University Educators' Perceptions of Informal Learning and the Ways in which they Foster it

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Abstract Little research has been conducted in higher education settings that focuses on how tertiary educators understand informal learning or on their role in fostering students' informal learning to facilitate formal learning. In this article we partially fill this knowledge gap by reporting findings from a case study exploring how 30 New Zealand tertiary educators from one university conceptualised informal learning and the strategies they implemented to support students' informal learning as an enhancement to formal learning.

Informal learning has traditionally been defined in relationship to formal learning, which is generally understood to be the learning that takes place within a structured educational setting with a set curriculum that is delivered by a teacher with the ultimate goal of gaining a credential (Dabbagh & Kitsantas, 2012; Hall, 2009; Lai, Khaddage, & Knezek, 2013). In contrast, informal learning is conventionally viewed as learning that has "no teacher, no defined curriculum topic or concept, and no external assessment" (Laurillard, 2009, p. 12). Informal learning is also considered to be self-directed, driven by personal interests, and done in one's spare time, outside of a formal setting (Boustedt et al., 2011; Lai et al., 2013; Lai & Smith, 2018a, b). However, the traditional distinction between informal and formal learning has a long

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history of being challenged. For example, over 40 years ago Scribner and Cole (1973) argued that informal and formal learning were intersecting rather than separate categories. More recently informal and formal learning have been conceived as points along a continuum of learning, rather than separate categories (Barron, 2006; Cross, 2007). Colley, Hodkinson, and Malcolm (2002) maintained that all learning has elements of formality and informality.

In recent years increasing Internet accessibility and the burgeoning ownership of mobile digital devices such as cellular phones, tablets, and laptops has further blurred the distinction between informal and formal learning (Lai & Smith, 2018a, b). These digital and mobile tools can breach the traditional distinction between informal and formal learning because they enable students to undertake learning anywhere and anytime (Lai & Smith, 2018a, b). Students are also utilising social networking sites such as Twitter and Facebook as well as other online resources (e.g., *YouTube*, *Ted Talks*, and *Twitter*) for informal learning and support of their formal learning (Arshad, Hoon, & Hashim, 2012; Magogwe, Ntereke, & Phelthe, 2014; Staines & Lauchs, 2013). As the use of mobile digital devices has increased, so, too, has there been an increasing interest in seeking to understand how non-traditional learners and children/young people undertake informal learning as well as how formal learning can be enhanced by informal learning (e.g., Eshach, 2007; Greenhow & Robelia, 2009; Hofstein & Rosenfeld, 1996; Hsi, 2007; Ito, et al., 2008; Khaddage & Knezek, 2011; Martin, 2004; Sefton-Green, 2004). There is some literature reporting on primary and secondary school students' informal and formal learning practices, as well as studies focusing on how digital mobile devices can help to bridge informal and formal learning in schools. Nevertheless, there is a relative paucity of such studies at the tertiary level, while the literature that is available focuses on conceptual issues or on the design and assessment of learning outcomes (Bosman & Strydom, 2016; Clough, Jones, McAndrew, & Scanlon, 2009; Dabbagh & Kitsantas, 2012; Khaddage et al., 2015; Madge, Meek, Wellens, & Hooley, 2009). There is a shortage of studies reporting on tertiary educators' thoughts on informal learning and how their teaching practices facilitate students' informal learning to support formal learning.

With the study we report here we sought to address this research gap, and the following research questions guided our study.

- How do tertiary educators perceive informal learning and the relationship between informal and formal learning?
- How do tertiary educators understand their role in supporting their students to engage in informal learning?

We believe that exploring how tertiary educators facilitate students' informal learning to support formal coursework has important implications for tertiary education and course design. Our findings can inform teaching strategies that enhance the relationship between students' informal learning and the degree of success in their formal education.

The Study

Method

In the second academic semester of 2013, we conducted a research study investigating how educators in one New Zealand University used mobile digital technologies to support teaching

and learning (Lai & Smith, 2018a, b). As part of this study, we included questions that focused on how educators understood the concept of informal learning as well as how they supported their students in undertaking informal learning.

We should note that, although this research was undertaken in 2013, the publication of the results has been delayed due to changes in the life-circumstances of the two authors. Nevertheless, as the subject of informal learning and the relationship between informal and formal learning in tertiary education settings is an under-researched topic, we believe that the research findings remain relevant and that they will be of interest to other researchers and academic staff.[1]

Sample

After receiving approval for the study from the University of Otago Ethics Committee, we emailed questionnaires to all the teaching staff from across the four academic divisions of the University (Humanities, Science, Commerce, and Health Sciences). A total of 24.2% or 308 university teachers out of approximately 1272 teaching staff completed the survey. We also invited the survey respondents to participate in a follow up interview (either face-to-face or over the telephone), and 30 volunteered to do so. The interview participants included 16 male and 14 female educators who held varying academic positions, ranging from teaching fellows to professorial staff. We conducted the interviews in the latter half of 2013. Most participants (11) were from Humanities, with the least (3) from the School of Commerce.

Data Collection and Analysis

In this article we report the interview data from the study. The second author conducted the interviews, which lasted from approximately 15 minutes to an hour; and she digitally recorded and transcribed all the interviews. As a form of member checking, the participants were asked if they wanted a copy of the transcript; but the majority did not. The first author imported the transcripts into the qualitative software application NVivo and then conducted a thematic analysis based on the adaptive form of the constant comparative method outlined by Maykut and Morehouse (1994). The responses were read and re-read, and initial themes that emerged in the raw data were identified. We subsequently created codes based on these themes and then coded passages of text that evidenced these themes. Additional themes emerged during the coding process, and we undertook a number of subsequent coding processes. We checked for consistency or variation of the excerpts coded per theme; and, if the excerpts were too varied, a new theme was created.

In the following section we present the results of this thematic analysis, using a qualitative descriptive approach. We employed this approach to present the findings because of the scarcity of literature reporting tertiary educators' perceptions of informal learning. Our desire to have readers compare their own experiences of fostering students' informal learning with the participants' accounts also influenced our decision to employ this approach. In the results section the participants are referred by the order of interviews (e.g., Participant 4, or P4, was the fourth interviewee) in order to maintain anonymity.

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[1] In New Zealand the term *academic (or teaching) staff* is used instead of *faculty member* as used in North America.

Results

Defining Informal Learning

The participants were not initially provided with a definition of informal learning because we wanted to capture their interpretations of the concept. Nevertheless, the majority (21 or 70%) made comments highlighting how they considered informal learning to be a complex and messy concept, which made it difficult to define. For instance, "Informal learning is learning that is not formal, that kind of top level is very easy, but as soon as you try and start to unpack it and dig deeper [sic], it becomes messy and complicated very fast (P4)." Of the 21 participants who commented that informal learning was difficult to define, 20 also questioned the distinction between informal and formal learning. For example:

> I guess the issue is where [do] you draw the line between what's informal and what's formal....I'm trying to picture if it's like a Venn diagram, is there any overlap where something might be formal and also informal? I'm not sure about that…maybe some formal learning does incorporate informal. (P10)

At the same time, however, they also contrasted features traditionally associated with informal learning and formal learning. For example, formal learning was viewed as being teacher directed and undertaken to achieve a qualification. In contrast informal learning was considered to be self-directed, while students had flexibility in what and how they learned. For example, Participant 8 said, "You manage to get an academic qualification for your learning, then by definition it's formal learning, and, if you don't, well, then it's informal learning." Participants 5 and 6 elaborated in slightly more depth.

> I think formal learning is when we say to students we expect you to learn this, and we've got specific aims in our teaching, and we have specific outcomes for them, and what we expect you to be able to do at the end of a certain period of time. (P5)
> Literally, to me, informal learning would include that kind of learning, which is not part of the formally required learning environment. For instance, it is the learning that students undertake without necessarily being asked explicitly to engage that particular learning. (P6)

Slightly less than half of the participants used similar terms to describe informal learning, which included "peer-learning," "self-directed learning," or "independent learning."

Even though the majority of participants were unable to define informal learning clearly, all of them made comments that showed how they viewed informal learning as extremely significant. For example, Participant 17 said that "Informal learning is probably more useful…in terms of…students mastering what it is you're trying to get them to understand...especially early on when there are a lot of things that they need…to understand, what's going on in a discipline." Similarly, Participant 27 commented as follows.

> [Informal learning] is arguably more powerful than the formal…Well, I'm thinking of … role models, and the way you see people, do things, can often have an effect on your behaviour and the way you do things. [It] can be much more powerful than someone just telling you how to do something. (P27)

The participants also recognised the importance of informal learning for more pragmatic reasons. For instance, Participant 2 said that it was impossible to teach students everything

they needed in lectures. She said: "No programme can cover everything every student needs… so there has to be the ability for students to actually get other learning or other ways to access information, or to tap into other forms of information."

The Relationship between Informal and Formal Learning

All 30 participants made comments highlighting how they believed that there was a close relationship between formal and informal learning. Over two-thirds (21 or 70%) of them made comments regarding how informal learning could enhance and add value to formal learning. For instance, Participants 25 and 16 respectively said "[Informal learning is] a continuation of what everyone's covered in the formal process, what happens beforehand, what happens afterwards," and "Informal learning is a really fantastic support for formal learning…it's what nourishes the base learning that [students] get in formal classes." Participant 1 made a similar comment saying that "Informal learning can add a richness…to the formal learning and help you to make sense of the learning that you're doing in a more formal setting, gives it life, gives it context, makes it real, makes it valid."

The participants maintained that informal learning could provide more relevant examples to supplement formal learning. For instance, Participant 15 explained how she used examples of routine daily exchanges in her classroom to cement her students' formal business studies learning.

> In business studies, which is what we do [in] the everyday interaction of…being a customer…in the classroom, we might use something as an example that…happened in their life, and they go…this is what she was talking about the other day, oh interesting.

Consequently, informal learning strengthened and broadened students' formal learning and coursework. For example:

> Well, I think [informal learning] provides examples of things that might be discussed in the classroom in more abstract or theoretical ways. It's a way of updating information because in the informal context…it's likely to be much more current than some of the material that is more scholarly and academic that we've gathered from journals and books. (P14)
> Well, if I think about our teacher education students, they've got the formal learning prescribed for them in the courses…, but, if we can get them undertaking more reading just for enjoyment, then…that's really going to build up their understanding of language and literature, that's going to make them a better teacher. (P10)

Informal learning was also framed as fostering students' interest in their formal learning and course content, which one participant explained as follows:

> [Informal learning] can make students more engaged and motivated because they're finding out things that maybe are outside the remit of the formalised learning, but they can see the links in between…,they've found something and linked it to something else that they're learning. (P9)

Although not specifically mentioning how students transfer their informal learning to their formal coursework, Participant 7 said that his music students "look at the amount of material that's available on YouTube, some of it's on guitar sites. There's a programme you can buy called Guitar Pro, which is primarily for guitarists and bass players." Playing along with and writing music in response to viewing these online learning resources is likely to increase

students' musical knowledge and competence, which in turn may foster links to and enhance their formal musical performances.

Most participants considered informal learning as an extension of formal learning. Nevertheless, seven participants (or 25%) commented about how the tools students develop in their formal learning can be used to support and enhance their informal learning. These comments are typified by the following.

> For a person to get the most out of informal learning…an active learner needs to be applying some sort of critical thinking skills, some sort of critical reading skills, and I think it would be hard to get those without some kind of formal education experience… that would help you be an effective informal learner in the informal setting. (P12)
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> If I teach formal learning on a certain culture of the world, say Japan, a student might be inspired by what I've taught there and informally learn on their own or through their peers, or in other contexts they may learn about the music and culture of Korea, for example. (P5)

Nine participants (or 30%) made similar comments that showed how they believed that formal and informal learning intersected and how one form of learning could bolster the other. For instance, "you can't have formal learning without informal" (P15), "informal learning happens in conjunction with formal learning so both things happen at the same time alongside each other" (P26), and "they go hand in hand" (P2). Participant 3 elaborated in more depth on the interdependent relationship between informal and formal learning.

> I think you're learning all the time…I think there's a difference in where we learn, but I'm not sure that it's a different learning process. I don't see it as informal on one end and formal on the other. I think it mixes, especially in classrooms where you can have more informal situations and vice versa, and then there's [sic] things like community engaged learning and teaching where you're learning outside of the university, is that classed [as] formal or informal? Within [the] informal setting we often reflect on what we've learned in formal settings…I think they're meshed…[there is] an interconnected relationship, I think they are reflected by each other. I think our experiences outside of formal education inform our experiences inside formal education, [and] vice versa. (P3)

Participant 18 maintained that people should avoid distinguishing between informal and formal learning because of this intersecting relationship. Instead she said that people should simply view informal and formal learning simply as learning. For instance, "I think learning is something that happens inside a person…that might be achieved through formal opportunities to learn or informal opportunities to learn, but learning is learning…whether it happens informally or formally" (P18).

Fostering Informal Learning

Slightly over one third of the participants (11 or 36%) said that university educators had a small role to play in facilitating students' informal learning. However, the other 19 participants stated that tertiary educators, including themselves, played an important role in helping to foster their student's informal learning. One participant commented, for example, "The role of the lecturer is key in facilitating or actually identifying when and how informal learning environments can reinforce formal learning" (P6). Nevertheless, the participants' comments were more centered on how informal learning could support formal coursework rather than on how formal learning

could support students' informal learning. When the participants discussed how they fostered their students' informal learning or made suggestions for how other educators could do so, their responses were grouped into one or more of four categories. These included increasing students' interest in a formal course to trigger informal learning (ten participants); encouraging student agency by helping students to become self-directed and independent learners (nine participants); emphasising the importance of informal learning, providing resources to foster it in their students, and/or teaching informal learning skills in the classroom (eight participants); and finally, modelling examples of their own informal learning (six participants).

Ten participants (or 33%) explained that encouraging informal learning could make formal coursework more interesting and enhance students' curiosity, which in turn may encourage them to pursue more learning beyond the prescribed course content. For example, Participant 13 said, "I spike their interest, I hope I give them a structure of knowledge around which they can sort of build their learning...hopefully I open their eyes to the range of source[s] of information that are available." Participant 5 stated that connecting formal coursework to students' life experiences would likely boost their interest and trigger their informal learning.

> I relate, often create a context of discussion, and I do actually talk about the application...and then applying them to other ideas....I did... show one case study, and I said you could apply this case study to New Zealand, you could apply it to your own context wherever you come from...so that did kind of generate a sense of the application of ideas, which again could inspire a sense of informal learning. (P5)

Participant 12 provided another example:

> You set up some kind of an overarching question, and then it's up to students to figure out how they're going to go about answering the question, and so that requires kind of guided...informal learning....I used to teach a series of inquiry papers in my former university that were meant to be interdisciplinary...so you had to rely on students to help you bring the interdisciplinary to the discussion in the classroom, and that could work because students would come to these classes from different courses of study, so they would have different knowledge, different skills, different interests...and that's not something I could have done in a formal way, but you have to bring it back again to the group, and you have to do the kind of critical analysis part. So I guess that's a place where informal learning can support what's going on in the formal setting.

These same ten participants explained how they emphasised the importance of informal learning to their students. They also explained how they helped their students to develop the tools, resources, and necessary skills to enhance their informal learning, or suggested ways that other educators could do so. These comments are typified by the following.

> It's primarily through motivating and encouraging them to see value in [informal learning], to see that it's something most of them are doing all the time anyway. They may not have perhaps conceptualised it in that way..., and...[it helps them] to refine their skills and access the relevant resources and...finding out what other options are available to them and encouraging them to think critically about the resources that they're using. (P25)
> Give them the skills or show them ways to do, if they have a question how can they find the answer...I tell students on the first day they'll never know it all, you have the right to say I don't know, but...you should say "let's find out." (P2)

Participant 22 said that students needed direction in regard to the informal learning they undertook to support their formal coursework. For her, this direction was necessary to help students to distinguish between creditable and unreliable sources of information.

> I think there needs to be some sort of guidance provided to ensure that the informal learning is appropriate, or they need to be provided with the tools to enable them to decide whether the informal learning is adding value. In other words, if we insist on evidence for everything that we acquire as fact, that would certainly cut out an awful lot of unreliable informal learning that might take place.

Nine participants (30%) made comments highlighting how they could encourage students to take responsibility for their own learning, which, in turn, might result in students becoming "independent learners" (P27) who undertake informal learning to enhance their formal learning. Participant 3 attempted to "encourage the agency of the student" by giving them choice in the formal course curriculum in an attempt to foster interest, and thus informal learning. Participants 18 and 24 spoke in more depth about the strategies they used to foster students' informal learning and their sense of ownership of their learning process. For instance, Participant 18 said "We're encouraging people to take ownership of that responsibility to keep themselves up-to-date and to be aware of developments in the field, and actual practice in the situation, that location where they currently are." Participant 24 also stated:

> I do try and encourage the more informal learning or the more self-directed learning…
> I'll just give them a little bit of a hint as to where they might like to look or [what] they
> might like to be thinking about if they're continuing in [the subject]

Moreover, Participant 18 reported that to encourage informal learning, it is important to give students agency within the course structure and provide them the opportunities to learn by themselves.

> You set your curriculum, and you say this is how teaching and learning is going to happen in this programme…you can give learners opportunities to do things off their own suggestions for how they can enhance their learning….They might be reflective exercises, they might be practical applications of things, but they're not enforced, they're not required, they're suggested, and that is a way in which that formal learning programme can encourage informal learning to occur, by basically just making people aware of the opportunities they may have to learn informally around that.

Two participants mentioned online and face-to-face group work as an opportunity for informal learning. At the same time, these two participants emphasised students' group responsibilities and the necessity of completing their assessment tasks. For example, Participant 26 said, "It's just encouraging the students to take responsibility for what they're learning…,and it's not just in class…. We've set up the groups…,early on I talked to them….,you should be helping each other, working together to solve problems. Participant 29 commented as follows.

> Academics have a role to play obviously here to foster [informal learning], but also let [students] have some…ownership over that collaborative process, so for example, with the blogs…I sort of set the structure up, but then they're taking it on as an informal learning process.

Several participants said that peer learning was a means to support formal learning. For example, Participant 9 commented that students could learn from their peers when working in a group setting.

> Perhaps working with groups where they're actually learning from peers which are not formalized in terms of…learning about different cultures or different experiences through talking with peers, and friends, and colleagues about what it is…,so I think informal learning really does enhance formal learning.

Six participants (20%) said university educators, including themselves, could encourage students to engage in informal learning by modelling their own informal learning process. These comments are typified by the following.

> I sort of lead by example, where I will go to museums and say, "Hey come with me" and will go to the beaches, "Hey come with me"…. If I find something cool, I will get excited about it, I will say I read this really cool book at the weekend, here it is, do you want to borrow it…,so I try and pass on that kind of thing. (P16)
>
> We can highlight for the students how we've learned the things that we're teaching them…,using Twitter myself as a way of locating resources for the course, they can see how Twitter could be a teaching and research tool as well as a social medium. If I find something that's relevant that I happen to have in my phone or my tablet, I'll plug it in to the projector and show them then and there as an example of what they could be doing themselves. (P14)

Participants 17 and 27 reported that they encouraged students' informal learning through class discussions and incorporating open-ended questions into their lessons. Encouraging students to find relevant material and modelling how to go about finding it also served as strategies to help engage students in informal learning. For instance, Participant 17 said, "Asking open-ended questions, making it clear that you're not expecting the answer, turning the question back on them…,so I think it's really important for them to understand that I'm not there telling them what the right answers are." Participant 27 also explained how he encouraged his students to engage in informal learning.

> I see my role…as encouraging them to be independent learners and therefore encouraging them to try and find things out for themselves…We could talk together about how we might find [something] out, we might even together decide to look it up on the web at that very moment, so that sort of little bit of role modeling. (P27)

Discussion

Informal learning has traditionally been defined as interest driven and self-directed, while formal learning is framed as teacher-driven and occurring in a formal education setting with the overall purpose of gaining a qualification (Lai et al., 2013; Lai & Smith, 2018b). The participants found it difficult to define informal learning and in their attempts to do so drew on these traditional distinctions, while simultaneously defining informal learning in relation to formal learning. Nevertheless, nine participants also understood the relationship between informal and formal learning to be intersecting rather than distinct. This finding supports the conceptualisation of informal and formal learning as intersecting points on a continuum of

learning, as well as the notion that formal and informal learning are mutually reinforcing (Barron, 2006; Colley et al., 2002; Cross, 2007).

The participants' comments illustrate the complexity of the concept of informal learning. For instance, Participants 4 and 6 stated that informal learning initially appears easy to define, but it is more difficult to understand when delving below the surface level. We suggest that the attempt at a definition may be further complicated by the ubiquity in the ownership and usage of mobile digital devices in everyday life (Lai & Smith, 2018a, b). For example, tertiary educators and students can access formal course material from their homes through digital devices while also using these technologies to search for online resources to support their informal learning (Lai & Smith, 2018a, b).

Coffield (2000) conceptualised formal and informal learning as an iceberg where the upper third visible above the ocean surface is depicted as formal learning. The remaining two-thirds of the iceberg hidden below the ocean surface is depicted as informal learning. It is estimated that people spend almost three-quarters of their learning time in informal settings (Banks et al., 2007). According to Participant 15, fostering informal learning is "not in the job description." However, we argue that tertiary educators are in a prime position to make students aware that informal learning can bolster their formal learning and ultimately help them gain credentials and contribute to finding post-tertiary employment.

Six participants said that they encouraged students to engage in informal learning through role modelling. Role modelling is an important teaching strategy to support both formal and informal learning. For instance, in a national study on how tertiary educators taught professionalism in a health course, all of the participants (13 survey and 6 focus participants) said that the most common strategy was through acting as role models who demonstrated professionalism in their dress, clinical skill competence, and personal interactions (Smith, Adam, Moffat, & Ahmadi, 2017). Consequently, acting as role models through discussion and demonstration of their own informal learning is likely to be a powerful motivator in helping bolster students' informal learning.

Nine participants also stated that they facilitated students' informal learning by fostering their agency or independence in their learning. Agency is an aspect that is traditionally aligned with informal learning (Lai & Smith, 2018a, b). Nevertheless, teachers were once simply perceived as depositing information into their students; but in our current educational climate students are more likely to be perceived as active in their own knowledge creation (Scardamalia & Bereiter, 2006). Those participants who said that university educators should provide students with the opportunity to take agency in their informal learning embody the shifting perception of the role of educators and students over time.

University educators could encourage student agency in their informal learning by providing links to various online resources or community initiatives that may bolster students learning in relation to their field of study. For example, dietetics students could be alerted to community initiatives aimed at reducing food waste or providing subsidised food for low-income families. Through voluntary participation in these kind of initiatives, students could accrue valuable knowledge, which may transfer to their formal coursework and, eventually, to their post-graduation practice. At the same time, tertiary institutions could stress the integral link between informal learning and formal learning through professional development opportunities for faculty members and by providing examples of how they can encourage students to engage in informal learning.

Conclusion

The participants framed informal learning as invaluable in extending students' formal learning, but they also reported a perception of how informal learning gave meaning to formal learning. Moreover, the participants encouraged their students to engage in informal learning by trying to make their courses interesting, explaining the value of informal learning, modelling informal learning, and providing students with informal learning resources. They also provided students with opportunities to exercise agency in their learning through group work and independent learning. The participants' comments showed how informal learning and formal learning are not distinct, but are interdependent.

As the participants were all from one New Zealand University, the findings cannot be generalised to other tertiary institutions. However, we suggest that the findings can be used to inform other studies on how tertiary educators understand informal learning and how they can foster it in their own teaching practice. All the participants believed that informal learning is important in enhancing formal learning. Consequently, tertiary institutions and educators may wish to explore how they can foster and encourage this kind of learning. More research is needed on tertiary educators' conceptualisation of informal learning and how to facilitate it.

References

Arshad, A., Hoon, T. B., & Hashim, A. (2012). Tertiary students' application of web 2.0 for English language learning. *Malaysian Journal of ELT Research, 8*, 21–37. https://doi.org/10.1016/j.sbspro.2009.01.061

Banks, J. A., Au, K. H., Ball, A. F., Bell, P., Gordon, E. W., Gutierrez, K. D., et al. (2007). *Learning in and out of school in diverse environments. Life-long, life-wide, life deep*. Retrieved from https://education.uw.edu/cme/LIFE

Barron, B. (2006). Interest and self-sustained learning as catalysts of development: A learning ecology perspective. *Human Development, 49*, 193–224. https://doi.org/10.1159/000094368

Bosman, J. P., & Strydom, S. (2016). Mobile technologies for learning: Exploring critical mobile learning literacies as enabler of graduateness in a south African research-led university. *British Journal of Educational Technology, 47*, 510–519. https://doi.org/10.1111/bjet.12441

Boustedt, J., Eckerdal, A., McCartney, R., Sanders, K., Thomas, L., & Zander, C. (2011). *Students' perceptions of the differences between formal and informal learning*. Retrieved from https://dl.acm.org/citation.cfm?id=2016911&picked=prox

Clough, G., Jones, A., McAndrew, P., & Scanlon, E. (2009). Informal learning in online communities of mobile devices enthusiasts. In M. Ally (Ed.), *Mobile learning: Transforming the delivery of education and training* (pp. 100–112). Athabasca, Alberta, Canada: Athabasca University Press.

Coffield, F. (2000). Introduction. In F. Coffield (Ed.), *The necessity of informal learning* (pp. 1–11). Bristol, England: Policy Press.

Colley, H., Hodkinson, P., & Malcolm, J. (2002). *Non-formal learning: Mapping the conceptual terrain: A consultation report*. Retrieved from http://www.infed.org/archives/e-texts/colley_informal_learning.htm

Cross, J. (2007). *Informal learning: Rediscovering the natural pathways that inspire innovation and performance*. San Francisco, CA: Pfeiffer.

Dabbagh, N., & Kitsantas, A. (2012). Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *Internet and Higher Education, 15*, 3–8. https://doi.org/10.1016/j.iheduc.2011.06.002

Eshach, H. (2007). Bridging in-school and out-of-school learning: Formal non-formal, and informal education. *Journal of Science Education and Technology, 16*, 171–190. https://doi.org/10.1007/s10956-006-9027-1

Greenhow, C., & Robelia, B. (2009). Informal learning and identity formation in online social networks. *Learning Media & Technology, 34*, 119–140. https://doi.org/10.1080/17439880902923580

Hall, R. (2009). Towards a fusion of formal and informal learning environments: The impact of the read/write web. *Electronic Journal of E-Learning, 7*, 29–40 Retrieved from https://files.eric.ed.gov/fulltext/EJ867100.pdf

Hsi, S. (2007). Conceptualizing learning from the everyday activities of digital kids. *International Journal of Science Education, 29*, 1509–1529. https://doi.org/10.1080/09500690701494076

Hofstein, A., & Rosenfeld, S. (1996). Bridging the gap between formal and informal science learning. *Studies in Sciences Education, 28*, 87–112. https://doi.org/10.1080/03057269608560085

Ito, M., Horst, H., Bittanti, M., Boyd, D., Herr-Stephenson, B., Lange, P., Pascoe, C.J., & Robinsonet, L. (2008). Living and learning with new media: *Summary of findings from the Digital Youth Project*. Chicago, IL: The MacArthur Foundation. Retrieved from https://files.eric.ed.gov/fulltext/ED536072.pdf

Khaddage, F., Christensen, R., Lai, K. W., Knezek, G., Norris, C., & Soloway, E. (2015). A model driven framework to address challenges in a mobile learning environment. *Education and Information Technologies, 20*, 625–640.

Khaddage, F., & Knezek, G. (2011, October). Opportunities for mobile applications to empower informal learning in university environments. In C. Ho & M. Lin (Eds.), *Proceedings of E-learn 2011–World Conference on E-learning in Corporate, Government, Healthcare, and Higher Education* (pp. 236–243). Paper presented at the World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education, Honolulu, Hawaii. Honolulu, HI: Association for the Advancement of Computing in Education.

Lai, K.-W., Khaddage, F., & Knezek, G. (2013). Blending student technology experiences in formal and informal learning. *Journal of Computer Assisted Learning, 29*, 414–425. https://doi.org/10.1111/jcal.12030

Lai, K.-W., & Smith, L. (2018a). Socio-demographic factors relating to perception and use of mobile technologies in tertiary teaching: Socio-demographic factors and mobile technologies. *British Journal of Educational Technology, 49*, 492–504. https://doi.org/10.1111/bjet.12544

Lai, K.-W., & Smith, L. (2018b). Tertiary students' understandings and practices of informal learning: A New Zealand case study. *Australasian Journal of Educational Technology, 33*, 115–128. https://doi.org/10.14742/ajet.2937

Laurillard, D. (2009). The pedagogical challenges to collaborative technologies. *International Journal of Computer-Supported Collaborative Learning, 4*, 5–20. https://doi.org/10.1007/s11412-008-9056-2

Madge, C., Meek, J., Wellens, J., & Hooley, T. (2009). Facebook, social integration and informal learning at university: "It is more for socialising and talking to friends about work than for actually doing work." *Learning, Media and Technology*, 34, 141–155. https://doi.org/10.1080/17439880902923606

Magogwe, J. M., Ntereke, B., & Phelthe, K. R. (2014). Facebook and classroom group work: A trial study involving University of Botswana Advanced Oral Presentation students. *British Journal of Educational Technology, 16*, 1312–1323. https://doi.org/10.1111/bjet.12204

Martin, L. M. W. (2004). An emerging research framework for studying informal learning and schools. *Science Education, 88*(supplement 1), S71–S78. https://doi.org/10.1002/sce.20020

Maykut, P., & Morehouse, R. (1994). *Beginning qualitative research: A philosophic and practical guide*. London, England: Falmer.

Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy, and technology. In K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 97–118). New York, NY: Cambridge University Press.

Scribner, S., & Cole, M. (1973). Cognitive consequences of formal and informal education. *Science, 182*, 553–559. https://doi.org/10.1126/science.182.4112.553

Sefton-Green, J. (2004). *Literature review in informal learning with technology outside school*. Retrieved from http://www.futurelab.org.uk/research/lit_reviews.htm

Smith, L., Adam, L., Moffat, S. M., & Ahmadi, R. (2017). How do educators in one New Zealand undergraduate bachelor of oral health course teach and nurture professionalism? *European Journal of Dental Education, 22*, e212–e220. https://doi.org/10.1111/eje.12274

Staines, Z. R., & Lauchs, M. (2013). The use of Facebook in tertiary education: Case study of a unit-related Facebook page in a university justice class. *Interactive Technology and Smart Education, 10*, 285–296. https://doi.org/10.1108/ITSE-05-2013-0008