Practitioner Notes

What is already known about this topic

- Surprisingly little. Sharing of files and/or links via email and various online technologies is commonplace and easy but few if any existing studies have specifically targeted the online sharing of learning resources by students.

What this paper adds

- Recognition that students often share learning resources online.
- Identification of the main technologies used by students to share learning resources (email, Facebook, Dropbox).
- Comparison of the sharing of recommended versus discovered learning resources.

Implications for practice and policy

- Informal study networks may serve as key sources of and repositories for learning resources for students. We need to develop a better understanding of the extent and role of these networks.
- A substantial proportion of students' resource access and sharing may take place outside of university sanctioned or managed curriculum delivery systems. This access is not easily measured and may undermine attempts to monitor and quantify student activity and progress using learning analytics.

Methods and frequency of sharing of learning resources by medical students

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Abstract

University students have ready access to quality learning resources through learning management systems (LMS), online library collections and generic search tools. However, anecdotal evidence suggests they sometimes turn to peer-based sharing rather than sourcing resources directly. We know little about this practice – how common it is, what sort of resources are involved and what impact it is likely to have on students' learning. This paper reports on an exploratory investigation of students' resource sharing habits, involving 338 respondents from the first three years of a four-year postgraduate medical curriculum. On average, students reported sharing learning resources with other students two or more times per week. They were most likely to share non-curriculum resources (not available through their LMS) although curriculum and physical resources (e.g. printed or handwritten notes and textbooks) were also often shared. Students employed a range of sharing technologies including email (most frequent), social media tools and cloud-based file services. A cluster analysis revealed four distinct groups of students based on the frequency with which they share, the range of technologies they employ and whether they share both online and physical resources.

Our study suggests that resource sharing can play a key role in students' study and learning behaviour. Frequent sharing of resources using external (i.e. non-university) tools and services might also undermine efforts to leverage learning analytics to monitor students' activity or progress. Both findings warrant further investigation.

Introduction

University students have long relied heavily on physical resources to support their learning – handwritten or printed notes, textbooks and journals. However, they are increasingly turning to online learning resources to supplement and in some instances replace these more traditional forms. Online resources can provide both broad and comprehensive coverage of a topic, and have the advantage of being easily discoverable and readily accessible. The widespread adoption of learning or curriculum management systems also means that educators are increasingly likely to provide or recommend learning resources to students in digital forms – ranging from simple sets of lecture notes or recordings to online journal articles or textbooks hosted by their institution's library. Students also have a long history of sharing personal lecture or study notes with their peers, although this practice is poorly documented. We know even less about how and to what degree they share digital learning resources amongst themselves, and what role these shared resources play in their learning. However, given their affordances, it seems reasonable to assume that digital technologies are more likely to facilitate than hinder the sharing of learning resources.

Amongst our students the notion that peer sharing of learning resources is both common and important to their learning – and should therefore be tested – is supported by two lines of evidence. The first is primarily anecdotal and stems from conversations with tutors who are in regular contact with students about their learning and study habits. The second draws on emerging learning analytics data that reveal access rates by our students for many online curriculum resources, including those that would normally be considered core learning resources such as lecture notes and recordings, are much lower and more variable than expected. Widespread sharing of online resources could contribute to this pattern of use.

What we know already is that the online sharing of digital resources is easy. There are a wide range of sharing enabling tools and services available to students, including email, social networking services and cloud file storage services, as well as an emerging class of specialist note sharing sites (e.g. Course Hero, Nexus Notes). Many students are regular users of one or more of these tools or services (Dahlstrom et al, 2011). We also know that most students are active social media users and that many co-opt Facebook to support their learning (Hew, 2011; Selwyn, 2009; Dahlstrom et al, 2011). This includes medical students (Gray, Annabell & Kennedy, 2010), who are the subject of the current study, although it is unclear if this practice is widespread (Cheston et al, 2013). The rationale or motivation for sharing digital resources is less clear, but is likely to include a mix of extrinsic and intrinsic factors related to knowledge acquisition and socialisation (Chard et al, 2012). The number and breadth of

resources that are typically provided to students, and ease with which additional resources can be discovered and accessed might lead us to assume that their need or imperative to share resources is relatively low. However, because students are able to exchange information relatively frequently and freely, through a combination of face-to-face and online contacts, we might also expect that discussion of learning resources, including where to find them (sources) and which ones are useful (recommendations) is quite common. This in turn might serve to encourage and facilitate the actual sharing and exchange of learning resources. While the sharing of learning resources in this way appears to be poorly documented and is not particularly well understood, there are related and established literatures for us to draw on. These include knowledge sharing, which is primarily focussed around the business and management sectors (Wang & Noe, 2009), and social networking and learning (Hew, 2011). Both draw heavily on social cognitive theory (Bandura, 1986) and its subordinate concept of communities of practice (Lave & Wenger, 1991; Brown & Duguid, 1991).

Social cognitive theory posits that much of our learning occurs within a social context and is driven by observation and interaction. Learning behaviour is shaped by a combination of personal, behavioural and environmental factors, which in turn influence each other in a multidirectional and reciprocal fashion. Within this, communities of practice are groups of people who share a common interest and who learn within this social context by sharing and developing ideas and strategies. A legitimate community of practice consists of three core components, a domain, a community, and a practice. In this study these are represented by medicine, the student cohorts (or smaller groups within them) and the study and practice of medicine itself. Over time, the practitioners (the students) work collaboratively to develop a shared repertoire of resources, ranging from simple personal experiences to complex tools and methodologies, including the sorts of discrete learning resources that are the subject of this paper.

Knowledge sharing refers to the exchange of explicit or tacit knowledge from one individual to another or within a group. According to Boer and colleagues (Boer, Barends & van Baalen, 2011), this exchange can only occur when the participants share similar relational models and the extent to which sharing occurs depends on a range of factors including trust and self-efficacy (Chai & Kim, 2010; Hsu, Ju, Yen & Chang, 2007). Similarly, social capital, which describes the network of relationships owned by an individual and the groups they belong to, has a strong bearing on knowledge sharing (Nahapiet & Ghoshal, 1998), and this would appear to be particularly relevant within an online context, where students often develop

highly connected and extensive social networks using Facebook and other social tools and services (Ellison, Steinfeld & Lampe, 2007). These networks, which are primarily or at least typically social, are increasingly being appropriated to fulfil learning support roles (Hew, 2011; Madge et al, 2009). This appears to be true for medical students as well, with Gray and colleagues (Gray, Annabell & Kennedy, 2010) reporting that one in four medical students at their university had used Facebook in a learning context, and that around half of those that hadn't already were open to doing so. Sharing of learning resources likely forms part of these activities, and has previously been mentioned by Selywn (2009). However, direct sharing of resources via Facebook is somewhat problematic as it only provides built-in support for image and video files directly. Students may therefore need to co-opt additional tools or services in combination with Facebook to facilitate sharing of files more generally (Wang et al, 2012), which is where cloud-based file sharing services excel.

Despite a lack of direct evidence, many of these factors point to resource sharing playing an important role within students' study and learning practices. This paper takes a first step towards building an evidence base by investigating the prevalence of resource sharing among medical students and the methods they use to support their sharing activities.

Methods

Setting

This study was conducted at a large metropolitan Australian university and involved students enrolled in the first three years of a four-year post-graduate medical degree. The first year of the degree is based on-campus, has a bioscience focus and is structured around regularly timetabled lectures, tutorials and practical sessions. Case-based learning is an important element of the first year curriculum and involves a mix of formal (timetabled small-group tutorials) and informal, independent (self-directed) learning. Years 2 to 4 of the curriculum are clinically based. While they include an increasing emphasis on informal learning activities – particularly though independent clinical interactions with patients and clinicians – students also attend a range of scheduled activities including lectures, small-group tutorials and supervised clinical visits.

Delivery of the medical curriculum is supported by a customised learning management system (LMS). This LMS incorporates a database of over 8000 learning resources either created or selected for use within the curriculum. These resources are typically mapped to individual learning activities within the curriculum and can be accessed by students in a

variety of ways – through links embedded in students' personalised weekly timetables, by browsing a comprehensive curriculum map or by simple keyword searching. Students also have access to a wide range of high quality online subscription-based bioscience, biomedical and clinical learning resources, including textbook collections, journals and scholarly databases through the university library. Many of these resources are also easily located and accessed through the LMS.

Survey

This investigation draws on a comprehensive survey of the selection and use of learning resources by students within a postgraduate medical curriculum. The paper-based survey was administered to approximately 330 students in each of the first three years of the medical course (982 students in total). Permission to administer the survey was granted by the human ethics committee of the host university and participation in the survey was optional and anonymous. The full survey contained items organised into five distinct sections covering students' demographics, resource and information seeking, resource sharing, resource types and the timing of resource use. A range of items from the resource sharing (n=24), resource and information seeking (n=5) and demographic (n=2) sections are reported here. Four of the sharing-related items were designed to assess how often students share learning resources with, and receive them from, other students – with learning resources being categorised as either *curriculum resources*, which are those that are freely available to students through their LMS, and *external resources*, which are those that are discovered and/or are hosted outside of the LMS. In the context of *curriculum resources*, sharing therefore typically refers to the downloading and re-publishing of these resources by students outside of their LMS.

The remaining survey items were designed to assess the frequency with which students share and receive different types of resources (both *physical* and *online/digital*) and the methods they use for sharing and receiving them. The sharing methods investigated include email, social networking services (Facebook, Twitter and other) and cloud-based file services (Dropbox, Google Drive/Docs and other). The physical resource types that were investigated were printouts (e.g. notes, articles), personal (handwritten, typed or annotated) notes, and textbooks. The selection related items were designed to assess the frequency with which *curriculum*, *external* and *physical* (e.g. textbooks) resources are accessed and advice was sought from staff and peers. Inclusion of these items allows for some comparison of resource and information access and sharing rates. The demographic items relate to the age, year level and gender of the respondents. The sharing and selection items were scored on a five point

Likert scale where 1 = less than monthly, 2 = less than weekly, 3 = once or twice a week, 4 = on most days, and 5 = more than once per day. Items relating to specific technologies used to share resources also included a not applicable/never used option.

Analysis

Given the lack of published information about resource sharing an exploratory approach to the analysis of the data was undertaken. The data were explored using a combination of descriptive and comparative statistics (ANOVA) and included an exploratory cluster analysis by respondent. The comparative statistics and cluster analysis were carried out using the R Studio software package (R Studio, 2014). A K-means cluster analysis (kmeans package) was conducted on a data matrix consisting of 338 complete records of all 31relevant survey items. All variables were nominally coded (1-2 for gender, 1-3 for year level and 1-5 for all others). The appropriate number of clusters was determined by plotting the percentage variation in the within groups sum of squares values for a range of k values and identifying the k value beyond which further reduction in the within group sum of squares was minimal   (Hothorn & Everitt, 2014).

Results

A total of 620 surveys were returned (63% response rate). Of these, 338 were complete for resource sharing, resource and information seeking, and demographic items and were subsequently analysed.

Demographics

Gender balance of the respondents was approximately even (51% female) and each of the three course years was moderately well represented (35% 1st year, 33% 2nd year, 32% 3rd year). More than 80% of respondents were aged 25 or under and only 3.5% were aged above 30.

Resource and information sharing

Students reported accessing different types of resources and seeking information from staff and peers on a regular basis – typically between two and several times per week. However, there were a number of significant year effects, with first year students accessing curriculum resources more frequently (a majority of curriculum resources are explicitly targeted/recommended to first year students) and external and physical resources less frequently (Table 1). First year students were also much less likely to seek information or

advice from staff members. Students from all three year levels reported seeking information from their peers on a regular basis.

[Table 1 about here]

On average, students reported sharing curriculum resources slightly less than weekly and external resources two or more times per week (Table 2). Again, there was a significant year effect, with first year students more likely, and second and third year students less likely to share curriculum resources in line with their reported usage patterns. Only minor differences in the frequency with which students shared and received resources – of different types and by different technologies – were reported and with one exception (use of 'other' social networking services) these were not significant (see tables 2, 3 and 4). Use and sharing frequencies were only very weakly correlated for both curriculum ($r2 = 0.03$) and external ($r2 = 0.05$) resources.

[Table 2 about here]

Email was the most frequently used method of sharing (and receiving) resources. Almost all students reported using this method (98%) and more than half of the respondents reported using email to share and receive resources on most days (Table 3). The results for Facebook were similar, albeit at slightly lower frequencies. Dropbox was used for sharing resources on most days by 42% of respondents. Only a small number of students reported regular use of Twitter and social networking services other than Facebook or cloud-based file services other than Dropbox or Google Drive/Docs for sharing or receiving resources. While a majority of respondents reported sharing physical resources (printouts, personal notes and textbooks), most did this on a less than weekly basis.

[Table 3 about here]

With respect to year level and gender, year level had a significant effect on the frequency with which students shared resources using the social media tools Facebook and Twitter (highest in year 1 students, lowest in year 3) and males were significantly more likely to share textbooks than females (Table 4). All other comparisons were non-significant.

[table 4 about here]

Cluster analysis

The preliminary sum of squares analysis indicated a four group solution, with membership varying from a low of 52 (group 3) to a high of 129 (group 4) respondents. To assist with the interpretation of these groups, each was assessed in terms of the average frequency (based on the median Likert scale values for item responses associated with each cluster) with which the different types of resources were shared and received and the various methods of sharing were employed. Based on this analysis, the key characteristics of each group appear to be:

Group 1 (88 respondents) – This group is characterised by generally high levels of sharing and receiving of resources. Respondents in this group frequently share and receive digital resources via a range of methods, with the exception of social networking tools other than Facebook and cloud-based file storage or sharing services other than Dropbox or Google Drive/Docs. Members of this group report frequently sharing and receiving physical resources such as textbooks and notes.

Group 2 (69 respondents) – Members of this group report generally similar behaviour to those in group 1 except that they only infrequently share physical resources.

Group 3 (52 respondents) – Members of this group also report generally similar sharing behaviour to those in group 1 although in this case <u>all</u> methods of sharing digital resources are used relatively frequently.

Group 4 (129 respondents) – This group is easily the largest, including more than one third of all respondents. It is characterised by generally lower levels of sharing and receiving of resources than for each of the other three groups. Email and Facebook are the only methods of sharing and receiving resources that are reliably utilised by these students and as for group 2, physical resources shared and received infrequently.

Summary

The combined results of the descriptive, comparative and cluster analyses can be summarised as follows. Most students reported sharing resources with their peers on a regular basis. They typically employed a range of methods to support this sharing and both digital and physical resource types were often involved. The key technologies for sharing and receiving digital resources were email, Facebook and Dropbox. Students who engaged in regular sharing (around two in three) were able to be differentiated on the basis of the variety of social networking tools and cloud-based file services they utilised and the frequency with which they shared physical resources. The remaining students (around one in three) shared resources

less frequently than their peers. These students were most likely to use email or Facebook when they did share and rarely used other technologies to share resources or shared physical resources with their peers.

Discussion

Sharing of online or digital resources appeared to be common among the students we surveyed. More than half of all respondents reported sharing resources by email on most days and almost half of all respondents reported sharing resources via Facebook at a similar frequency. Moreover, the frequencies with which students reported sharing online or digital resources were only slightly lower than those with which they reported accessing them (see tables 1 and 2), suggesting that sharing is a key part of their information seeking and management strategies and, by extension, their learning. Reported resource sharing and receiving frequencies were also similar (see tables 2 and 3), further suggesting that sharing behaviour is relatively inclusive, reciprocal and equitable. In other words, there is little indication that resource sharing is either mediated by a few students or that the majority of students are simply passive consumers/receivers of resources. If students' real resource sharing behaviours mirror their self-reported ones then it suggests a very strong social element to their knowledge sharing and study practices. And, while the identification of social learning communities or learning-centred communities of practice isn't new, we may have underestimated the degree to which students utilise these communities as resource repositories and distribution channels. For some students this may even translate into a preference for accessing learning resources through peer channels rather than through 'official' online sources like their institution's LMS or library.

Knowledge of how students form and maintain these social learning communities is critical to our understanding of the role they play in supporting students' learning and study practices. In our medical curriculum, as in many others, small group learning is practised extensively, both during the first year when bioscience learning is emphasised, as well as during the subsequent clinical years, when groups of students are co-located in hospital or clinical settings. Whether the students in this study simply co-opted these formal learning groups for informal sharing (and learning) or established new groups based on friendship or other functional or social criteria is unclear. Gray, and colleagues (2010), for example, reported that Facebook study groups consisted of between 5 and 140 members among the medical students they studied. Whether such groups are formed purely or primarily for the purpose of study is also unclear,

although according to a recent study (Dahlstrom, Walker & Dziuban, 2013) a clear majority of students prefer to keep their social and academic lives separate.

Our data highlight some interesting differences regarding the technologies students use to share or facilitate the sharing of learning resources. Email is clearly the most popular technology for sharing. This aligns with it's consistently high level of use among university or college level students – according Dahlstrom and colleagues (2011), 97% of students use email at least a few times a week and 75% use it several times a day. Email also satisfies three key requirements of an effective resource and file sharing service. That is, it has the ability to (i) target one to many recipients (to either established or ad-hoc groups), (ii) accurately convey the purpose and context of the sharing (in the message title and body) and (iii) simultaneously link to or distribute from one to many resources of various types (as attachments). Facebook and Dropbox, the two next most popular sharing technologies, as well other related tools, each only directly support one or two of these three functions. For example, while Facebook excels in the ability to connect users and provide a structured context within which the sharing of information can take place, it lacks the ability to directly share resources other than images or videos, relying on external links and/or the use of file sharing services (like Dropbox) to distribute digital documents. Similarly, Dropbox allows for rapid and simple sharing of virtually all digital resource types with one to many users, but typically relies on email to notify recipients that these resources have been shared with them. Each of these technologies has its own strengths and weaknesses, and the descriptions above as well as our data suggests that many students use two or more of them in combination to support their sharing activities. Although lacking the level of technology integration and sophistication proposed by Chard et al (2012), the students are in many ways creating their own version of those authors' proposed 'social cloud', which they describe as "a resource and service sharing framework utilising relationships between members of a social network".

Social networking tools, and particularly Facebook, are extremely popular among students and young adults – according to a recent PEW Internet survey 87% of 18-29 year olds use Facebook, 70% use it daily, and 52% use two or more social media tools (Duggan et al, 2015). However, surprisingly little is known about their use to support learning, particularly when this use is initiated and controlled by students rather then teaching staff. According to a detailed analysis by Selwyn (2009), less than 5% of students' general Facebook posts are academically related, although this may have risen during the last few years as academic use of Facebook has become more widespread. A 2011 survey of US college students reported

that approximately one in four students considered Facebook to be either valuable or extremely valuable to their academic success, with a clear majority stating that they were comfortable using it to connect and communicate with other students about coursework, although no information was specifically provided around resource sharing (Dahlstrom et al., 2011). These numbers are likely to be higher still among students who are involved in Facebook groups that focus on or are dedicated to study, such as the medical students in the study by Gray Annabell and Kennedy (2010). That study involved students from the same medical school as the current study but whereas only one in four students in the earlier study reported using Facebook for learning purposes the equivalent figure in the current study was much higher – 92% of respondents reported sharing learning resources through Facebook, with two in three students doing so on at least a weekly basis. While lacking data on the frequency of sharing, Tan (2013) draws extensively on student focus group interviews to provide an interesting description and discussion of students use of Facebook to share content, including learning resources. According to Tan, these students place considerable value on the interactions with others that occur outside of their formal learning environment (i.e. their LMS). They also appear to prefer sharing resources via private profiles rather than through groups suggesting somewhat different behaviour to the medical students in our study. Despite their popularity among our students, we could find no comparative data on the use of Dropbox, or other cloud-based file services, to support informal peer-to-peer learning.

The high frequency with which the students in this study reported using and sharing external learning resources (i.e. self-discovered resources accessed from outside their LMS) is also noteworthy. These students are expected to spend some hours each week engaged in informal or self-directed learning activities, which usually involves locating and utilising appropriate learning resources from a wide variety of sources. The LMS used by our medical school supports and facilitates this process by recommending to and providing them with easy access to a comprehensive collection of quality online learning resources including lecture and case notes, journal articles, textbooks, scholarly databases and biomedical and clinical resource collections. These resources have been developed and selected to meet the bulk of students' learning needs, yet our survey data suggest that they are accessed (and shared) somewhat less frequently than external resources. While we did not explicitly ask our students about the nature of these external resources, previous research suggests that many of them are likely to turn to popular and convenient services and sources like Google and Wikipedia (Judd & Kennedy, 2011). This is somewhat at odds with findings from the University of Washington's recent Project Information Literacy study (http://projectinfolit.org), which suggests that

among US tertiary students, curriculum resources (typically in the form of course readings) are easily the most frequently used source of information for course-related research (Head & Eisenberg, 2010).

That curriculum resources are shared as often as they are by the students in this study is similarly noteworthy, as in most cases these are very easily accessed or discovered (by browsing or searching) through the LMS. A possible contributing factor is that some learning resources, for example some case notes, are 'time-released' (i.e. cannot be accessed before a specific date) or have their access restricted to specific year levels. Students may be using their informal sharing networks to circumvent some of these restrictions. Alternatively, they may simply find it more convenient or efficient to share rather than discover and access some curriculum resources themselves. Whatever students' motivations or intentions, their use of informal resource sharing networks may have unintended consequences for teaching staff or researchers attempting to utilise learning analytics data from an LMS to monitor or measure student activity and progress (e.g. Arnold & Pistilli, 2012; Duval, 2011). These measures typically rely on being able to capture or derive all or at least a large part of students learning related activity based on system access – e.g. pages or resources accessed or viewed. High rates of access indicating a high level of learning related activity and vice versa. But, if students are accessing curriculum materials by other means or turning to shared learning resources sourced from outside of an institutional LMS then their learning activity may be substantially underestimated. Shum and Ferguson (2012), in their paper on 'social learning analytics', canvas a number of ways in which useful data might be captured and analysed from sources other than an LMS, However, the technical and ethical issues associated with accessing and utilising these data, particularly when the technologies involved are 'owned' by students are considerable and likely prevent their routine capture and use.

The results of this study also suggest that the sharing of physical resources, such as textbook and notes (by which we typically mean the act of lending or borrowing these resources, rather than simultaneous use of them), continues to play an important role in many students study habits. More than 4 out of 5 students reported sharing these types of resources, with more than half doing so on an at least weekly basis. This compares with just over 40% of undergraduate students in a 2007 study (Yuen & Majid, 2007) who reported sharing their personal books and lecture notes. Again, while comparative data are extremely limited, this adds to the picture of a strong resource and information sharing culture among the students involved in the current study.

And finally – as mentioned in the introduction, student generated notes can also be shared (and sold) electronically rather than in hard copy form through notes sharing sites like Course Hero or Nexus Notes. Searches of both sites suggested that our medical students are unlikely to use these services so they weren't canvassed as part of the survey (our most recent search [Feb 2016] revealed only seven individual sets of notes related to the study of medicine at our university, of which only three had been previously accessed). However, Course Hero in particular has amassed substantial repositories of notes across a large number of subject domains, including medicine and might be an important source of resources for students from particular disciplines or institutions, especially where high quality course notes aren't routinely provided

Limitations and future directions

This study has a couple of obvious limitations. Firstly it is based on the self-reports of students within a single course at a single university – the patterns of technology use and sharing behaviour exhibited by these students may not be transferrable to other curricula, medical schools or universities. Secondly, the analysis of the data is exploratory, concentrating on the frequency, methods and generalities of resource sharing. Subsequent studies should focus on what is shared, whom it is shared with and what motivates students to share. Answers to these latter questions are critical if we are to determine the effect and importance of resource sharing on students' study behaviour and knowledge construction and how this might impact on the delivery and effectiveness of formal curriculum activities. Nevertheless, the presented data provides strong initial evidence that sharing of resources is common, that it is likely to take place outside formal learning channels and that it often involves non-sanctioned learning resources. These findings alone suggest that further investigations are warranted, particularly around the establishment, maintenance and activities of informal learning networks and students' selection, use and sharing of learning resources within them.

Ethics and data access

The survey data on which this study is based was collected and is retained under the conditions of human ethics project agreement between us (the researchers) and our host university (see also Methods). As it stands, that agreement does not allow us to publish the study data in a publically accessible data repository. Interested researchers are however welcome to contact us about the possibility of individual access.

Conflicts of interest

The authors received no external funding in support of this study and know of no conflict of interest regarding our collection, interpretation or reporting of the data in this manuscript.

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Table 1. Frequency of use of different types and sources of course related resources and information – overall and by year level. Values are averages of 5-point Likert scale responses.

	Overall	Year			
		1	*2*	*3*	*p <*
Resource type					
Curriculum	3.4	3.9	3.2	3.0	0.001
External	3.9	3.5	4.2	4.0	0.001
Physical (textbooks)	3.1	2.8	3.2	3.4	0.001
Information source					
Staff	2.8	2.0	3.3	3.1	0.001
Peer	3.9	3.7	4.1	4.0	0.05

Table 2. Frequency of sharing and receiving/accessing shared online curriculum and external learning resources – overall mean and by year level (sharing values only). Values are averages of 5-point Likert scale responses.

	Overall		Year			
	share	*receive*	*1*	*2*	*3*	*p <*
Resource type						
Curriculum	2.7	2.8	3.0	2.7	2.5	0.01
External	3.3	3.2	3.3	3.3	3.3	ns

Table 3. Frequency of use of different resource methods for sharing and receiving/accessing shared online and physical resource types. Overall means are averages of 5-point Likert scale values for all respondents, sharing frequency values are percentages of respondents.

Method or type	Overall			Sharing frequency (%)		
	share	*receive*	*p <*	*ever*	*< weekly*	*most days*
Online resources						
Email	3.5	3.4	ns	98	21	58
Social networking						
Facebook	3.2	3.2	ns	92	33	49
Twitter	1.4	1.5	ns	51	88	5
Other	1.4	1.5	0.05	44	88	7
Cloud storage						
Dropbox	2.9	2.9	ns	87	40	42
Google Drive/Docs	2.3	2.2	ns	73	58	27
Other	1.4	1.5	ns	41	85	8
Physical resources						
Printouts	2.5	2.6	ns	82	53	26
Personal notes	2.7	2.6	ns	86	47	33
Textbooks	2.6	2.5	ns	87	46	27

Table 4.. Frequency of use of different resource sharing methods for online and physical resource types by gender and year level. Values are averages of 5-point Likert scale responses.

Method or type	Gender			Year			
	F	*M*	*p <*	*1*	*2*	*3*	*p <*
Online resources							
Email	3.7	3.4	*ns*	3.4	3.6	3.7	*ns*
Social networking							
Facebook	3.3	3.2	*ns*	3.7	3.2	2.7	*0.001*
Twitter	1.2	1.5	*0.01*	1.5	1.3	1.2	*0.05*
Other	1.2	1.4	*0.05*	1.4	1.4	1.3	*ns*
Cloud storage							
Dropbox	2.9	2.9	*ns*	2.8	2.9	3.1	*ns*
Google Drive/Docs	2.2	2.5	*ns*	2.3	2.3	2.3	*ns*
Other	1.3	1.6	*0.01*	1.5	1.4	1.3	*ns*
Physical resources							
Printouts	2.4	2.5	*ns*	2.3	2.5	2.6	*ns*
Personal notes	2.8	2.7	*ns*	2.6	2.7	2.8	*ns*
Textbooks	2.4	2.8	*0.01*	2.6	2.6	2.6	*ns*

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