"The slides are part of the cake": PowerPoint, software literacy and tertiary education

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This paper reports on the findings from a two-year funded research project exploring software literacy - how it is understood, developed and applied in tertiary teaching-learning contexts and how this understanding serves new learning. MS PowerPoint was selected as an initial focus as it is widely available and commonly used. Two disciplines (Media Studies and Engineering) were case studied and data collection obtained through student interviews and an online survey. Findings revealed that students tend to draw from informal learning strategies when learning to use PowerPoint, they have the functional skills and understanding of the software, and were able to identify some of its key affordances and constraints. However, they were only able to critique these at a superficial level, suggesting a need for formal recognition of software literacy as a means to empower students to engage with software and its use at a more critical level.

Keywords: software, literacy, teaching and learning, PowerPoint, university, New Zealand

Introduction

This paper reports on the initial findings from a two-year (2013-2014) Teaching and Learning Research Initiative funded project exploring how tertiary students develop the understandings and skills needed to use software as forms of *software literacy*. Three strands of thinking dominated and shaped our conceptualisation of this project - the software studies paradigm, our revision of notions of digital natives and digital literacy, and recognition of student engagement in a range of informal (and some formal) learning contexts when learning to use software.

Software studies, a comparatively new field of enquiry that Manovich and others have championed (Fuller, 2008; Johnson, 1997; Manovich, 2008), insists that 'software', which encompasses many forms of computer programming, is the dominant cultural technology of our time, fundamentally shaping the nature of our institutions, and integral to many of the social, political and economic practices central to our everyday lives. A core premise of software studies is the need to move away from seeing software applications as neutral tools – "simply things that you do something with" (Fuller, 2003, p. 16). The argument is that there is a need for software users to develop a more critical awareness of how software operates to both 'empower and discipline' us (Kitchin & Dodge, 2011, p. 10-11), contextualising and framing our agency within the embedded logics and

affordances of software applications. We propose there is a need for detailed empirical research into how software is understood, interpreted, and 'performed' by individuals and groups within a tertiary education context. How do both lecturers and students engage with software applications, platforms and infrastructures? How do people learn and perform different kinds of software, and what are the implications of this for their teaching and learning practices? For the purposes of pursuing this interest we introduce and define the notion of software literacy, as the expertise involved in selecting, using and critiquing software applications where these are being used to achieve particular goals.

Our notion of software literacy is a practice-based schema which anticipates that users can scaffold from acquiring a basic use of an application, to appreciating its configuration and limitations, and then perhaps to developing an awareness of how software operates to shape and frame knowledge and knowledge generation, communication and use within disciplinary practices. We view software literacy, then, as encompassing three specific levels of capabilities:

a. a basic functional skill level, enabling the use of a particular application in order to complete a specific set of tasks;
b. an ability to independently problem solve issues faced when using an application for familiar tasks (which includes the ability to draw upon various resources to help solve difficulties); and, ultimately,
c. the ability to critique the application, including being able to apply a similar analysis to a range of software designed for similar purposes - enabling the informed selection of applications and more 'empowered' new software learning.

In these terms, the most 'critically literate' users both develop the ability to identify the affordances of particular software tools and are able to apply and extend their knowledge and use of these and other software tools to a range of new and different purposes and contexts. Users may acquire software literacies through a combination of any number of means; through trial and error, learning informally, or training in a more formal or structured way. Most people develop proficiency with ubiquitous software packages informally through everyday engagement. Tertiary students are assumed to be able to translate these knowledge and skills into formal settings to complete learning tasks.

Labels such as 'digital natives' claim to describe the characteristics of a new generation of learners, capable of operating at 'twitch speed' and able to multitask, imagine, and visualize while communicating in multiple modalities (Prensky, 2001). This term tends to conflate a basic skill with new technologies with broader forms of understanding and critiquing aspects of technology-based cultures. We need to unpack this set of assumptions, to more carefully identify the range of skills and other literacies that today's students do (and do not) bring to their tertiary learning. There is emerging evidence that although this generation may be technologically competent, many still lack the basic academic technological literacy skills needed to successfully apply software embedded technologies effectively to enhance their learning (Kvavik, 2005). We argue that that there is a need to revisit and revise concepts such as information literacy, digital literacy, and related terms (Hegarty et al., 2010; Livingstone et al., 2013). In particular, we need to differentiate between distinct literacies relevant to specific technologies, and to examine the nature of student critique and decision making around which tools might best serve their learning purposes.

A crucial question here is whether, in an environment of universal access to digital tools, the 'digital divide' is being reconfigured as inequalities in software literacies. Recent research indicates that inequalities and marginalisation persist around students' access to, and use of information and knowledge (Bennett, Maton, & Kervin, 2008). Digital inequality is not restricted to just the issue of physical access to software and hardware (Selwyn & Facer, 2007), and given the various forms of investment required in the adoption of ICTs in the tertiary sector, it is imperative to understand how to close the participatory gap for students and ensure that technology is equitably and effectively used (Jenkins, Clinton, Purushotma, Robison, & Weigel, 2006). No studies to date that we know of raise the role of student understanding of how software and its affordances influences knowledge generation and critique, or the influence of formal and informal learning in relation to software.

Research Context

In this paper, we report on the initial findings from a study conducted earlier this year (March to June) exploring how students develop the understandings and skills needed to use particular pieces of software in a tertiary institution in New Zealand. Two very diverse disciplines of study, engineering and media studies, are being case studied. PowerPoint (PPT) is commonly available and used; we assume that students, irrespective of their

backgrounds, have had some experience with it. Both cases begin with a focus on PPT (in Phase 1) and will move (in Phase 2) to focus on the teaching and learning of discipline specific software such as Adobe Photoshop, Final Cut Pro (Media Studies), and SolidWorks (Engineering). The focus of our paper is on the initial Phase 1 findings aimed at understanding how students in first year undergraduate courses become aware of and develop software literacy understandings and skills about PPT. Both courses are characterised by high enrolments of students (180 and 104 students respectively) with diverse backgrounds but differ in terms of disciplinary foci and professional pathways. Data was collected through an online student survey (179 respondents) and student focus groups (36 participants). Analysis of the data was underpinned by sociocultural theory which directed attention to the interaction between people, the tools they use to achieve particular purposes and the settings in which the interactions occur (Cole & Engestrom, 1993). Emergent themes were identified through a process of inductive reasoning (Braun & Clarke, 2006).

Findings

Four themes emerged from investigating students' perspectives about PPT: 1) their general comfort level in engaging with technology and how they acquired the skills to use PPT; 2) PPT's affordances and constraints; 3) the extent they refer to their PPT notes for their studies, and how they extend their understanding of the notes; and, 4) how they think PPT shapes knowledge in their discipline.

1. Student comfort level with technologies
When asked about their general views towards adopting technologies, 42.1% of students indicated they usually use new technologies when most of their friends do, 30.2% reported liking new technologies and using them before most people they know do, and another 16.4% indicated they love new technologies and are among the early adopters to use them. These results illustrate a majority of students (88.7%) consider themselves early or quite early adopters of new technologies and are comfortable in engaging with new technologies.

Students drew mostly from informal learning resources when acquiring basic skills to use PPT (i.e. the first level from our software literacy scheme). When asked to identify 'useful', 'very useful' and 'extremely useful' strategies for learning, trial-and-error emerged as the preferred option (86.9%), followed by asking an expert (86.8%), asking a friend (84.9%) or watching someone use the application (82.1%). These stand in comparison to attending a formally organised workshop to learn about PowerPoint (42.3%), or reading a paper manual (33.1%). Common across the main reported strategies, then, is the idea that students take the initiative and agency to go about learning about PPT.

2. PPT's affordances and constraints for presenters and audience
When asked their views on the *opportunities* that PPT affords for presenters, students indicated the application allowed the embedding of multimedia resources in a presentation (88.4%), in-built templates helped to structure and organise ideas (85.5%), and affirmed how easily information can be incorporated into slides (81%). From an audience perspective, students highlighted that PPT affords audience paying attention to key points in a presentation through its default bullet points (87.2%), and guided note taking (82.8%) and the provision of more focused lecture presentations (77.5%). Focus group interviewees added ideas such as: PPT bullet points provide a reference point which can be expanded on; slides are visually easy to follow and save writing time; multimedia resources within slides can be an appealing and meaningful prompt for learning; presentations are easily customizable; and finally that all material is self-contained within a PPT file making it easy to access and revisit. Our participants identified the main three *constraints* of PPT to be: the brevity of information on each slide (67.6%), PPT files not containing enough detail for students to understand a lecture (65.2%), and a tendency for presenters to move too quickly through presentations (63.2%). The focus group data also highlighted frustrations with PPT layout or templates used in a repetitive manner; PPT used as a 'fixed script' for a lecture; text-laden slides presented too quickly for their content to be processed; and visuals that are inappropriately used in the PPT slides.

3. Student use of PPT notes for revision and strategies for extending their notes
A majority of students reported using PPT notes in revising for their course (76.8%) while another 56% of these students reported doing extra study to add to their PPT notes to better understand the lecture content (either through making their own notes (60.9%), attending the lecture lab or tutorials (60.5%), or reading the course textbook (59.6%)).

4. How PPT shapes knowledge

Although very few students discussed how PPT shaped their disciplinary knowledge, four focus group participants alluded to this by explaining how learning through PPT lecture notes is akin to learning via factoids and the decomposing of information. These are encapsulated in the following representative quotes:

> Student 1 : In PowerPoint, you see a lot of factoids put on the screen rather than actual information. One of the things I noticed the other students were saying that they liked the bullet points. Society as a whole seemed to be heading towards factoid based learning rather than actual learning.

> Interviewer: How do you think a lecturer kind of scripts or builds a PowerPoint presentation?
> Student 2: Just the key points. Parts of a cake. The slides are part of a cake.
> Interviewer: So is it important to capture everything that's there on all the slides?
> Student 2: Yeah
> Student 3: Well, yeah because I try to break it down into main points and you can't really miss anything.

These discussions conveyed a common student (mis)assumption that the PowerPoint bullet points in and of their own adequately reflected the extent of the knowledge presented in a lecture. For some students, these meant not much work was needed to extend them further.

Discussion and Conclusion

Our study aimed to understand the extent to which and how first year tertiary students are critically aware of how specific software can impact their learning, with PPT as a case to understand the emergence of software literacy. Our participants were generally comfortable with engaging with new technologies, identifying themselves as early to quite early adopters of technologies (89%). They reported a range of learning strategies that were mostly informal when acquiring the skills to use PPT, particularly the use of trial and error. Both these findings support assumptions in the 'digital natives' label. Further, students could successfully identify the affordances and constraints of PPT use, and quickly applied these to observations and criticisms of their (and other) lecturers' PPT presentation practice. Our participants generally considered PPT to be central in their engagement with disciplinary knowledge, particularly enabling the embedding of multimedia resources, focusing and structuring/organising lectures and guiding note taking. However, outside of the occasional focus group response such as in the first quote above, student critique of how this application might *shape* their disciplinary knowledge was surprisingly superficial (In our terms, there was a clear absence of the third level of software literacy).

These findings have two implications for tertiary teaching and learning. Firstly, teaching and learning of courses involving a focus on software can be informed by and take advantage of students' informal repertoire of learning strategies. As an example, students can benefit from being given time for practice and trialling a software for themselves. Being informed by and drawing from students' already established informal learning strategies recognises the relevant social and cultural contexts that shape effective technology and software engagement and if appropriated accordingly can enhance technology-based pedagogies in the tertiary sector. Next, students superficial critique of PPT revealed that critical awareness does not necessarily develop naturally as a result of use of a software, rather it needs to be prompted and/ or explicitly taught. Lecturers need to explicitly model software critique if they wish to foster this capacity and/or make this possibility known to students. Scholars such as Vallance and Towndrow (2007) urge educators to adopt an *informed use* approach to using PPT, that is, lecturers consider how they talk around PPT slides and how they encourage students to engage with and think about the content of the slides influences students' interpretations and engagement with disciplinary knowledge. Similarly, Stoner (2007) highlights the logics inherent to default PowerPoint templates, while O'Dwyer (2008) emphasises the need for careful thought and reflection in the design of (Engineering) PowerPoint presentations in learning settings.

The next phase of our study will consider the above issues more specifically in the context of courses where software teaching and learning is a main and discipline rather than learning based foci. This phase addresses two core aspects of the pedagogy around software: how to teach software, and, how to teach *about* software. In relation to the first aspect, we would like to provide teachers with an empirically-informed guide to best practice in teaching disciplinary-specific software (such as SolidWorks or Final Cut Pro). While the second aspect would involve repositioning PowerPoint as one of a range of common applications that shape learning, and which need critical awareness on their use by *both* teachers and students. For students, having this critical awareness would

mean a recognition of the role of how software in a broader sense shapes their learning experiences, and in a more specific sense then see the need to take on more active learning strategies in pursuit of learning goals.

In concluding, we view understandings of how software literacy develops and impacts on teaching and learning can lead to insights into the cultural significance of software more generally, and especially lecturer and student understanding and use of the practices associated with knowledge generation, communication, critique in engineering and media studies. Software literacy, in other words, is an essential part of learning in the twenty-first century, one which we argue transcends the use of any particular tool (be it within the context of e-learning, mobile learning, or software-based practices yet to come). This understanding is crucial and relevant to ensure all students and lecturers are better supported in teaching and learning processes that are mediated through and focused on software.

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