GPaedia: A Web 2.0 technology enhanced digital habitat to support the general practice learning community

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Abstract

Introduction: In the past decade, we have witnessed the rapid growth of Web 2.0 technologies. While Web 2.0 tools have been recognised for their potential to enhance and enrich learning practice, very little research has been done to examine the level of acceptance of these tools among medical educators and learners. The project described in this paper aimed to explore the capacities of Web 2.0 technologies to foster a community of learning in general practice (GP) education, through the piloting of a digital habitat model, which we called "GPaedia".

Methods: The mixed-method study involved 150 participants, representing various general practice roles, from 15 Australian education institutions. Firstly, a questionnaire, semi-structured interviews and focus groups were conducted to investigate the participants' views and adoption of Web 2.0 tools. These data were used to inform the development of "GPaedia". A second questionnaire was then used to evaluate this pilot digital habitat.

Results: Participants showed a high level of interest in Web 2.0 technologies but a relatively low level of engagement. Age and roles in the learning community were two influential factors on their views and engagement. "GPaedia" was perceived to be effective in its ability to facilitate communication and collaboration, maintain confidentiality and enhance the quality of GP education.

Conclusion: The project demonstrated the potential of Web 2.0 technologies and a resource-rich digital habitat in GP education. The integration of Web 2.0 tools and quality resources enhanced "GPaedia's" ability to support the professional development of GP learners. Relevant training and ongoing moderation were identified as critical factors in its future implementation.

Keywords: Web 2.0 technologies, GPaedia, general practice education.

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Introduction

During the past 10 years, Web 2.0 technologies have had a significant impact on medical research, education and practice (Eysenbach, 2008). Following the development of Web 1.0 tools, which are characterised by one-way flow of information and "read-only" materials, the term Web 2.0 was coined by DiNucci (1999). It was also referred to as "web-based collaborationware" (Boulos, Maramba, & Wheeler, 2006) and "the new web" (Solomon & Schrum, 2007). Examples of Web 2.0 tools include online discussion boards (Skiba, 2009), wikis (McLean, Richards, & Wardman, 2007), blogs and podcasts (Boulos et al., 2006; Standing & Kiniti, 2011). Compared to Web 1.0 technologies, Web 2.0 resources are more "user-driven, collaborative, participatory and personalized" (Sodt & Summey, 2009, p. 97). Due to their ease of use and the limited technical expertise required, these technologies have attracted a large number of users (Moran, Seaman, & Tinti-Kane, 2011; Sandars & Schroter, 2007) and created opportunities to enhance and support innovation, especially in collaboration and information management (Standing & Kiniti, 2011). Web 2.0 technologies are "sweeping through existing structures" and "unleashing possibilities of interactivity, collaboration and creativity" (Tanner, 2011, p. 1). Their contribution can be observed in the combination of disparate information from various data formats, the collaboration and sharing of this information, as well as the facilitation of interactions amongst learner groups (Cheung, Yip, Townsend, & Scotch, 2008).

A "digital habitat" is a collaborative learning space arising from an engagement with Web 2.0 tools, and according to Wenger, White and Smith (2009), effective digital habitats have the potential to establish active, sustainable and capacity building communities of learners. Compared to other commonly used web-based content management systems (CMS), a digital habitat has closer involvement of Web 2.0 technologies and places more emphasis on the facilitation of collaboration and communication between learners. Since medical learners are required to fit their ongoing studies around unsocial hours and potentially isolated clinical placements (Pachecho, Kuhn, & Grant, 2010), digital habitats allow medical educators/teachers and clinical supervisors to play a role as facilitators, while giving learners more control over their own participation, engagement and interactions (Minocha, 2009). They provide valuable opportunities for knowledge construction and a high degree of learner involvement, therefore fostering knowledge creation and enhanced problem solving skills (Huerta, Ryan, & Igbaria, 2003; Wenger, Trayner, & de Laat, 2011). These attributes may contribute a new means of support in the training of the medical workforce and for the improvement of healthcare delivery (Hughesa, Joshib, Lemondec, & Wareham, 2009). This project had three primary aims: (1) to investigate and report on the potential use of Web 2.0 technologies for general practice (GP) education and training, (2) to develop a digital habitat based on the findings, a "sandbox" known as GPaedia and (3) to investigate user responses to GPaedia. Key research questions were:

- In what ways can Web 2.0 technologies be used to support general practice education and training?
- How can Web 2.0 technologies be implemented in a digital habitat to support general practice education and training?
- What are users' evaluations and experiences of the designed digital habitat: GPaedia?

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Methods

The research adopted both qualitative and quantitative methods to collect and analyse data, including two online questionnaires (Questionnaire 1 sought experiences of Web 2.0; Questionnaire 2 was used to evaluate GPaedia), semi-structured interviews and focus group discussions. The study was conducted with two initial research stages, followed by the digital habitat design stage.

Ethics approval was obtained from the Tasmanian Social Sciences Human Research Ethics Committee (Reference Number H0012730). Participation in this research was voluntary. Participants were sought from a variety of roles and academic backgrounds, with many participants having more than one of these roles. Those who had a combined role of both learners and educators made up a small, yet distinct group. One purpose of involving participants from various roles and backgrounds was to ensure input from a majority of the key audience groups in the general learning community. The researchers also hoped the digital habitat that was being designed might facilitate communication and collaboration between the different groups. The participants were from 15 Australian education institutions, including universities and GP vocational training organisations. Details of the participants' demographic backgrounds, including occupation, gender and age, are summarised in Table 1.

Table 1
Participant Demographics

Participant groups	1st Questionnaire % (n/N*)	Interview n/N*	2nd Questionnaire % (n/N*)
Occupation			
GP registrar/junior doctor (PGPPP)/IMG	33.8% (45/133)	4/17	16% (8/50)
Medical student	15.8% (21/133)	4/17	6% (3/50)
Medical educator/teacher	22.6% (30/133)	4/17	14% (7/50)
GP supervisor/medical educator & GP supervisor	22.6% (30/133)	3/17	56% (28/50)
Combined role of both learner and educator	5.3% (7/133)	2/17	2% (1/50)
Other (IT consultant, academic & e-learning expert)	0% (0/0)	0/17	6% (3/50)
Gender			
Male	44.4% (59/133)	10/17	62% (31/50)
Female	55.6% (74/133)	7/17	38% (19/50)
Age			
20–29	26.3% (35/133)	5/17	14% (7/50)
30–39	28.5% (38/133)	6/17	14% (7/50)
40–49	20.3% (27/133)	4/17	22% (11/50)
50–59	21.8% (29/133)	2/17	44% (22/50)
Over 59	3.0% (4/133)	0/17	6% (3/50)

* N = total number of participants involved in the particular data collection phase
n = number of participants in the occupation/gender/age group

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First research stage

During the first research stage, the initial questionnaire was completed and semi-structured interviews and focus group meetings were conducted. The questionnaire comprised check boxes, free text and 5-point Likert scale questions/statements (Likert, 1932) and was administered online. Information about the study was sent to the directors of all 17 Australian GP regional training providers, some of whom agreed to disseminate the information to the educators and learners in their organisations. People who were interested in participating could access the questionnaire through a link provided in the invitation email. Therefore, the participant selection process was opportunistic. Due to the difficulty in estimating the number of recipients to receive the invitation, the researchers were unable to calculate the response rate for the questionnaires. The first questionnaire was completed by 150 participants; 133 provided complete responses. The responses appeared as variables which were organised and analysed using non-parametric tests (Kruskal–Wallis and post hoc Mann–Whitney U tests) using the Predictive Analytics Software (PASW) version 19.0 (IBM, 2012). Descriptive statistics were also used to determine the participants' self-reported views and experiences of using collaborative and communication Web 2.0 tools in the study.

In addition, 17 semi-structured interviews and three focus group meetings were conducted (Creswell, 2009; Johnson & Christensen, 2004). The participant selection for these two activities was purposive; from amongst the questionnaire respondents who had expressed an interest in being involved in the interviews or focus groups, a number of representatives were chosen from each occupation group (groups listed in Table 1). Nine participants were chosen for the focus group, and 17 were chosen for the interviews. Written consent forms were returned by mail, and both activities were conducted via the telephone/teleconferences. The conversations were audiotape-recorded, transcribed, entered into NVivo software (QSR International, 2012) and analysed using a constructivist grounded theory approach. The three-step coding approach of constructivist grounded theory was used to generate key themes from the textual data (Charmaz, 2014).

Digital habitat design

Based on the findings of the first research stage, a pilot digital habitat, known as GPaedia, was designed. An open-source content management system (Joomla) was used as the initial template for this online platform because of its strong ability to create highly interactive multi-language websites within a short time frame (Patel, Rathod, & Prajapati, 2011). GPaedia had two main parts: an interactive Web 2.0 component and an online repository component. The first component was pre-populated with Web 2.0 tools that were highly rated by other medical education programs (Boulos & Wheeler, 2007; McLean et al., 2007; Skiba, 2009) and rated as desirable by the participants of the first stage of this study. The functions offered by Web 2.0 tools include discussion boards, live chat tools, the ability to create private groups and the ability to subscribe to news (RSS feeds). The online repository was initially resourced with materials developed by various vocational medical educators for use in GP registrar training. These materials were extracted from an existing online repository, namely STARS, which was developed in 2009 (Fan, Cooling, Radford, Fabian, & Brown, 2014). Permission was obtained from the lead researcher of the STARS development team, who was also involved in this project.

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Second research stage

After the initial design process, the link to GPaedia was sent to potential users for evaluation and feedback. These users included Australian GP regional training providers and all of the interview and focus group participants from the first research stage. A link to the Quickstart Guide, which gives simple directions for registering and using the site, was provided on the GPaedia homepage (Figure 1). A GP supervisor workshop was also organised by one of the GP regional training providers to offer a short introductory session for their users. By the end of the trial stage, 83 participants completed registration in GPaedia, and 50 of them answered the evaluation questionnaire, which was also linked to the GPaedia homepage. One focus group meeting was organised towards the end of the trial process to seek suggestions on other possible tools and on future implementation of Web 2.0 enhanced sites like GPaedia. The site was live for a five-month period and was decommissioned at the end of the project.

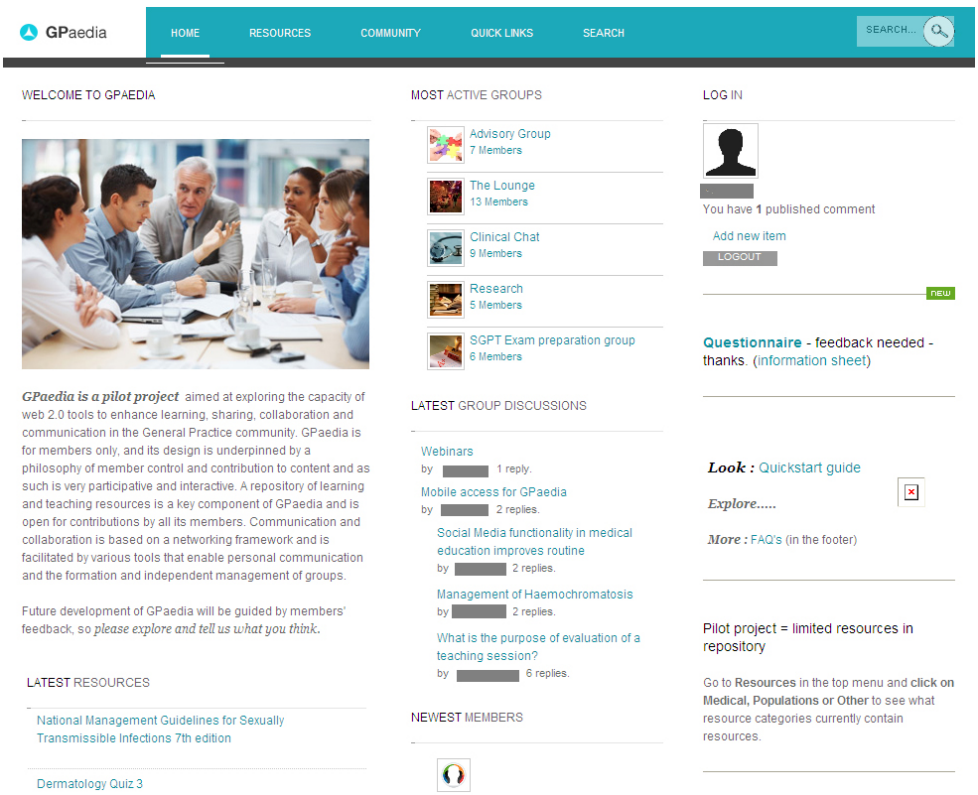

Figure 1. GPaedia homepage.

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Results

There were two data components: 1) the quantitative data gathered from the questionnaires and 2) the qualitative data collected from the open-ended section of the questionnaires and the transcripts of interviews and focus group discussions. These findings are presented below under the three research objectives.

Participant usage and perceptions of Web 2.0 tools

Web 2.0 tools were adopted for three main purposes: communication, collaboration and information sharing. As indicated in the method section, this study focused on approximately 10 tools selected from those popularly used by other medical education programs. The results of data analysis showed a high level of interest in Web 2.0 tools among the participants, but a relatively low level of engagement. At least half of the participants were unfamiliar with some of the tools studied. In particular, 51% of participants (N = 68) were unfamiliar with RSS feeds, and 38% (N = 51) were unfamiliar with social bookmarking. There was more familiarity and more positive views on other tools, such as online discussion forums (11%, N = 14) and instant messaging (12%, N = 16). Table 2 summarises the participants' views and experiences adopting Web 2.0 tools.

Table 2
Participants' Views and Usage/Experience of Web 2.0 Tools

Web 2.0 tools	N = 132, Missing data = 1			
	Views*		Usage/experience**	
	Median	Mean	Median	Mean
For collaboration				
Wikis	3.00	3.80	4.00	3.90
Podcasting	3.00	3.34	4.00	3.69
Social networking tools (e.g., Facebook)	3.00	3.17	3.00	3.14
Media file sharing (e.g., YouTube & Flickr)	2.00	2.88	3.00	2.85
Social bookmarking	3.00	3.93	5.00	4.83
Online discussion forums	2.00	2.66	3.50	3.55
RSS feeds (e.g., accessible through Internet Explorer, Firefox or Google Reader)	5.00	4.43	5.00	4.10
For communication				
Blogs/micro-blogs (e.g., Twitter)	3.00	3.54	5.00	4.30
Instant messaging (e.g., MSN Messenger)	2.00	2.95	4.00	3.69
Social networking tools (e.g., Facebook)	3.00	2.99	3.00	3.14
Online discussion forums	2.00	2.62	3.50	3.55

* Mean/median scored on Likert scale: 1 = Useful collaboration/communication tool (indicated as Strongly Agree) to 5 = Not useful at all (indicated as Strongly Disagree)

** Mean/Median scored on Likert scale: 1 = Used very often (indicated as Very Often) to 5 = Never used (indicated as Never).

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The items that provided divided responses (Median = 3.00) were analysed using the Kruskal–Wallis test and the Mann–Whitney U test. The analysis indicated that the participants' roles in the GP learning community and their age were the two dominant factors influencing their views and usage of these tools (Table 3). In terms of usage, the learner group (e.g., GP registrars, junior doctors and international medical graduates [IMG]) used Web 2.0 tools the most, while the GP educators (e.g., medical educators/teachers and GP supervisors) reported the least usage. In regard to their perceptions of Web 2.0 tools, the participants who had a combined role of both learner and educator held the most positive view towards the tools they were familiar with, while the GP educators reported less positive perceptions (Table 3). The participants in the

Table 3
Comparison of the Views and Use of Web 2.0 Tools by the Different Participation Groups

Web 2.0 tools	Views			Usage/experience		
	Occupation	Gender	Age	Occupation	Gender	Age
For collaboration						
Wikis	K = 12.985, p-value = 0.011	K = 9.809, p-value = 0.002	K = 9.272, p-value = 0.055	-	-	-
Podcasting	K = 1.264, p-value = 0.868	K = 0.200, p-value = 0.654	K = 2.341, p-value = 0.673	-	-	-
Social networking tools	K = 10.651, p-value = 0.031	K = 0.074, p-value = 0.785	K = 20.459, p-value = 0.000	K = 22.695, p-value = 0.000	K = 0.248, p-value = 0.618	K = 41.587, p-value = 0.000
Media file sharing	-	-	-	K = 9.919, p-value = 0.042	K = 0.030, p-value = 0.862	K = 19.209, p-value = 0.001
Social bookmarking	K = 14.572, p-value = 0.006	K = 0.735, p-value = 0.391	K = 13.945, p-value = 0.007	-	-	-
Online discussion forums	-	-	-	-	-	-
RSS feeds	-	-	-	-	-	-
For communication						
Blogs/micro-blogs	K = 9.423, p-value = 0.051	K = 0.575, p-value = 0.448	K = 9.895, p-value = 0.042	-	-	-
Instant messaging	-	-	-	-	-	-
Social networking tools	K = 10.503, p-value = 0.033	K = 0.034, p-value = 0.853	K = 22.103, p-value = 0.000	K = 22.695, p-value = 0.000	K = 0.248, p-value = 0.618	K = 41.587, p-value = 0.000
Online discussion forums	-	-	-	-	-	-

Note: The Kruskal–Wallis test was only performed on the items with a median score of 3.00. These represented responses with divided opinions or a central tendency.

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combined roles were primarily 20–39 years of age; therefore, it was the respondents in this age range that had the most positive views. The over 59 age group, who were all GP educators and GP supervisors, reported the least positive perceptions.

Responses to the first questionnaire suggested that Web 2.0 technologies were being adopted for various educational and personal purposes, and their use was influenced by a range of personal factors. Some of the purposes included Twitter and Google+ health groups (social networking and sharing tools), Wikipedia, online chat/instant messaging, RSS feeds, online discussion forums, Dropbox (media file sharing and storage), podcasts and Illuminate (online communication tool). Participants were motivated to use Web 2.0 tools for personal reasons, such as "combating isolation" and "seeking connections with others", as well as for their professional benefits, including seeking linkages with other community members, professional growth, and sharing/obtaining clinical opinions/advice. Conversely, participants cited lack of time and skills, information overload, concerns for ethical risks, as well as a personal preference for traditional communication/collaboration methods and paper-based materials as reasons for not using Web 2.0 tools. The learner participant group and the younger age group indicated a higher willingness to adopt Web 2.0 tools in the future. One participant's comment summed up the GP supervisors' views: "*If it can be shown to demonstrate value and overcome some of their natural fears, such as security, time and how it (the tool) actually fits into their work flow, they will be open to it*" (GP supervisor, interview data).

Participants' expectations of the digital habitat

Responses to the "Users' expectations" section of the first questionnaire, which asked for suggested attributes that digital habitats should contain, revealed a high level of consistency across all participants. It was generally agreed that a digital habitat should have an intuitive design, be visually appealing and able to be personalised to users' needs and preferences, and be educationally valuable. For example, it should allow users the ability to search and share information, and to collaborate and communicate with other users. In addition, to attract more users, the digital habitat should streamline work practices and fit into users' work flow. Most importantly, relevant technical support and assistance must be in place. Participants also mentioned the importance of effective search tools, easy access, ongoing moderation, user-friendliness and sustainability. The ability of the digital habitat to maintain confidentiality and to recognise individuals' needs were also considered to be highly important by some respondents.

Statistically significant differences in willingness to use Web 2.0 tools and a Web 2.0 supported digital habitat were found between the occupation groups and age groups (Table 3). Consistent with the data from the first questionnaire, the group who held a combined role of both learner and educator had the highest degree of willingness, with the 20–29 age group being the most positive. It was commonly agreed that the learner groups would adapt to the site more easily than the educators (data from open-ended section of Questionnaire 1).

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GPaedia structure and content

Taking these expectations and Patel et al.'s (2011) research findings into consideration, GPaedia was designed based on "Joomla", an open source content management system, as it had the greatest potential to create highly interactive websites within a short timeframe. The design of GPaedia incorporated functionalities such as online discussion forums, synchronous and asynchronous communication tools, spaces for study groups, an information filter, user profiles and links to other websites (such as Facebook and YouTube). Other resources were also incorporated, such as exam type questions, short embedded videos, teaching and learning materials, latest research findings, links to other websites, self-assessment tools, therapeutic guidelines and other high quality resources that were sorted by subjects. Some functions and resources can be viewed on the GPaedia homepage (Figure 1).

GPaedia evaluation

Overall, the participants involved in the "sandbox" evaluation process provided positive feedback on the pilot digital habitat. This feedback was collected through the second questionnaire. It was believed by these participants that GPaedia's use of Web 2.0 tools enhanced the site's ability to support the professional development of GP learners and helped to streamline their learning and teaching practice. Positive responses were obtained in relation to GPaedia's design, including the interfaces, structures and functionalities:

> *This is the most user friendly form of social media that I have explored, and I am pleasantly surprised and a bit proud of myself. The format and the forum has* [sic] *been very encouraging.* (Medical educator)

Being able to: (a) comment on and rate a resource, (b) add a resource to the repository, (c) find and connect with other members, (d) create and belong to groups and (e) view other members' profiles were some of the functions that were well received.

Compared to the other age groups, the younger participants (aged 20–39) were more positive about the ability offered by Web 2.0 tools to collaborate and communicate with other GPaedia members. Among the occupation groups, the GP registrars and medical students more actively engaged in synchronous conversations, through the live chat tools, than the medical educators/teachers and GP supervisors. In general, the participants favoured the use of GPaedia in supporting educational activities. That is, they felt that the site provided opportunities for sharing resources, asking/answering questions, expanding professional networks and engaging in professional development activities.

> *[GPaedia offers] the potential to be that one space where GPs, registrars and students can easily collaborate without boundaries between them. I also like the idea of interactive resources, although this will require [the involvement of] many users before it happens.* (GP supervisor)

In addition to receiving a considerable amount of positive feedback, suggestions for improvement were also provided by the participants in the GPaedia evaluation phase of the research. Some participants negatively experienced the design and adoption of

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the site. For example, issues such as the interfaces and structure, speed of the internet, languages used on the site and limited number of users at the pilot stage were noted. Some critical factors in future development were discussed, including maintaining confidentiality, enhanced ability to upload and manipulate resources, moderation of the site, design of activities, promoting non-judgemental attitudes from users, presence of "tutor figures" on the site, ensuring the site is easily accessible while also password protected and providing relevant training. The availability and quality control of resources was also considered to be vital by more than half of the participants:

> *Having some way of either compiling those [resources] and making them freely available and reviewed, so you know … where the high quality resources are, rather than having to flick through a million websites, can be really useful.* (GP supervisor/medical educator)

Discussion

The initial aim of the GPaedia trial was to provide the GP learning community with a secure space for communication and collaboration. GPaedia has modelled a potential way for Web 2.0 tools to be adopted for these educational purposes. Within GP education and training, participants agreed that the ability to maintain confidentiality is vital. While Web 2.0 tools provide an important avenue and opportunity for communication and collaboration in medical education, they also pose ethical and practical dilemmas (Frankish, Ryan, & Harris, 2012). As these tools are increasingly adopted among younger learners, such as medical students and GP registrars, it has become more challenging to prevent inappropriate conversations from occurring in public virtual spaces and misuse of the information disclosed through these conversations (Greysen, Kind, & Chretien, 2010). The design of GPaedia took into consideration the issues identified by existing literature and the participants in this study. GPaedia offered confidentiality by providing a password protected space and the ability to create private groups and private conversations. Examples of private groups created in the "sandbox" trial are: "Advisory group", "The lounge", "Clinical chat", "Research" and "Exam preparation group"' (Figure 1).

The study has highlighted the importance and influence of relevant training and personal preferences in the adoption of Web 2.0 technology in GP education. It has also provided further evidence of the "digital divide" regarding the adoption of established and emerging technologies by older users (over 40 years of age) and younger users (under 24 years of age) (Dwivadi, Williams, Ramdani, Niranjan, & Weerakkody, 2011; White, 2007). This "digital divide" was also apparent in the different views across occupation groups. The learner group, including medical students, GP registrars, junior doctors and IMGs, who also appear to be the younger groups, showed a significantly higher level of interest, willingness and previous use than the educator groups. Younger users were more frequently adopting Web 2.0 tools and expressed more positive views about doing so in the future. Interestingly, some studies found the more advanced information technology skills of this user group to be an important facilitating factor in Web 2.0 technology adoption (Prensky, 2001), but the participants in this study did not recognise this influence. Nevertheless, it is increasingly desirable for medical educators and institutions to adapt Web 2.0 technologies to fully engage learners, and to demonstrate ethical use of these tools for students preparing for careers in the medical profession.

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The importance of relevant, early training in using the site is an issue that was well recognised by both the researchers and the participants in this study. At the first research stage, the educator participant groups showed a high degree of unfamiliarity with Web 2.0 tools and digital habitats, although within this group, a change in GP supervisors' attitude was observed through their positive evaluation of the GPaedia site and the Web 2.0 tools linked to the site. This change was reflected in their responses to the two questionnaires. This change may have been influenced by the relevant training and assistance provided during the trial process. The learner groups expressed a desire for similar training sessions in the use of Web 2.0 tools for academic purposes. This is supported by the literature, which reveals that although younger learners are more tech-savvy, considerable variation has been found in their use of resources beyond entrenched technologies and tools, such as computers, mobile phones and email (Kennedy, Judd, Churchward, & Gray, 2008). Our findings suggest that ongoing training and support must be available to all users for successful implementation of sites such as GPaedia in the future. Introductory sessions, organised into workshops for a particular user group according to their needs and interests, may be particularly beneficial.

Due to funding and time constraints, GPaedia was decommissioned at the completion of the project. The project team, therefore, was not able to further equip the site with more resources or to perform a longer trail period. Also, the participants involved in this project were invited from GP regional training providers in Australia. Therefore, this study is limited to the Australian GP education context. However, with future opportunities to enrich the site with more resources and participant involvement, GPaedia can be enhanced, maintained and made available to participants in a wider context.

Conclusion

Although time and funding constraints dictated that GPaedia serve as a pilot site and be decommissioned upon the completion of the study, the potential of a Web 2.0 enhanced site, such as GPaedia, in supporting medical education and training has been examined and demonstrated. Future projects should consider collaboration at regional and international levels as well as a larger participant group and evaluation of the impact.

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