wenger, 1999). According to Wenger (2011, p. 1) “Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.” Some organisations prefer to call the notion of communities of practice by other terms, such as learning networks, thematic groups or tech clubs.

A community of practice or CoP can assist with creating an environment that fosters both innovation and positivity towards emerging technologies. Often the building of a CoP is seen as relationship building amongst teachers and is central in developing trust (Crum, Sherman, & Myran, 2010). The CoP Community of Practice within a school can provide an environment that fosters shared trust amongst the teachers to allow them to pass on knowledge, and to interact with one another to transform their teaching practice (Crum et al., 2010; Lee & Brett, 2015). Given the complex nature of implementing new technologies into the classroom, building a teacher CoP is a significant and an important factor in building teachers’ capacity to use technology effectively in their teaching (Lee & Brett, 2015). This shared leadership, fostering of common beliefs, and a place of belonging not only provides teachers with a means of professional development but it also creates ownership of the initiative, assists with school improvement and improved student learning outcomes (Waters, Marzano, & McNulty, 2003; Wilhelm, 2013). Ownership is quite vital when it comes to implementing technologies that are new to a teacher’s practices. Equally vital are teachers’ contributions to educational leadership (Dinham, 2005).
Teacher Participation in Online Communities

An online community can be defined as “a group of people who come together for a particular purpose or to satisfy particular needs; they are guided by formal and/or informal policies and supported by computing technology” (Jones & Preece, 2006, p. 113). With the availability of technology, teachers are being drawn to professional online communities. Over time, these communities provide a space for participants to learn, create, interact, and develop relationships through active participation (Trust, Krutka, & Carpenter, 2016; Wenger, McDermott, & Snyder, 2002; Wenger, Trayner, & De Laat, 2011).

Research suggests that teachers are drawn to teacher online communities because of the relationship and emotional connections they develop. Teachers who felt that they were professionally isolated or did not have other colleagues that were like-minded often sought the emotional connection of teachers through online communities. (Carpenter & Krutka, 2015; Visser, Evering, & Barrett, 2014). Continuous support and promoting interaction among teachers are keys to successful teacher professional development (Hiebert, Gallimore, & Stigler, 2002; Hur & Brush, 2009; Lantz-Andersson, Lundin, & Selwyn, 2018).

Online professional communities enable teachers to have access to informal and professional resources, and connection 24-hour hours a day, seven days a week. This has enabled more access and flexibility for teachers in overcoming temporal and geographic limitations than traditional offerings such as Subject Associations, or face-to-face networks.

Many educators have attempted to create online communities for teachers. These include spaces such as the Scootle Community, Facebook groups, and LinkedIn. Whilst most of these are free, there is a growing number of teachers who develop resources where money can be exchanged for resources such as Teachers Pay Teachers. Teacherpreneurs is the term given to K-12 teachers who are entrepreneurial and share their teaching resources through online websites. By building up a strong online presence in private social media networks, they build up their networks amongst other teacherpreneurs.
Service Design for Accessing Online Resources

Historically, online services have been designed with a hypothetical user in mind. The designer considers how this imagined user will interact with the interface and front-end processes of the service, and how best to guide them through the service in a transparent and direct manner. User-Centred/User-Experience (UX), or Human-Centred Service design (HCD) concepts are dominant ideals in the industry. However, accessing resources online is a non-linear, context contingent, human decision-making process. The risk with these service-user models involves designers using themselves and their immediate cohort as the user template therefore limiting the scope of the design to exclude how people outside their circumstance may use it. Other frames of reference may not be considered or questioned. Another risk with using this model is it does not account for how a user engages with the service in their actual social context. User behaviour is contextualised in personal, professional, cultural and situational conditions that are influenced more by peers including by the norms of their actual social network connections.

Designing services, especially in the context of classroom teaching, requires a more sophisticated conceptual frame than UX or HCD models of online service design. Digital leaders such as Intel, Xerox-Parc, Google and Apple are leading the way in redefining the idea of a service-user to that of a peer-influenced, conditionality influenced, human decision-maker.

One of the more productive directions to take for service evaluation and design is to understand the teacher, not as a compliant and ‘to be funnelled’ persona of interface design, but as a just-in-time socially and technologically contingent decision-maker seeking to optimise in their moment of need.

Good service-design is framed for a person navigating highly contingent and complex social and technical systems. Effective online services for teachers should present an interface and a search feature that accommodates non-linear thought and search patterns by the teacher.

To create a sustainable resource that will meet the diverse needs and circumstances of Victorian teachers, the search functions of the interface should link with the communities of practice and transactional social contexts of the teacher-users. In design anthropology terms, humans gravitate to more than one type of social belonging in their professional lives. There is value in a supply-based DET-managed non-linear digital platform (of Public-Private partnership for content supply) for teachers, that allows teachers to also access a Public-Teacher community partnership platform where teachers can interact and contribute content (informal contribution that would grow demand-based content). This disruptive model is also likely to be self-sustaining for teachers, as it places teacher expertise in the centre of the resource and creates value in the CoP interactions. Figure 3 (above) illustrates a concept of a digital supply-based hub management by Government, learning and exchanging resource with a CoP teacher base hub reliant on a Public-CoP based supply and consumption.

An opportunity to invest in a CoP will be contingent on the transactional value of that engagement. If access to and using the resources of a digital hub is a strategic outcome of DET, then linked access to a CoP that opens up teacher-sourced and created resources online will raise the hub’s value for many classroom teachers. Content transaction value will grow the desire to access the Digital Hub if teachers can, in a linked search way, contribute content too.
Emerging and Enabling Roles of DET

This section highlights specific design-anthropology perspectives about the general themes related to Communities of Practice (CoP) and emergent more sophisticated Fellowships of Practice (FoP) for understanding teacher search-behaviour online. Humans generally seek out the company of others as they search for:

- security (confidence in their value)
- meaning (confidence in where they fit in) and
- subsistence (confidence in their productivity or value to DET).

These behaviours are the foundation of human communities whether online or in person. Affirmation of belonging is sought through a variety of means including on the basis of blood, place and or affection. Three modes of human grouping identification explored in the field of design anthropology are listed in Table 3.

Table 3: Modes of human grouping identification

Source: Seemann, 2019, Lecture notes on Designing for Groups and Communities, Sept 30, 2019)
Supporting Communities of Practice in Teaching

This report has highlighted the growth of various blended (online and/or in-person) and temporal (opt-in and opt-out) communities of practice among teacher cohorts. Teachers are turning to other teachers through informal networks, for filtering and processing the vast array of online resources available to them, DET-provided resources are in competition with other resources available in the online space. Teachers are time challenged and seek veracity and effectiveness of resources immediately. Communities of Practice are more responsive towards meeting this need. Self-appointed and outspoken new leaders are emerging in non-traditional spaces. They generate followings of people who are interested in their work. This behaviour is consistent with tribe-like behaviours in many professional sectors (Godin, 2008; Wang, 2005).

Similarly, teachers identify with colleagues in their tribe who have experienced failures and successes and are prepared to share their experiences.

This valuing of others fits within the affection category in Table 3 (page 34). Communities of practice tend to form around specific common operational or practice matters where advice on practice and empathy are shared.
Emergent Fellowships of Practice in Teaching

Alongside Communities of Practice is a relatively new phenomena, Fellowships of Practice. Whether communities of practice are temporary or long-term, they share a common social-professional network that thrives on sharing ideas about classroom practice. With the rise of online social platforms, communities of practice have also formed blended modes of sharing and trading trusted and useful sources for gathering digital resources. The emergence of the fellowship is related to the combined scenario of the vast array of digital resources being produced worldwide against the immediate local conditions to which teachers are seeking to find fit-for-purpose resources. This environment not only relates to the learning needs within curriculum areas programmed for their classes, but also their school leadership culture, budgets, and navigating the balance between their capabilities and knowledge of DET’s regulatory boundaries. This situation produces a dynamic challenge, in a complex system of multiple factors to balance and consider.

The two distinguishing characteristics of fellowship are that more experienced teachers engage in forming robust philosophies of education and are connecting at a higher conceptual level on the meaning of their profession, often with other teachers not in their field or sector. Philosophies of education offer an overarching, evolving conceptual framework to filter digital resources and how to manage and utilise them. Having a philosophy of education also assists teachers in identifying their role in the ever-evolving digital ecology. DET has a role to assist teachers with developing robust philosophies of education based on sound evidence and theory.
Responsive Digital Content

Responsiveness is measured by time and value, which teachers are looking for when locating digital resources. Content for the Digital Hub needs to be engaging for students, adaptable, allow for differentiation and active learning and the resources should be current. The Department of Education and Training: User Research Value Proposition Canvas Exercise (Keating, 2019, p. 5) stated that “Content should be relevant to the curriculum; it should be kept up to date and well referenced. Ideally there should be examples of how the resource has been used included with the resources.” These four points are important when curating digital resources. Digital curation needs to be done systematically and thoroughly so that teachers can see the value in using the Digital Hub.

According to the Grosvenor Presentation to DET (2019), it determined that teachers were after access to digital content that was:
- simple and easy to use
- reliable
- fit for purpose (ie/ aligned with the curriculum)
- adaptable
- interactive and collaborative.

The Digital Usability Report (Barber, 2019), Department of Education and Training: User Research Value Proposition Canvas Exercise (Keating, 2019) and the Grosvenor DET Digital Content Presentation (Grosvenor, 2019) also align with our views.

Digital Hub needs to have enticing, high quality content for teachers to use for the first time and continue to reuse. We believe that for this to happen, DET should consider establishing criteria and following a digital curation lifecycle to assist with the curation of digital resources and the preservation of them.
Section 3: digital curation
Digital curation refers to activities that are related with the maintenance of digital resources and their long-term value (Kouper, 2016).

The Digital Curation Centre (DDC)\(^1\), have developed a digital curation lifecycle to document, at a high level, all the necessary steps involved in digital curation. Whilst these steps are generic, there is the possibility further steps may be required or some that may need to be deleted as they might not be relevant to the Digital Hub.

Digital curation are ongoing processes, requiring considerable thought and the investment of adequate time and resources. It is also important to take actions to promote curation and preserve throughout the data lifecycle. Figure 4 below illustrates the Digital Curation Centre’s (DDC)\(^2\) model of the digital curation lifecycle.

Figure 4: Diagram of the digital curation lifecycle

\(^1\) [http://www.dcc.ac.uk](http://www.dcc.ac.uk)
\(^2\) [http://www.dcc.ac.uk](http://www.dcc.ac.uk)
The Digital Curation Lifecycle Model

The DDC\(^1\) have identified the following key elements of the Digital Curation lifecycle model:

- **Conceptualise**: conceive and plan the creation of digital objects, including data capture methods and storage options.
- **Create**: produce digital objects and assign administrative, descriptive, structural and technical archival metadata.
- **Access and use**: ensure that designated users can easily access digital objects on a day-to-day basis. Some digital objects may be publicly available, whilst others may be password protected.
- **Appraise and select**: evaluate digital objects and select those requiring long-term curation and preservation. Adhere to documented guidance, policies and legal requirements.
- **Dispose**: rid systems of digital objects not selected for long-term curation and preservation. Documented guidance, policies and legal requirements may require the secure destruction of these objects.
- **Ingest**: transfer digital objects to an archive, trusted digital repository, data centre or similar, again adhering to documented guidance, policies and legal requirements.
- **Preservation action**: undertake actions to ensure the long-term preservation and retention of the authoritative nature of digital objects.
- **Reappraise**: return digital objects that fail validation procedures for further appraisal and reselection.
- **Store**: keep the data in a secure manner as outlined by relevant standards.
- **Access and reuse**: ensure that data are accessible to designated users for first time use and reuse. Some material may be publicly available, whilst other data may be password protected.
- **Transform**: create new digital objects from the original, for example, by migration into a different form.

Applying the DCC’s digital curation lifecycle model to the Digital Hub, the following table explores the implications and raises further questions that need to be addressed as outlined in Table 4.

The process of acquiring and curating resources requires substantial investment of human resources to ensure that the digital resources curation is of high quality, relevant and accessible to teachers. Additionally, a search engine that is responsive to teachers needs that can identify resources that are both thematic and mapped to the Victorian Curriculum is much needed. The Digital Hub will require resourcing both financial and staff to ensure that the content is relevant, adaptable, up to date so that teachers will see the value in this resource.

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\(^1\) http://www.dcc.ac.uk
<table>
<thead>
<tr>
<th>DCC Lifecycle</th>
<th>Applying to Digital Hub</th>
<th>Implications for Digital Hub</th>
<th>Questions arising?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptualise</td>
<td>Conceive and plan the creation of digital objects, including data capture methods and storage options in the Digital Hub.</td>
<td>Who will find the resources?</td>
<td>Where will the resources be sourced from?</td>
</tr>
<tr>
<td>Create</td>
<td>Produce digital objects and assign administrative, descriptive, structural and technical archival metadata.</td>
<td></td>
<td>Does DLS only curate resources from strategic content partners?</td>
</tr>
<tr>
<td>Access and use</td>
<td>Users can easily access digital objects on a day-to-day basis. This includes locating the digital resources easily. Some digital objects may be publicly available, whilst others may be password protected.</td>
<td>How are the digital resources stored in the Digital Hub? Do the resources have keywords in the metadata that identifies them through curriculum themes or by the year level? The search engine for searching will be critical in assisting with the access and use.</td>
<td>Will digital resources be searched through themes or by curriculum year levels or both? How will the edupass single sign-on work across platforms?</td>
</tr>
</tbody>
</table>
## DIGITAL CURATION

<table>
<thead>
<tr>
<th>DCC Lifecycle</th>
<th>Applying to Digital Hub</th>
<th>Implications for Digital Hub</th>
<th>Questions arising?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appraise and select</td>
<td>The digital resources will need to be evaluated. There needs to be a process where resources are updated, and also long-term curation and preservation needs some consideration. Adhere to documented guidance, policies and legal requirements.</td>
<td>The resources will need to be evaluated to ensure that the resources are relevant. The resources will need to be periodically reviewed to see if they are still appropriate or relevant.</td>
<td>How do you know if the resources are of high quality? Will there be criteria created to assist with the evaluation of the resource? Can these criteria be applied to all resources? How often will the resources be reviewed to ensure they are current? Will there be one review of the resources, before acceptance? Where will you store the archived resources when they are no longer relevant, however teachers still want access to it?</td>
</tr>
<tr>
<td>Dispose</td>
<td>Rid systems of digital objects not selected for long-term curation and preservation.</td>
<td>Resources that have been identified as not been relevant or used will need to be disposed so that only current and relevant resources are available. There is a fine line between long term preservation and disposition of resources and the team/person making the decision. Paid resources that are no longer licensed can easily be disposed as DLS no longer has access to them.</td>
<td>Who will make this decision that the digital objects are no longer required and will not be preserved? Will there be a criteria/checklist devised to assist with what makes a resource redundant? Will the number of statistics of downloads be taken into account?</td>
</tr>
<tr>
<td>DCC Lifecycle</td>
<td>Applying to Digital Hub</td>
<td>Implications for Digital Hub</td>
<td>Questions arising?</td>
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<tr>
<td>---------------</td>
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<td>-------------------</td>
</tr>
<tr>
<td>Ingest</td>
<td>Transfer digital objects to an archive, trusted digital repository.</td>
<td>The <em>Digital Hub</em> will be all encompassing and new, however is this a space where the current contents of FUSE might sit until the resources are sorted? Also, will there be resources allocated to this site for maintenance?</td>
<td>Where will this secondary repository be positioned? What resources will be available to maintain the site? The site cannot be seen as a “dumping ground” for resources that are no longer relevant. What provisions will be made to ensure this doesn’t occur?</td>
</tr>
<tr>
<td>Preservation action</td>
<td>Undertake actions to ensure the long-term preservation and retention of the authoritative nature of digital objects.</td>
<td>We don’t believe this step is necessary for the <em>Digital Hub</em>.</td>
<td>We don’t believe this step is necessary for the <em>Digital Hub</em>.</td>
</tr>
<tr>
<td>Reappraise</td>
<td>Return digital objects that fail validation procedures for further appraisal and reselection.</td>
<td>This will provide a “second chance” for digital resources that are not initially accepted into the <em>Digital Hub</em> to be considered. It would be appropriate to have another reviewer or team of reviewers to look at the resources and reappraise them. This should be done blindly so the opinions of the first reviewer does not influence the second ones.</td>
<td>Will this step also apply to digital resources that are deemed to long term preservation? Who would DLS consult in these cases?</td>
</tr>
<tr>
<td>Store</td>
<td>Keep the data in a secure manner as outlined by relevant standards.</td>
<td>Where will the digital resources be stored and how big is the server?</td>
<td></td>
</tr>
<tr>
<td>Access and reuse</td>
<td>Ensure that data are accessible to designated users for first time use and reuse. Some material may be publicly available, whilst other data may be password protected.</td>
<td>See “Access and Use”</td>
<td></td>
</tr>
<tr>
<td>Transform</td>
<td>Create new digital objects from the original, for example, by migration into a different form.</td>
<td>Will the <em>Digital Hub</em> accept digital resources that have been re-worked by teachers?</td>
<td></td>
</tr>
</tbody>
</table>
The Digital Curator

For the Digital Hub to be a dynamic repository, it will require constant appraisal of the digital resources that will be stored. The appraisal of digital resources will require criteria to be established so that the Digital Curator, possibly along with a team of people, to assist in selecting appropriate resources. Additionally, the Digital Curator will also have to know when the digital resource will need to be archived when it is no longer relevant or useful to teachers.

DET can do this in a variety of ways to assist the Digital Curator, such as training up volunteer teachers in exchange for professional development, providing payment above the teaching salary for the extra work they undertake outside of school hours (as per VCAA-VCE exam marking), or through another devised scheme. The review of resources will be a continuous and constant process to ensure that the resources stored in the Digital Hub remain relevant.

We would encourage DET to formalise the process, provide support and training and have a contract in place with expectations of requirements so that those involved in the reviewing process understand the terms and conditions of what they are doing. In the initial move from FUSE to the Digital Hub, given the large number of resources in FUSE, a team of people will be required to work exclusively on this project so that only relevant and high quality material is mapped to the Digital Hub and other resources can be archived or disposed.

Open Educational Resources

Another area that would be of interest for DET to explore is OERs (Open Educational Resources). OERs, whilst not used widely in Primary and Secondary education, needs further promoting (Marcus-Quinn & Hourigan, 2017). The resources found in the international repositories (such as MERLOT, MIT Open Courseware, JORUM, Cool4Ed) offer access to open, creative commons licensed resources. JORUM, for example, (http://www.openwa.org/jorum-page/) is not a content provider, but lists open educational materials shared by those who teach in or create content for the further and higher education communities. Alternatively, teachers can contribute through using OER Commons https://www.oercommons.org/

In European educational systems, policies are in place to improve the development and availability of digital learning resources, including Open Educational Resources (OER). The Eurydice Report (European Commission/EACEA/Eurydice, 2019) stated that some European countries promote the use of digital learning resources by financing web portals that become repositories, enabling teachers to share resources. These portals may also provide tools to help teachers to create their own resources, or they may offer e-learning opportunities or other services linked to digital education, for example: Flemish Belgium4 – Klascement, Spain5 – Mediateca EducaMadrid, France6 – Canopè, Greece7 – EduGate and Photodentro – OER8.

4https://www.klascement.net/
5https://mediateca.educa.madrid.org/
6https://www.reseau-canope.fr
7http://edu-gate.minedu.gov.gr/
8http://photodentro.edu.gr/aggregator/?lang=en
The review of resources will be a continuous and constant process to ensure that the resources stored in the Digital Hub remain relevant.
Strategic Partners

DET currently has a number of strategic partners that provide content through the official Department Strategic Partnership Program. These include but are not exhaustive: NGV, Zoos Victoria, ACMI, Museums Victoria, Parliament of Victoria and subject associations. Additionally, there are partnerships which include software and hardware vendors (i.e., Google and Microsoft). Currently, these content providers are linked through FUSE as their content is considered to be of value due to each of the content providers being regarded as reputable.

Whilst not wanting to reinvent the wheel and separately cataloguing each of the strategic partner’s content, the Digital Hub may need to continue linking these sites through a URL with a disclaimer stating that this content is from a third party and has not been vetted by DET (as per the DCC lifecycle model). However, DET may choose to feature or highlight specific resources from their strategic partners if it may be of value to all teachers, such as, ACMI Film it – the filmmaker’s toolkit https://www.acmi.net.au/education/online-learning/film-it/.

Subject associations identify themselves as a formal community of practice. The role of the subject association has been to provide teachers with assistance in developing and procuring resources, hosting annual conferences, and professional development/networking events for in-service teachers. The subject association has been and was the main sources for subject and curriculum content; however with technological advances the role of subject associations is changing, and the reliance of teacher volunteers is becoming increasingly difficult to maintain.

Further discussion with strategic partners is needed.

Who is Meeting the Needs of Teachers?

The Department of Education and Training (DET) is the employer of teachers in the public-school system in Victoria. In effect, DET is both a regulatory body and an employer which makes it difficult for teachers to perceive the relationship between themselves and DET as anything else than an authoritative body. In the digital technologies space, teachers turn to DET for regulatory advice. DET provides its teachers with hardware and software and a repository of resources through FUSE. Nonetheless, the widely accepted view is that this platform is not being used and it is not the go to platform that teachers turn to first. The products and services that are offered by DET are not serving the teachers’ needs, which is why they have established informal networks through the use of social media, or informal gatherings such as “teachmeets” (Bennett, 2012).
Search Tools from a Design Anthropology Perspective

Searching for resources online is as much a relational and goal driven social act as it is a technical act of navigating the digital ecology as it is known to, and experienced by, the searcher (Seemann, 2015). Consistent with the Cynefin model for framing complexity (Snowden & Boone, 2007), the number of relational interactions at play can vary. Interactions can range from a simple direct-hit search and successful use relationship with these platforms, to complicated but predictable systematic access routines where common and multiple search filters are used in each search activity. Moreover, there may be multifaceted access behaviours that include search-term to resource-term misalignments, trust in a digital resource being relevant, developmental appropriateness of the quality, managing digital interface design and/or hardware/software design technology failures, all competing with teachers seeking to satisfy a present need.

Searching is commonly designed around logical reasons. However, teachers also have other search reasons based on a range of common factors that are present. While such features may include year level, or areas of curriculum, the search engine needs to be able to determine resources of value. For example, a Year 3 teacher wanting to teach STEM in their classroom may start searching for lesson plans and classroom activities within a budget or lesson length constraint. The search engine in the Digital Hub needs to learn and predict the types of searches teachers will enter for it to be adaptative.

Teachers engage in a range of online search behaviour depending on the outcomes they seek and the circumstances to which they are responding. Search behaviour can be categorised as: simple, complicated but predictable, non-linear and problematic, and failed. Simple search behaviours involve using well-known search expressions matched to well-known ways to describe resources. For example, searching “bees” and “science” for a lesson resource is a simple search behaviour likely to return a range of useful results. Complicated but predictable search behaviours involve more criteria, including more general search-terms. This tends to return appropriate results even if a further refined search is required, based on the type of results returned. For instance, “STEM” and “Maths” for a lesson resource is likely to return less accurate results as STEM remains an ill-defined field. However, initial results may reveal other search terms and words, enabling a subsequent search with a terms such as “Maths activities”. This refined search may yield enough results for a teacher to seek further using that search expression. Search behaviour that is non-linear and problematic can be behaviours that try many iterations of different search term combinations until the teacher exhausts search options without finding many appropriate or useful resources. For example, a teacher may use different combinations of search terms such as “year three” and “STEM”, or “transport” and “year 3” and “ADHD” to find a suitable guiding resource for lessons that accommodate year 3 ADHD students in hands on science lessons. Finally, search behaviours may fail to yield any results of value. This may drive teachers to search outside the Digital Hub platform onto the world wide web (WWW) and through collegial networks instead.

The confidence level of teachers to lead themselves or others in filtering and curating their own digital resources is also a key factor that should influence the design of the Digital Hub. To borrow from Blanchard and Steindl (Blanchard, Zigarmi, & Nelson, 1993; Steindl, 2017) how a teacher searches for, adapts, and curates their own resources is related to their confidence. We may broadly map Blanchard’s situational leadership hierarchy with that of the Australian Professional Standards for Teachers (Australian Professional Standards for Teachers, 2018):

- **Enthusiastic beginner** (graduate teachers) may seek specific DET regulated instruction.
- **Disillusioned learner** (proficient teachers) may respond to empathic mentors (fellowships) and enabling and encouraging performance feedback.
- **Capable but cautious contributors** (highly accomplished teachers) may need clear, positive recognition (valued groups or communities of practice).
- **High fliers/self-reliant achievers** (lead teachers) may respond best to “higher order” incentives including facilitating more autonomy in genuine authority and recognition to lead, create and guide as fellows.
Section 4: examples
EXAMPLES OF OTHER PLATFORMS

Examples of Other Digital Hub Platforms

A search for platforms was conducted to explore how other educational jurisdictions provided resources and information to teachers, parents and students. Three search terms were used amongst all the examples featured below to see the type of information that could be elicited without password restrictions. The terms searched were Minecraft, Policy, and Curriculum. These three search terms were used to provide the researchers with insight about how to search for resources and information.

The site design was very user friendly, with English and Maori languages intertwined. The main teaching areas were clearly displayed on the homepage delineated by age, which made it very easy to find information. There are tabs for Parents, Educational Conversation and the work the department does in the header menu, with pull-down menus for each. It was very easy to navigate, and the different teaching areas were colour coded.

The search bar was displayed prominently, and the links downloaded very quickly. We tried our three key word searches; the results were mixed. For Minecraft, there was only information on licence and software installation; there was no information on teaching strategies. There were 328 hits for Policy, with different types but not in a relevant order for teachers. With Curriculum, it seemed to concentrate on updates and did not have any about teaching strategies in the top ten selections: 394 hits.

A few interesting items to note on the homepage were the Education Hub, which was a series of conversations about education; there were also Quick Links of common matters, and current news/media reporting. There are links to the main social media platforms: Twitter, Facebook and LinkedIn.

http://www.education.govt.nz/
The British Government have collected the different department and organisation within its jurisdiction under the one umbrella website. From the homepage, it can be seen that it is very spartan in nature, and hyperlinks the main categories. The design is considered exemplar in accessibility design for the web. It makes it easy for people with various disabilities to access and navigate, including those who use screen readers. The accessibility statement is https://www.gov.uk/help/accessibility-statement. There was no site plan. Information and images of the top personnel are listed below, as well as corporate information i.e. energy use, equality and diversity and job contracts.

The search bar appears simple, but has a pull-down menu that refines the key words, and allows further sorting of the results. The links opened up within the site, not to another window, which made it hard to navigate back to the homepage. This is an accessibility feature as being sent to a new webpage can be problematic for people using screen readers. There are breadcrumbs and a link to Home on every page that a user should use to return to the homepage rather than a back-browser button.

For Minecraft, there were 19 results, of which two were for teaching strategies, and the others not relevant. There were initially 1281 hits for Policy that were filtered down to 304, but few relevant for teachers. With Curriculum, there were 2832 hits, and the first 20 relevant for teachers. There were main links on the homepage to Research and Statistics, National Curriculum and Special Needs and teacher training, however, it was difficult to find details on teaching strategies. There are links to the main social media platforms: Flickr, Twitter, Facebook, YouTube, Instagram and Newsletters (Children and Family Social Workers).

https://www.gov.uk/government/organisations/department-for-education
EXAMPLES OF OTHER PLATFORMS

DEPARTMENTS OF EDUCATION ACROSS CANADA

The different education departments of the provinces are listed on the main site and hyperlinked. If a province was large, schooling and post-secondary options were provided; for smaller regions, only one category was itemised. There are options for English or French language translation. Each one has a different layout and style.

Ontario was selected for further examination. The interface is easy to navigate, the key options are clearly listed in the main menu, with a customised sidebar listing the different education areas. For Minecraft, there was one result, and not relevant. There were initially 50 hits for Policy, with wide variety in the results; with Curriculum, there were no results, which is unusual for an education website. Each of the pages had very good explanations, and pdf documents could be downloaded.

There are two parts to the sidebar: Learning in Ontario, as well as other topics, including Employment, Publications and FAQs. The menu item for Popular Topics contained a wide range of subjects, such as teacher excellence, policy, indigenous and learning strategies. These topics were not found with the search function in the top listing. Publications was divided into different categories for teachers, parents, students and administrators. Included are the names of members of parliament in Explore Government. There was also an English, French Education glossary.

There is a sitemap and an accessibility statement. There are only two social media platforms listed: Facebook and Twitter.

http://www.edu.gov.on.ca/eng/relsites/oth_prov.html
The present website was launched in 2017, and shared with the Ministry of Communication as they deal with feedback and queries. It offers three languages: Finish, Swedish and English. However, google translator needs to be selected with any hyperlinks from the homepage. The breadth of education spans from pre-school to university. The website is clearly laid out, navigable and adapted for mobile, tablet and PC.

The search option is very sophisticated, and further refines the results in two ways: there is a Limit Search Result as well as a Help+ button. For Minecraft, there were no results. There were 338 hits for Policy, and for Curriculum, there were 52 hits.

What was most useful was that each of the results came with a preview and key search areas bookmarked at the bottom, so it was easy to see which criteria they satisfied. There is a sitemap, and four social media platforms listed: Instagram, Flickr, Facebook and Twitter.

Towards a thriving digital resource ecology with teachers

The menu items are clearly categorised, and the website is well-laid out. The site plan is very comprehensive, and it is easy to find relevant information because the headings are clear: School Support, Educational Stages, Education Information, Sections for Teachers, and Related Sites.

What is most interesting is that as soon as the website loads, a pop-up window appears that takes visitors directly to the resources available to everyone. The guiding mottos are: You Don’t Stop Learning, and with this Platform, Anyone can Learn!

The site is targeted at students and adults, and pushes coding and programming. The educational resources are free and up-to date with an underlying philosophy of life-long education. There are over 3000 digital books, with the use of game theory for mathematics education. Google translator is needed for the English Language.

The search button is basic, with no facility for refinement or a total number of hits. For Minecraft, there was zero result. For Policy, there was only news, not the policies themselves, and this was the same for Curriculum.

The menu items each have a drop-down menu, and the different areas are clearly itemised, such as curriculum and policy, which makes locating information easy. The size of the text can be changed. They also have categories that are appealing. For example, if a visitor is looking for a job, they can click on, Work With Us. The Chilean Education department was highlighted in the TALIS report (OECD, 2018) for its Enlaces program that sought to build teachers’ ICT skills.

https://www.mineduc.cl

EXAMPLES OF OTHER PLATFORMS

MINISTRY OF EDUCATION CHILE

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https://www.mineduc.cl
The interface is uncluttered, with a few broad categories. This website was created in 2018, and updated recently.

There were customised side bar menus for FAQs and Quick Links with clearly labelled categories that enable users to navigate the site quickly.

The search bar has Search, Learn, Explore embedded within it; it is an attractive touch and invites users with different interests to peruse the site. There is some delay when clicking on the hyperlink, but separate windows are opened up in Google, which makes it easier to navigate back to the homepage. For Minecraft, there were only two results and dated articles about their use. There were 1360 hits for Policy, while Curriculum and Syllabus scored 1790 and 767 hits respectively. There are several features worth highlighting.

First, content from the MOE (Ministry of Education) link was always referenced. Second, content was printer friendly. Finally, there was an enquiry option, Ask Jamie, where a query could be made, and a file uploaded. There were other points of interest with this site, such as a website satisfaction poll and a link to a dedicated education news site called School Bag containing videos/stories/vignettes with practical classroom teaching tips from a range of disciplines.

Visitors are invited to rate the site, which was not common to other websites, and there was a competition where visitors could deliver a thank you speech for a teacher. There are three social media platforms listed: Facebook, Instagram and Twitter.

https://www.moe.gov.sg/
The homepage has a sidebar menu, with clearly labeled categories for navigation targeted at educators, parents, partners and students. Further down the homepage, there were more sub sections within the four identified categories. It is interesting to note that they have resources for parents and Professional Development for teachers.

Further down the homepage, there were more categories to help locate desired information. It is interesting to note that they have Professional Development in the list and Special Education. There was also a hyperlink to procedures for teaching credentialing. In the Resources for Teachers, a community of practice (CoP) invited teachers to share resources, collaborate and share best practice, under the label of Digital Chalkboard.

The search function is basic and does not provide a result total. It allows a user to filter the type of file required, such as PDF, PowerPoint or image file, but the usefulness of this is uncertain. For Minecraft, there were two results and not relevant. There were a number of results for Policy, but not sorted in a relevant order for teachers. With Curriculum, there were more relevant results located for teachers.

There are three social media platforms listed: Facebook, LinkedIn and Twitter.

https://www.sccoe.org/
The TALIS report (OECD, 2019) drew attention to the Israeli digital education platform, Education Cloud, because it provides extensive resources for teachers and allows them to upload content and collaborate/reflect with others on their teaching. The information written in Hebrew is spread across various websites. There is descriptive information for teaching on a hyperlink from the Ministry of Foreign Affairs. Translations are provided in a number of languages: English, Arabic, Hebrew, Russian and Spanish. The different areas of schooling are clearly detailed, ranging from pre-school to adult, but not hyperlinked. There seemed to be no search facility here.

However, on the other two websites, there are basic search buttons that sit above customised sidebar menus that link to different types of resources, in particular digital content and books. There is also a portal for teachers and parents, and the FAQs contained clear and explicit information.

Ministry of Education — https://mfa.gov.il/MFA/AboutIsrael/Education/Pages/default.aspx


EXAMPLES OF OTHER PLATFORMS

THE LEARNING PLACE – QUEENSLAND GOVERNMENT, DEPARTMENT OF EDUCATION

This site is a comprehensive environment that provides access to digital resources, tools, online spaces for teaching and learning, collaboration and networking. There is provision for both students and teachers to access this site. Some of the items are behind passwords, whereas other resources are open.

The design of this website was clean but did not necessarily draw the user to it. When Minecraft was entered into the search engine, the site came up with an error. All eResources were hidden by a password. The Department of Education has published a Digital Strategy (2019-2023) which will aim to connect and engage learners through the integration of digital platforms and resources. The second page of the digital strategy is similar to DET’s plans for the Digital Hub. We recommend it is read in addition to this report.

The second page of the Digital Strategy has been included below to highlight the similarities between the DET’s Digital Hub and QLD’s plans.

Key learnings from other digital hubs

- Whilst each of the listed examples all provide something unique, QLD’s Department of Education has articulated their plans to create a comprehensive and integrated platform for the use and support of technology in relation to teaching and learning. Whilst there is a brief Strategic Plan listed on their website, there is limited public information as the strategic plan was published in late June. We would advise DET to contact QLD Department of Education to see whether they are willing to explore mutual collaboration.

- In all examples, there were some aspects which were desirable such as Singapore’s example where their Department link was always referenced. The content was also printer friendly. The third point of interest was the automated help feature where a query could be made, and a file uploaded. The site contained a poll which may or may not be of interest, and also the personalisation of the site, by including vignettes with practical classroom teaching tips from a range of disciplines.

- Israel’s Educational Cloud is a platform for sharing and creating content between teachers and for teachers. There is a special platform to encourage teachers to publish content they developed and to collaborate with other teachers in the production of content (Winer, 2018).
Section 5: is DET ready?
DET’s Role in Provision of Digital Support to Classroom Teachers

Strategic opportunities and new existential challenges are facing DET. Critical questions include:

1. What is the role of DET/DLS in providing digital content for teachers?
2. What emerging roles related to DET’s digital ecology are likely to be more important for assuring quality educational practices into the future of education?

It should be acknowledged that:

1. DET has roles as both a digital author and digital curator and regulator of quality processes
2. DET’s relationship with teachers is expanding to include that of a digital resources coach, a provisioner of tools to enable teachers to create engaging resources, and to that of an institutional facilitator
3. DLS’s vision for the Digital Hub is to be a curator of quality digital content and provide support to other department areas in the creation of digital content.

DLS’s role in digital curation provision will remain core, though different in emphasis towards guiding and regulating quality processes. The Digital Hub is also likely to continue to shift the balance of its efforts between acting as content authority to including greater effort in developing its role as mentor and partner to its teachers, helping them to assume greater responsibility for filtering and content gathering (curation) and creation. A useful metaphor is to view their future role as standing beside teachers and to jointly work out the best approaches for finding, filtering, and creating quality, engaging content suitable for classroom teachers.

The Digital Hub demands it allocates proportionally more of its attention to helping classroom teachers find, filter, adapt, use, create, or share samples of content aligned with the Victorian Curriculum and policy constraints. It is a position that fully embraces emerging new digital content and learning resources being produced globally.

Teachers are demonstrating greater interest in sourcing resources through Google or social networking such as online groups. This indicates that a new digital culture of practice has seeded. The result of this emerged behaviour does not appear to be centred on digital content alone, nor on ease of searching and finding fit-for-purpose resources, even though these factors are essential. The pattern of behaviours identified in this review and of associated reviews suggest teachers, depending on their level of experience and expertise, may be optimising their efforts to the ‘situational demands’ before them, demands that are multi-factored. Their digital searching behaviour is situational because the circumstances of learning vary in the classroom from year to year, school to school, region to region, and sector to sector.

With teachers diversifying where they find access with resources online, DET’s digital platforms are competing with many others to be the first ‘go-to’ option. Significantly, classroom teachers are well aware of the breadth of quality and volume that the ‘Google environment’ delivers. Not only are many teachers seeking tips from trusted colleagues for resources to cull down the search effort (hence the role of a community of practice in the same area of curriculum or school year, or school sector), but also find value in hearing very general or common transcending human dilemmas faced by other teachers not normally in their typical communities of practice.

The plethora of digital resources emerging across the internet is growing at a pace. This vast array of options presents teachers with filtering challenges, and how to value one resource or part of it over another. For the enthusiastic beginner, curated resources will support and remove the complex task of finding resources. For capable and expert teachers, appropriating and customising digital resources is preferred, however complex. To help filter, the operational support found in temporary or ongoing connections to communities of practice is also showing a new growth in the philosophy of teaching for their field. This new pattern along with how empathy is becoming dominant between fellow teachers, is the basis of a fellowship of practice taking form.
The report makes the following recommendations to guide high level planning in the development of the Digital Hub.
Recommendations and options for DLS

Whilst the Digital Hub requires many features that allow it to be seamless and supportive of teacher work habits, level of confidence, and workload, the rapidly evolving nature of technology may not realistically enable it to keep pace with the expectations of most teachers. The role DET’s Digital Hub plays should be framed in a larger strategy that includes enabling teachers to curate and share their own resources depending on their level of confidence to do so. Thus, graduate teachers or those that may be classed as enthusiastic beginners would benefit from exemplar resources curated by DET in the Digital Hub. More confident teachers such as highly accomplished and lead teachers would respond better to career signals from DET that it values such higher-level performing teachers to find, adapt, and curate or lead the curation of self-developed resources in their professional networks.

The report makes the following recommendations to guide high level planning in the development of the Digital Hub.

1. DLS does not enter the space of informal networks and continues to operate as authoritative. Any attempt by DLS to directly enter the informal community of practice realm may prove unproductive. DLS enters informal network spaces without any authorisation or jurisdiction, therefore if they enter an informal space they do so as an ordinary person in the teaching profession and not representing DLS.

2. DLS explore Foresighting/Design Anthropology position or capability towards the medium and longer-term future of its role and relationship with teachers.

3. DLS to take on the role of Digital Curator of digital resources. This does not mean that DLS produces all resources from scratch but collects quality resources that will add value to the Digital Hub.

4. DLS should formalise the process of digital curation and the appraisal of content, provide support and training and have a contract in place with expectations of requirements so that those involved in the reviewing process understand the terms and conditions of what they are doing. DLS should not shoulder the responsibility of creating all resources for the Digital Hub, but rather house quality exemplar resources which teachers can turn to with confidence.

5. DLS should consider a process to allow a team of teachers that are paid or provided with some form of appreciation (i.e. professional development vouchers) in exchange for their appraisal work to work alongside the Digital Curator (on the Digital Hub). There needs to be a direct benefit to the teacher.

6. Quality resources placed in the Digital Hub are essential to support early career teachers; however all teachers should be encouraged to join communities and fellowships of practice that they best connect with.

7. DLS should explore Open Educational Resources and how the materials could be modified or contributed to the Digital Hub. Also, DLS could contribute back to the OER community by sharing some of their materials developed.

8. Framed in the context of social innovation, DLS should be supportive of communities and fellowships of practice and continue to explore this strategy further. This should be promoted and valued without DLS having a direct presence in these communities.

9. The Digital Hub should be a comprehensive solution for teachers as a go to to find quality resources aligned to the Curriculum in Victoria, specific information on hardware, software and
References
REFERENCES


REFERENCES


