

Beyond Web 2.0: mapping the technology landscapes of young learners

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Abstract

Boundaries between formal and informal learning settings are shaped by influences beyond learners' control. This can lead to the proscription of some familiar technologies that learners may like to use from some learning settings. This contested demarcation is not well documented. In this paper, we introduce the term 'digital dissonance' to describe this tension with respect to learners' appropriation of Web 2.0 technologies in formal contexts. We present the results of a study that explores learners' in- and out-of-school use of Web 2.0 and related technologies. The study comprises two data sources: a questionnaire and a mapping activity. The contexts within which learners felt their technologies were appropriate or able to be used are also explored. Results of the study show that a sense of 'digital dissonance' occurs around learners' experience of Web 2.0 activity in and out of school. Many learners routinely cross institutionally demarcated boundaries, but the implications of this activity are not well understood by institutions or indeed by learners themselves. More needs to be understood about the transferability of Web 2.0 skill sets and ways in which these can be used to support formal learning.

Keywords

boundary crossing, digital dissonance, digital technologies, learning contexts, Web 2.0.

Introduction

In order to understand how technology use and Web 2.0 activities might draw together the disparate digital worlds of young learners, we need to understand a great deal more about what it is young people *do* with their technologies. In this paper, we present the results of a study that reports on learners' use of Web 2.0 and related technologies in and out of school, with a particular focus on technologies, practices, boundaries and the relationships between them. Research suggests that many young people are engaged in the participatory Web as authors and consumers of digital content (Boyd 2007; Lenhart & Madden 2007), in activities ranging from file sharing to online gaming and writing of blogs.

They are participating in these activities not only as individuals but collaboratively and cooperatively as interest- or purpose-driven communities of practice (Marchant 2007). When considering the potential of Web 2.0 technologies to support learning in formal educational contexts, we need therefore to consider the ways in which these technologies already form a significant part of the learner's out-of-school digital worlds (Grunwald Associates 2007; Green & Hannon 2007).

Background

Ownership of mobile and networked devices among young people is increasing (LSE 2006). There is greater access to broadband connectivity (Ofcom 2008) and a rise in the development of software that facilitates individual, collaborative and user-generated content. Recent studies in the UK and the US (Grunwald Associates 2007; Green & Hannon 2007; Lenhart & Madden

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2007) point to the increasing use of participatory digital technologies in the everyday lives of young people and ask what this means for learning and the acquisition of new skills sets. Buckingham (2007, pp. 92–93 and 143–145), by contrast, suggests that few young people are developing innovative skill sets in their interactions with new technologies. He argues that their activities are ‘relatively mundane’ and suggests that their technologies, ‘embedded in the everyday culture of their peer group’, are ‘largely dominated by the desire for communication and entertainment’. He highlights the discrepancy between young people’s in- and out-of-school uses of technology and identifies media literacy as a desirable skill set. This view is in contrast to the technological and cognitive skill sets identified by Green and Hannon, and by Grunwald. Boyd (2007), however, echoes Buckingham’s view that young people’s use of Web 2.0 technologies are immersed in their everyday cultural identity and suggests that their participation in sites such as MySpace and Facebook offers a sense of ‘cultural resonance’ for American teens. Like Buckingham, she also points to young people’s lack of criticality and a focus on sociality, pointing to young people’s reasons for participation in such sites as being ‘*It’s where my friends are*’ and, when asked what they do there, ‘*I don’t know . . . I just hang out*’ or, why they spend time there, ‘*Because I was bored*’.

It is evident that digital technologies raise many questions for young people. These questions are particularly acute when it comes to considerations of learning and the potential transferability of skills between informal and formal settings. If young people *are* acquiring new and valuable skill sets in and through their interactions with Web 2.0 technologies, how can these usefully be introduced to more specific settings such as formal education?

Boyd suggests that there is a sense of ‘cultural resonance’ in young people’s use of social networking sites such as Facebook and MySpace. In a similar manner, our exploration of learners’ use of Web 2.0 tools offers evidence that learners’ negotiation of technologies in the school setting is generating a sense of ‘digital dissonance’ in formal learning settings. The phrase ‘digital dissonance’ is used here to describe the tension around learners’ use of particular technologies, such as Web 2.0 tools and mobile phones in formal educational contexts. We argue that as yet, although increasingly apparent, the tension is not clearly demarcated or understood

by learners or the institutions into which they are increasingly importing their own technologies. While recent research (Owen *et al.* 2006; Buckingham 2007; Nikolov 2007) suggests an increasing awareness of the mismatch between the perception of technology as a socio-cultural artefact and its appropriation as an educational tool, the research also suggests that this tension remains largely unresolved (Selwyn 2006). This element of dissonance is framed by a situation where young people’s ‘everyday’ use of digital technologies is encountering a process of delegitimization as evidenced by the banning of mobile phone use in schools, for example.

It is clear that technology use is changing rapidly, as is the nature of the technology devices available to young people and the potential of these devices to support learning in and out of school. It is also evident that use of technologies by young learners is influenced by physical, affective and social factors. In this paper, we explore the nature of these technologies and the ways in which they are used and perceived by young learners within and across the demarcated spaces framed by formal and informal learning settings. We consider the types, levels of engagement with and sophistication of young learners’ Web 2.0 activity and their use of related technologies. We also consider ways in which these may or may not engender transferable skill sets which may support or enhance learning in formal educational contexts.

Methods

A study was designed to investigate what learners (aged 11–16 years) are doing with Web 2.0 and other technologies in and out of school. The study explores learners’ perceptions of the relationships between these activities and their experience of technology-mediated activity in the school setting. Learners’ perceptions of the boundary structures around school-mediated technology use and their boundary-crossing activities in relation thereto were also explored. These data were used to highlight the potential of Web 2.0 tools and related technologies to support learning in the school setting.

Two instruments were used for the research design: a questionnaire and a mapping activity. The questionnaire was used to identify the kinds of Web 2.0 sites that learners are using and the kinds of practices that they are using them for. The mapping study was used to explore

Table 1. Synopsis of study participants.

No.	Group	Age range	Setting	Number of participants ($n = 51$)
1	Self-managed learners	11–15	Informal education	9 ($m = 2, f = 7$)
2	Youth club	11–16	Social	12 ($m = 7, f = 5$)
3	Sunday school	12–15	Social	9 ($m = 5, f = 4$)
4	Girl guide group	11–14	Social	11 ($m = 0, f = 11$)
5	School group	14–15	Formal education	10 ($m = 8, f = 2$)

these technologies and their uses in greater detail, by examining relationships between technologies, practices and contexts.

Web 2.0 tools and activities, in this paper, are defined as learners' use of social networking sites like MySpace and Facebook, file sharing websites like Piczo and Limewire, participatory sites which facilitate collaborative production, sharing and review such as YouTube, and networked gaming sites such as Runescape which facilitate user collaboration and discussion via forums and online chat. Alongside these, we review those digital tools (mobile phones, computers, Internet, mobile handheld devices, etc.) which facilitate these Web 2.0 activities. While e-mail and webmail were mentioned frequently by learners, particularly in relation to homework and school work, we do not consider these applications to be Web 2.0 tools and they are included here only by way of contrasting learners' perceptions of formal and informal methods of communication. For example, e-mail is more likely to be used to communicate with teachers than MSN.

Overview of participants

Five groups of learners took part in the study (Table 1). Data were collected from a total of 51 learners, 29 girls and 22 boys aged between 11 and 16 years. Groups were selected by means of invitation and voluntary participation. The study conformed to institutional ethical procedures, in accordance with the British Educational Research Association guidelines. Written consent to participate was provided by participants and their guardians.

Of the two groups which were specifically learning-focused (Table 1: 1, 5), one was a group of learners attending an alternative educational establishment operating a self-managed learning (SML) approach and the other a group of Year 10 General Certificate of

Secondary Education (GCSE) students attending an information and communication technology lesson in school. Data from each of these two groups, by contrast with the remaining three groups, were collected within an educational setting. All groups were based in towns and cities in London and the South East. Specific socio-ethnographic data about participants were not collected for methodological reasons and considering the age of the participants. It was however noted that overall, a variety of social and ethnic backgrounds was represented. Based on group compositions, approximately 50% of participants were white British females from the upper middle-income socio-economic group (working parents, some but not all, university educated), while the remaining participants represented a higher percentage of male participants and mixed ethnicities (Black, Asian and Bangladeshi) from the lower middle income socio-economic group.

Data collection and procedures

Data were collected during a 1-h visit to each group. Learners were asked to:

- 1 Complete a questionnaire.
- 2 Generate a mind map.
- 3 Identify school-mediated boundaries around technologies identified in activity 2.

Each activity took approximately 10–15 min. The researcher explained what was required for each task and, for activity 3, stepped through learners' identification of boundary structures using a series of pre-defined categories:

- A Can use.
- B Can use, but are not allowed to use.
- C Cannot use.

These categories were designed to highlight learners' perceptions of technologies which could (A) or could not (C) be used in the school setting and which, among these, they regularly chose to use (B) in circumvention of school-prescribed rules relating to use of technologies.

Mavers *et al.* (2002) cite the advantages of the phenomenographic approach (Marton 1994) in eliciting learners' perspectives of their technology worlds. They suggest that this approach is about 'variation in the ways people see, experience, think about, understand and conceptualize the phenomena they encounter' and point to the 'layering' of the individual's awareness as they are called to situate phenomena according to these different 'ways of experiencing' their technological world.

In this paper, we argue that it is this contested space between (A) acceptable, (B) unacceptable (school-designated) and (C) impractical (school and learner-designated) technologies and activities that frames the notion of 'digital dissonance' experienced by learners in the transfer of new media, such as Web 2.0, and personal technologies to the school setting.

The questionnaire

This element of the study was derived from the instruments used by Luckin *et al.* (2008), simplified to reflect the focus on 'digital dissonance', learning and transferability of Web 2.0 skills sets explored in this study. The questionnaire comprised five sections. The first of these related to the kinds of Web 2.0 sites that learners used, how often they were used, where, why, how and with whom. In addition, learners were asked which Web 2.0 sites, if any, they did **not** use and why not; what features they would want from a social (Web 2.0) site, and how they learned about Web safety.

In this paper, we focus on ways in which learners' use of Web 2.0 sites can be used to support learning in and out of school.

The mapping study

This activity was conducted immediately after completion of the questionnaire, in two stages. The first stage required learners to map their technologies around the

central theme 'My Technologies'. A preliminary discussion invited learners to provide examples and the following questions were available as prompts, if needed:

- 1 What technologies do you own or use?
- 2 How and what do you use them for?
- 3 Where, when, why and with whom do you use them?
- 4 What difference, if any, do Internet and/or mobile technologies make to the way that you use these things?

On completion of their maps, learners were then asked (in a stepped sequence) to map pre-designated boundary categories onto a tracing paper overlay as follows:

- A Things you **can use** in school (*solid circle*)
- B Things you **can use (but are not allowed to use)** in school (*dashed circle*)
- C Things you **cannot use** in school (*rectangle*)

The separation of initial maps and boundaries using two separate layers (paper and tracing paper) was an intentional device designed to facilitate the separate and distinct evaluation of learners' technologies and their perceptions of the boundary spaces around them.

Data analysis

Responses to the questionnaire were sampled in terms of the questions that were explored to highlight learners' use of Web 2.0 sites in and out of school and to establish and evaluate the kinds of practices that learners' engaged in when using these sites. The aim of the sample was to identify which tools and practices might be used in the school setting to support learning in formal contexts. The following questions in particular were considered:

- 1 What sites do you use and how often?
- 2 Why do you like these sites?
- 3 Do you use any of these sites in school during lessons or in your free time?
- 4 Do you use any of these sites outside of school?
- 5 Do you use any of these sites to help you with school work?

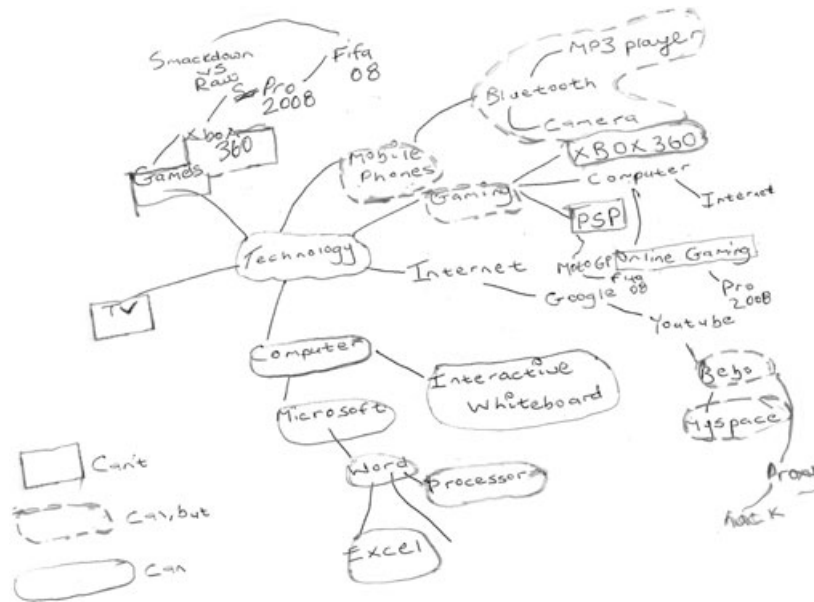


Fig 1 Learner's map (male, aged 15 years) of technologies with boundaries overlaid and annotations describing learner circumvention of school-prescribed rules.

6 What features do you want from a social (Web 2.0) site?

Questions 1 and 2 allowed learners to provide open responses and were designed to elicit data about types of sites, frequency and location of use. Questions 3 to 5 used basic Yes/No Boolean indicators designed to indicate levels of learners' in-school engagement with Web 2.0 tools and technologies. Question 6 used a three-level Likert scale (*definitely use/might use/would not use*) and a range of options (*private chat, open chat, photo uploading, gaming and Web page creation*) to ascertain the kinds of features learners' might want in an ideal Web 2.0 site. The aim of this question was to explore the kinds of Web 2.0 activity which might usefully be transferred to the school setting as a support for learning, for example, through collaboration and discussion.

Analysis of the maps was carried out in three stages. First, a frequency count of technologies and their uses was conducted. The spatial layout of nodes and the relations between them were then analysed to identify and evaluate connections between particular technologies and the practices that learners associated with them. For example, identification of computers with productivity tools such as Word or Excel was tied to use for school or homework, or the use of the Internet for research

(Google, Wikipedia), and social networking (chatting, sharing photos). In addition, learner annotations relating to circumvention practices (Fig 1 – 'proxy', 'hack') were noted. Finally, the layered boundary structures (A, B and C – see 'Data Collection' section above) were analysed to identify learners' perceptions of patterns of acceptable use, unacceptable (but desired) use and constrained or restricted use of technologies in the school setting.

This secondary level of analysis was used to identify, in particular, those technologies and practices that were deemed unacceptable in the school setting but which learners were nevertheless motivated to use (B). Alongside these, and using those that were deemed acceptable (A) or unacceptable (C), the maps were also used to compare, contrast and evaluate those technologies and activities in the contested space (B) between (A) and (C).

Integration of the analysis

Having analysed the two sources of data separately, a boundary between social uses and potential educational uses was identified. The first element of this involved identifying familiar Web 2.0 technologies (on the basis of frequency from questionnaire responses) and the

Table 2. Most popular Web 2.0-type sites used by learners.

Site	Total (%) <i>n</i> = 51	Girls (%) <i>n</i> = 29	Boys (%) <i>n</i> = 22	Type
MSN	88.2	82.8	91.3	Social network
Bebo	66.7	75.9	52.2	Social network
Facebook	39.2	37.9	39.1	Social network
MySpace	21.6	20.7	21.7	Social network
YouTube	19.6	20.7	17.4	Video sharing network
Club Penguin	7.8	10.3	4.3	Gaming network
Runescape	7.8	0.0	82.6	Multiplayer online game
Ebuddy	5.9	0.0	13.0	Social Network
Hi5	5.9	0.0	13.0	Social Network
Piczo	5.9	6.9	4.3	Photo Sharing network
Torn City	5.9	0.0	13.0	Gaming network

frequency counts of clusters of technologies that learners wish to use, but which they are not allowed to, in school settings. Specific learning potentials were then identified by returning to the descriptions of technology use provided in both sources of data.

A second element involved comparing data that mentioned school work. The questionnaire data identified when and how social networking technologies were being used to support school work, while the mapping study provided more specific data about the associative relationship between specific technologies (devices, tools and sites) and school work. The frequency with which social networking was associated with school work, compared with other technologies, was used to frame the potential of Web 2.0 technologies to support formal learning.

A third element involved confirming the boundaries described in each source of data. The questionnaire identified use of technologies in school during lessons or free time. This was compared with the areas and practices of circumvention described in the '*can use, but are not allowed to*' components of the mapping study clusters, to see whether the descriptions were consistent.

Results

In this section of the paper, we, first of all, address the findings from the questionnaire, followed by those from the mapping activity, before concluding with an integrated review of both sources and the degree to which their findings overlap to confirm or disconfirm the findings of the study as a whole.

Learners' use of Web 2.0 sites

Learners identified 30 different Web 2.0 sites, including social networks, file sharing and gaming sites. Most learners used more than two types of tool, with just two learners identifying only a single method (MSN).

Of sites mentioned by three or more learners, social networks predominated (Table 2). MSN was the most popular site (88%), followed by Bebo (67%) and Facebook (59%).

Learners' use of these sites ranged from 1 to 7 days per week, with average usage being 6.9 days out of 7. Access to these media, with the exception of MSN, indicated a fairly even distribution of use of between 1 and 7 days per week, with a far greater number using MSN daily (Fig 2).

Each of these sites was used by learners in school – in lessons, during free time and, among other things, to support school work activities – with the exception of Bebo, which, although used frequently in school in and out of lessons, was not used to support school work (Table 3).

Learners' school-mediated experience of Web 2.0 technologies

While learners' use of Web 2.0 technologies in school is much lower than their out-of-school use of these technologies (Table 4), what is notable is the level of access that learners *do* have and the fact that learners are making more use of these technologies in lessons than in their free time in school.

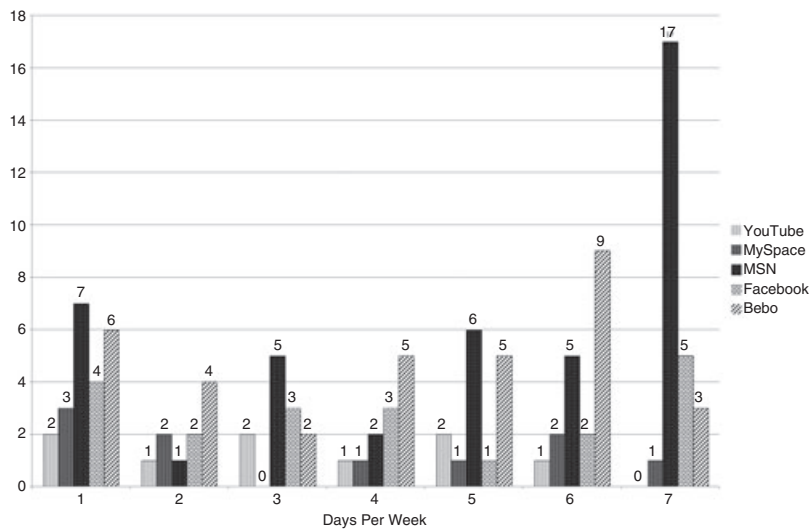


Fig 2 Learners' use of most popular Web 2.0 sites over a week.

Table 4. Learners' use of Web 2.0 technologies in and out of school and for school work.

Learners' use of Web 2.0 technologies	Percentage of learners (%)
Use for schoolwork	45
Use in school during school lessons	49
Use in school during free time	43
Use out of school	100

When asked how and why they used such sites, responses from the questionnaire data revealed that, in confirmation of earlier research (Boyd 2007; Buckingham 2007), learners are predominantly using these media for social, leisure or entertainment purposes, such as chatting, making arrangements, playing games, creating Web pages, sharing photos, music, personal profiles and online journals (Table 3).

These sites and practices are contrasted to learners' perceptions of the use of technologies for more formal, learning-oriented practices, such as transferring files between home and school or contacting teachers for help or support with learning (Table 5) where the use of e-mail prevailed.

The results of this questionnaire activity compare well with the follow-on activity which looked at what learners might want from an ideal social (Web 2.0) site.

What learners want from a social site

When asked what features they might want from a social site, learners' responses showed a strong desire

for the suggested chat tools, photo uploading, gaming and Web page construction features. What is evident from learner responses is their willingness to engage with Web 2.0 technologies and these features generally (Table 6).

What is evident from the questionnaire data is that learners are using Web 2.0 sites in and out of school in lessons, in their free time and to support school work. Of those sites used for school work, learners cite usefulness, instantaneity, efficiency and ease of use as key motivational factors. In addition to the kind of activities that might be deemed potentially distracting in the school setting (chatting, playing games, listening to music, sharing photos), learners identify activities that could usefully be transferred to the school setting, such as peer support networks, file sharing, file transfer, interaction with teachers, and greater use of learner-centred (as opposed to teacher directed), multi-modal and interactive resources (visual images, music and other audio materials, quizzes, Web page creation, etc.).

Learners and their technologies

The mapping activity revealed that learners have access to a wide range and variety of technologies. Mobile phones, computers, Internet connectivity and games consoles were the most widely cited technologies. Most learners indicated that they own or have access to a mobile phone (92%), a computer (88%) or laptop (29%), the Internet (94%) an iPod/mp3 player (69%) and/or a games console (73%). Almost 40% of learners

Table 3. Learners' use of Web 2.0 sites in lessons, free time, out of school and for school work, together with purpose and reasons for choice¹.

Site	Total responses (n = 51)	Use in lessons, free time, out of school and for schoolwork			Purpose	Reason	
		Lessons	Free time	Out of school work			
MSN	45	6	8	44	13	Talk, chat, arrangements, communicate over a distance, multitask (talk and do homework at the same time), upload photos, play games, start activities	Quick, easy, good, useful, instant, efficient
Facebook	20	2	2	20	2	Talk, chat, music, quizzes, games, photos, meet people, send messages, communicate over long distance	Fun, useful, easy
MySpace	11	2	2	11	2	Talk, chat, music, upload photos, online diary	Fun, good, easy
YouTube	10	4	6	9	2	Watch videos, listen to music, watch videos made by friends	Fun, good, funny
Ebuddy	3	1	0	3	1	Talk, chat	
Hi5	3	0	0	3	2	Meet new people (social network)	Fun
Use in lessons and/or free time, out of school but not for schoolwork							
Site	Total responses (n = 51)	Lessons	Free time	Out of school work	School work	Purpose	Reason
Bebo	34	9	12	30	0	Talk, chat, decorate your page (profile), music, upload photos, share pictures, people website (social network)	Good, easy, fun, useful, alleviates boredom
Runescape	4	1	0	4	0	Talk, chat, interact while playing games	
Club Penguin	4	0	1	3	0	Talk, meet people, play games	
Torn City	3	1	0	3	0	Talk, chat	
Use only out of school and not for schoolwork							
Site	Total responses (n = 51)	Lessons	Free time	Out of school work	School work	Purpose	Reason
Piczo	3	0	0	3	0	Talk, share profile (put stuff about me)	Interesting
Habbo	2	0	0	1	0	Talk	

¹Sites (n = 16) identified by only one learner have been omitted from Table 4 for ease of presentation and reference. Of these, only two (AOL and Google) were used in and out of school and for school work.

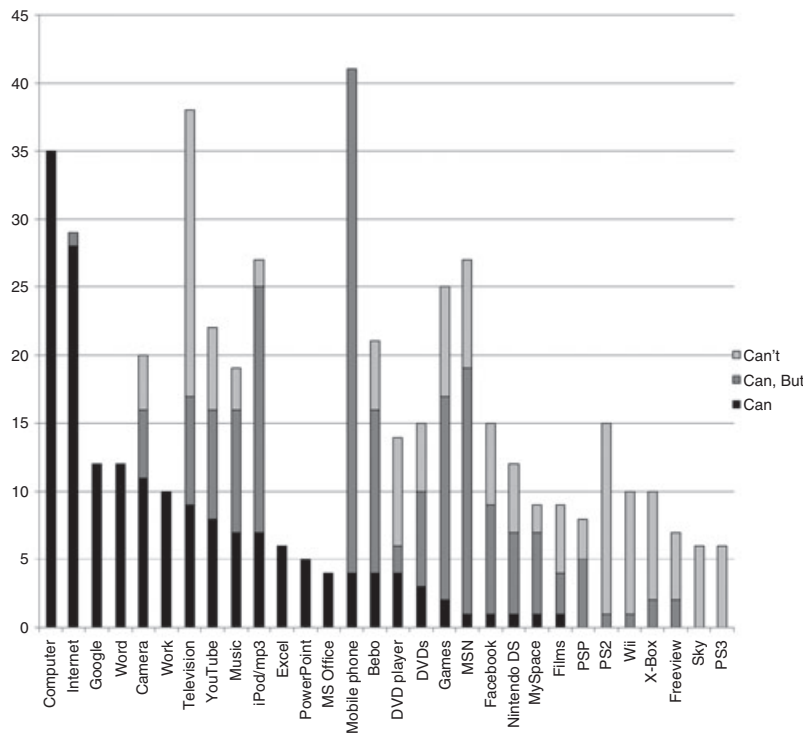


Fig 3 Learners' positioning and circumvention of school-mediated rules around use of technologies.

have access to a standalone digital camera and 10% to a video camera. Television and related peripherals (DVD players, satellite or digital connectivity) and media (such as DVDs) were also cited as key technologies by many learners (78%).

While the most common use of mobile phones by learners was calling and texting friends and family, many learners identified additional functionalities. The most common features after calling and texting were taking pictures or making video clips, followed by gaming, music and use of Bluetooth. A smaller number of learners used their mobile phones for a variety of activities including reminders, to do lists, calendars and contacts, e-mail, storage and as a radio. Less than 15% of learners associated their mobile with Internet use. A student comment in the questionnaire activity to the effect that MSN was useful for communication because it was 'free' suggests that the latter perception may relate to costs of mobile connectivity and this is an issue of relevance in terms of the potential transferability and use of personal mobile devices in formal educational contexts.

Most learners (94%) associated computer access directly with Internet use, and Internet sites represented a primary focus of the computer node in learners' maps.

The majority of these related to social networking (82%), downloading and gaming sites. Most learners focused on leisure, entertainment and social networking activities and only 41% ($n = 21$) directly mentioned school work, homework or research. The computer node in learners' maps was, however, also frequently linked to productivity tools such as those in the Microsoft Office suite (52%) and Internet sites like Google (27%) or Wikipedia (6%) used for research and to support school work.

It is also evident that, in certain areas (see also Fig 3), and particularly those relating to Web 2.0 activity and use of mobile devices, learners perceive their out-of-school use of technologies to be at odds with institutional management of their technology use in school. They are proactive in finding ways to circumvent the rules, either by using proxies to bypass school filters (Fig 1) or by using their mobile devices surreptitiously in the school setting¹.

Learner perceptions of technology in schools: boundaries and boundary crossings

In addition to the basic identification and clustering of technologies in their initial mind maps, a secondary

Table 5. Learners' use of e-mail to support learning in and out of school.

Use of e-mail in lessons, free-time, out of school and for schoolwork							
Site	Total	Lessons	Free time	Out of school	School work	Purpose	Reason
E-mail	21	12	7	16	7	Talk, chat, send work, e-mail homework to teachers, send schoolwork home, send photos, help people with homework, get teachers to send help, communicate over long distance	Useful, interesting, free

Table 6. Learners' interest in suggested features for a social (Web 2.0) site.

Feature	Definitely use (%)	Might use (%)	Would not use (%)
Chat area to talk only with friends	67	33	0
Chat area to talk with people they have not met before	18	53	29
Place to upload photos	43	37	20
Games that can be played against other users	45	39	16
Able to build own Web page	45	41	14

level of analysis was conducted to ascertain learners' perceptions of the boundary structures around their use of these Web 2.0 sites and technologies in the school setting (Table 7).

When reading across the cross-tabulation of the mapped technologies and the perceived boundary structures around their use, it is clear that learners have a clear understanding of what they perceive to be and not to be permissible in the school setting. In this study, the most frequent circumventions apply to use of mobile phones, iPod/mp3 players and access to MSN.

In terms of leisure, entertainment activities linked to use of television, DVDs and music, and some gaming devices, results of the mapping study were skewed by the SML group. As this group of learners are self-regulating, they are more likely to suggest that a technology can be used and are more likely to include technologies that would be deemed impractical in formal educational settings (e.g. X-Box).

A visual representation of learners' mapping of boundary spaces and implied circumvention of school-mediated rules proscribing the use of certain technologies and devices is reflected in Fig 3.

Technologies that are deemed acceptable (Fig 3 – 'Can') are those that have had time to embed themselves in the school system, namely computers, the Internet, search engines like Google and productivity tools like

Microsoft Word and Microsoft Excel. Those areas under dispute, negotiation or circumvention (Fig 3 – 'Can, But') are clearly demarcated as:

- mobile phones and their features and functionality.
- use of online chat and messaging applications (e.g. MSN).
- taking photographs.
- music.
- games.
- file sharing.
- handheld devices.
- access to social networking (Bebo, Facebook, etc.) or other Web 2.0 sites (e.g. online gaming networks).

Integrated analysis

The most popular Web 2.0 sites were identical to those identified in the questionnaire data, although there was a noticeable percentage shift downwards for MSN (61%), Bebo (41%), Facebook (29%) and MySpace (20%) and a significant upwards percentage shift with respect to YouTube (51%). A possible reason for the shifting trend in relation to learner identification of social networking sites is the recontextualization of these sites in the mapping study as part of the broader technology worlds of learners. Learner use of the Internet evidenced in the mapping study was most

Table 7. Learners' perceptions of boundaries and boundary-crossing activity relating to school-mediated use of technologies.

Technology	Can	Can, But	Cannot
Computer	35	0	0
Internet	28	1	0
Google	12	0	0
Microsoft Word	12	0	0
Digital camera	11	5	4
Work (research)	10	0	0
Television ¹ (SML = 48%)	9	8	21
YouTube	8	8	6
Music ¹ (SML = 44%)	7	9	3
iPod/mp3	7	18	2
Excel	6	0	0
PowerPoint	5	0	0
Microsoft Office	4	0	0
Mobile phone	4	37	0
Bebo	4	12	5
DVD player	4	2	8
DVDs ¹ (SML = 60%)	3	7	5
Games	2	15	8
MSN	1	18	8
Facebook	1	8	6
Nintendo DS	1	6	5
MySpace	1	6	2
Films	1	3	5
PSP	0	5	3
PS2 ²	0	1	14
Wii ²	0	1	9
X-Box ²	0	2	8
Freeview ²	0	2	5
Sky	0	0	6
PS3	0	0	6

¹Positive results (*Can*; *Can, But*) for Television, Music and DVDs significantly skewed by Self-Managed Learning (SML) Group ($n = 9$).

²All marked technologies would have been '0' in *Can, But* category if Self-Managed Learning Group are excluded.

commonly associated with use of social networking sites (82%), e-mail (31%), Google (27%) and downloading sites, e.g. for games or music (14%). In the boundary layering activity, all but Google were cited by learners as areas where these activities were not allowed in the school setting and around which they frequently circumvented school-designated rules.

Whereas in the questionnaire learners had elaborated on the practices associated with their use of Web 2.0 sites (Table 3) in the mapping study, their description of practices was more directly related to their use of mobile phones and other devices (Table 8).

In a cross-analysis of these two sets of data relating to practices, we looked at ways in which the commonalities of technologies (tools and devices) might generate a set of transferable skills sets which could usefully support learning in the school setting (Table 9).

A cross-analysis of learners' use of Web 2.0 activities in school during lessons and free time against those that they identify as being accessible to use in the school setting (whether through circumventing activities or because these are unfiltered) was made (Table 10).

Learners' responses in the mapping activity did confirm learner indications in their questionnaire responses with respect to their levels of use in school and in the classroom, albeit with a slight reversal of trends in relation to Bebo.

Technology futures for learners in and out of school

The study shows that while learners are predominantly using their technologies for socializing, they are clearly being used in multiple spaces, including the formal contexts of the school setting. As a result, the boundaries between formal and informal spaces are becoming blurred. Learners do appear to have a clear sense of the growing discrepancies between their in- and out-of-school experiences of technology, in particular those relating to Web 2.0 and mobile technologies, and are increasingly creating their own 'spaces' within the formal demarcations of the school setting. Learners' active and routine circumvention of school-designated rules in order to use these technologies in the school setting are generating a sense of 'digital dissonance' around these technologies as learners and their teachers struggle to negotiate an acceptable balance between the social and educational potentials they offer. These 'invisible potentials' appear to be reshaping the boundaries in ways that are often not realized either by teachers or by learners themselves. For example, teachers and institutions, fearful of the disruptive (social) potentials of these contested technologies, do not immediately recognize or understand the increased repertoire of practices available to learners in their engagement with them. At the same time, learners remain mostly unaware of the wider educational potentials of these resources. As personal devices become smaller, more mobile, and increasingly multifunctional and connected, the need to facilitate a dialogue around use of these devices in the

Table 8. Learners' practices with their technologies from mapping activity.

Technologies (tools and devices)	How used
Mobile phone	Talk, text, make arrangements, play games, listen to music, store data, transfer files, send messages, take photos, make videos, notes, tasks, reminders, to do lists, access the Internet, use a calculator, stopwatch, timekeeping, send e-mail
Computer	Play games, edit films, do schoolwork, do research, do homework, download things, listen to music, watch videos, watch films, send e-mails, share photos, use forums, do maths, learn languages, transfer files, use chat rooms, learn music, obtain guitar tabs
iPod/mp3 player	Listen to music, play games, store photos, watch videos, store data, create playlists, use the Internet
Internet	Talk, chat, shop, school work, homework, download games, play games, music, watch videos, use social networks, shop, research, use forums, download music, do quizzes, get help with homework, share photos, create websites, send e-mails, communicate

Table 9. Learning potentials in formal contexts derived from learners' use of Web 2.0 and related technologies.

Commonalities of practices across technologies (tools and devices)	Learning potentials ¹
Talk, chat, communicate over a distance, meet people, interact with other people	Inter- and cross-institutional collaboration; tutor and peer support networks; video conferencing; dialogue with external experts
Make arrangements, make to do lists, create playlists, make notes, list tasks, make reminders	Learner eportfolios, learning journals, personal development, organization and management skills; communal noticeboard or bulletin
Send messages, send e-mails, transfer files, upload photos, download games, download music, download things	Resource management; synchronous and asynchronous communication; file sharing, collaborative and cooperative learning
Share photos, share personal profiles, share an online diary	Learner showcase, peer review and feedback, learning journals, online narratives (extended audience)
Listen to music, watch videos or films	Review, discuss, debate, comment (extend 'music' to audio – pod-casting, vod-casting) of learning-focused materials
Play games, do quizzes	Simulations, modeling, hypotheses, strategic thinking, test and review, assessment
Create websites, decorate Web page (profile), keep an online diary, take photos, make videos, edit films	Collaborative production of materials; online production, publication, communication, reflection, feedback and review, media literacy skills, eportfolios
Store data, store photos	Distributed resource management between formal and informal learning contexts
Do schoolwork, do research, do homework, do maths, learn languages, do quizzes, get help with homework	Learning support forum; extended discussion debate between teachers and learners across in- and out-of-school contexts; extended curriculum (availability of externally produced resources)
Use chat rooms, use forums, get help with homework, multitask	Learning support forums; collaborative discussion, peer feedback and support

¹These learning potentials represent an overview of possible uses of collaborative web-based technologies drawn from the literature see, for example, Leask and Pachler (2005); Owen *et al.* (2006); Richardson (2006); Green *et al.* (2008).

school setting becomes increasingly important. This dialogue should (1) accentuate what these technologies can bring to learning in a positive, critical sense, and (2) embrace the wider cultural contexts of young learners' 'learning worlds' which are characterized by instantane-

ous, distributed, cross-setting communication and resource sharing.

The need for shared dialogue around these technologies and their potential is supported by evidence from the mapping study which suggests that while learners

Site	In school	In free time	Total	Can	Can, but	Total
MSN	6	8	14	1	18	19
Bebo	9	12	21	4	12	16
Facebook	2	2	4	1	6	7
MySpace	2	2	4	1	6	7
YouTube	4	6	10	4	6	10

Table 10. Cross-analysis of learners' use of Web 2.0 technologies in school.

have access to a wide range of technologies, what they lack is an understanding of ways in which such technologies can be used critically and creatively to support their learning. In general, there is more evidence of activity than creativity with Web 2.0 technologies and of passive interaction, such as viewing, watching and downloading, than active interaction such as editing, uploading and creating. Creative activity is more likely to be low level, such as chatting and social sharing, than high level, such as Web or graphic design and image editing. Only a very small number of learners mapped the latter type of activity in their technology worlds.

Learners do not appear to 'see beyond' the immediately obvious functionality of the technologies and there is little evidence of transfer. Few learners consider alternative uses of specific features or functionalities other than with multifunctional devices, or alternative audiences or purposes. In a parallel wave, the school institution appears to be slow to realize the potential of collaborative, communicative interactions, and the open and flexible potentials of learning 'beyond the classroom walls'. Institutions need to consider the implications of elements such as social networking and mobile devices, which are part of young learners' everyday 'life worlds', and to see that what is needed is a supportive negotiated response through which the institution guides the learner towards a more critical, reflective appropriation of these technologies.

Conclusions

Both the questionnaire and the mapping study support evidence from the literature to the effect that, while Web 2.0-type participatory technologies are a large part of young learners' everyday lives, very few learners are using these with a high level of sophistication. Nevertheless, the evidence adduced in this study suggests that most learners are and would like to use at least some of these technologies to support their learning in more

formal contexts. Results from the mapping study suggest that not only learners but also their teachers and institutions are experiencing a sense of dissonance around learners' in- and out-of-school uses of Web 2.0 technology and related devices. This is evidenced by the school-designated boundary structures and learners' routine and frequent circumvention of those structures. From the mapping study, patterns of acceptable use identified across participant groups suggest that while tools of productivity and research are well embedded in the school context, collaborative and communicative tools are not well accepted or used in the school setting nor, as yet, are their potential benefits fully understood by institutions, teachers or learners.

For a variety of reasons, it is clear that less activity using technology occurs in school settings, both in terms of quantity and variety. While technically we can link learners' 'life worlds' in and out of school, in practice, this is rarely done effectively. Tensions occur around perceptions of which activities are considered appropriate and pedagogically useful in learners' formal learning worlds. If Web 2.0 activities and mobile learning devices are to be deployed usefully across formal and informal learning, teachers, learners and institutions need to develop shared strategies and understandings around a participatory approach to technology use in schools. They need to be able to consider and explore the benefits of technology-mediated collaborative practice rather than school-mediated regulation of technology use. In so doing, they need the ability to develop an effective pedagogic response to these issues. In this respect, the deployment of the curriculum, in particular, needs to facilitate a more flexible response to the potentials offered by Web 2.0 and related technologies and the skill sets they engender rather than apply a prescription to their use in the school setting.

Note

¹Ascertained in discussion with learners.

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