ACIS 2017 Proceedings   Australasian (ACIS)

2017

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Abstract

Twenty years ago, it was proclaimed that collaborative technologies were able to impact the learning environments of educational institutions. Despite research indicating that these collaborative technologies could impact the learning environments in a positive way, no change occurred. Twenty years later, the same claims are being made, where a new collaborative technology, social media, is being proclaimed to be able to impact the learning environments of education institutions, by changing, and possibly improving, the learning approach. However, while these calls are being made, there is currently a lack of understanding on whether social media platforms are effective at enabling collaborative learning. To address this lack of understanding, it is first necessary to create prescriptive knowledge on how we can build collaborative learning environments with the platforms of social media, which this study does.

Keywords social media, social media platforms, collaborative learning, design principles.

1   Introduction

The call for technology to be used in educational institutions is not a new one, and over the years we have seen many technologies introduced into their learning environments. For example e-mail, course websites, and newsgroups have added value to the traditional learning environment (Ajjan and Hartshorne 2008), but have been used to aid the traditional learning approach, rather than trying to change or improve it (Leidner and Jarvenpaa 1995). Twenty years ago another type of technology, namely collaborative technologies, were proclaimed as being able to impact the learning environments of educational institutions by changing, and possibly improving, the learning approach (Alavi 1994). This impact comes in the form of changing from a traditional learning approach, to a collaborative learning approach, but it is evident that this has not been widely adopted. Instead the traditional approach is still the most dominant approach to learning in educational institutions, where the outcome is often passive learners (Lave and Wenger 1991; Vygotsky and Cole 1978).

Twenty years later, the collaborative technology has changed, but the calls remain the same. Social media are being proclaimed as being able to impact the learning environments of educational institutions by changing, and possibly improving, the learning approach (Ajjan and Hartshorne 2008; Kane and Fichman 2009; Zhang 2012). The impact again comes in the form of changing from a traditional learning approach, to a collaborative learning approach. However, while these calls are being made, there is currently a lack of understanding on whether the platforms of social media are effective at enabling collaborative learning. To begin to address this lack of understanding, it is first necessary to create prescriptive knowledge on how we can build collaborative learning environments with the platforms of social media. This provides an opportunity for research to be conducted, where such knowledge will contribute to the IS knowledge base in the form of nascent theory, where we can begin to understand the impacts of social media on collaborative learning, and learning environments. It will also provide contributions to practice, in particular educational institutions, in the form of providing them with knowledge that can inform decisions on whether or not the adoption of social media is beneficial to their learners.

The rest of the paper is structured as follows. In the second section, we position social media platforms as being learning environment enablers. In the third section, we provide an overview of collaborative learning, and its concepts, which we use as a basis 1) to develop the six design principles for building collaborative learning environments (CLEs) and 2) to apply them to social media enabled collaborative learning environments (SMECLEs) in the third and fourth sections, respectively. In the fifth section, we use this knowledge to design and run a microblog enabled CLE. Lastly, we discussion the contributions of our paper and provide a conclusion.

2   Positioning Social Media Platforms as Learning Environment Enablers

Leidner and Jarvenpaa (1995, p. 265) found that when technology was being used in educational learning environments, it was in an automating fashion as opposed a transforming one, where in *"the absence of fundamental changes to the teaching and learning process, such classrooms may do little but speed up ineffective processes and methods of teaching."* That is to say, rather than trying to use collaborative technologies to transform the learning environments, they were merely being used to aid the traditional method of teaching. Alavi (1994 suggested that to be able to effectively integrate collaborative technologies into the learning environments, a shift from the traditional method of teaching was necessary, and such a shift needed to prove to be superior to the alternative modes of instruction. To test this, Alavi (1994 used a collaborative technology, namely GDSS, to enable a different learning method, namely, collaborative learning, to enable a collaborative learning environment. The design for such an environment was informed by the principles of collaborative learning, i.e. groups of 3-4 members must work together to complete a task, and in this case they must use a GDSS to do so. Findings from this study indicated that *"GDSS-supported collaborative learning leads to higher levels of perceived skill development, self-reported learning, and evaluation of classroom experience in comparison with non-GDSS supported collaborative learning."* (Alavi 1994, p. 159).

New generations of collaborative technologies often emerge (Bajwa et al. 2008), and the platforms of social media are one such technology. This is due to their popularity, availability, and increased power in recent years, as well as the ability to collaborate and share information amongst users (Aral et al. 2013; Kane and Fichman 2009). The definition of social media offered by Kaplan and Haenlein (2010, p. 61) is adopted for this study, and are defined as "a group of Internet-based applications that build on

the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content." Further, there are different types available, including blogs, social networking sites, virtual social worlds, collaborative projects, content communities, virtual game worlds (Kaplan and Haenlein 2010) and microblogs. In a similar fashion to previous collaborative technologies, social media have been proclaimed to be able to impact the learning environments of the future (Ajjan and Hartshorne 2008; Kane and Fichman 2009; Zhang 2012). It is proclaimed that social media could impact the learning environments of educational institutions through better communication and collaboration, in new and exciting ways (Ajjan and Hartshorne 2008; Ebner et al. 2010; Kane and Fichman 2009; Zhang 2012).

However, just like before, the very same issues can be observed. For example, the learning environments of educational institutions have seen little change in the past 20 years, especially in comparison to organisations adoption of such technologies, where there is still a lack of engaging students in the learning process, relying on the traditional method of teaching (Hustad and Olsen 2014; Kane and Fichman 2009; Zhang 2012). Further educators, students, and employers, believe that technology enabled learning environments will enhance learning (Chen et al. 2008; Tan et al. 2011). The IS discipline has also focused much research on social media in terms of their impact on organisations, but have failed to discuss it in terms of how this knowledge could influence their own practice, especially in terms of teaching (Kane and Fichman 2009), i.e. to our own learning environments. These statements echo what was being said 20 years ago, but the collaborative technology that is being discussed has changed. There is one major difference between these technologies, and that is that social media are a grassroots collaborative technology, where the majority of learners have experience of using them in their daily lives, as opposed to the GDSS that Alavi (1994) used, where it was a relatively new technology to the learners, and classes had to be dedicated to showing students how to use them.

With learners, mainly from the millennials (born 1977-1997), and generation 2020 (born after 1997), are used to these technologies in their personal lives, it is unsurprising that there are calls for them to be adopted into the learning environments of which these generations are/will be a part of (Chen et al. 2008; Chen et al. 2010; Guo et al. 2009; Tan et al. 2011). It is argued that by utilising the technologies they are used to, it may encourage more engagement, and prepare them for the work environments that are also embracing these technologies (Tan et al. 2011). However, in the IS research community, there is still a lack of understanding of the impact that social media has on the learning environment, and by not addressing this issue it could mean *"IS instructors and scholars might no longer connect to, let alone well educate, these future IS professionals that would soon become a major information technology (IT) workforce and significantly shape and reshape our professional community worldwide."* (Chen et al. 2008, p. 2). So if we wish to influence the future IS professionals, we are required to rethink how social media can *"increase the value of and/or decrease the effort required to manage the learning environment"* (Kane and Fichman 2009, p. 12). This creates an interesting problem that is presented in the next section.

2.1 Problem Statement

Introducing social media into the learning environment is not such a simple task, and should not be done just for the sake of it (Kane and Fichman 2009). Educators need to consider the learning models that best suit the platforms to enable learning to occur (Alavi 1994; Chen et al. 2008; Leidner and Jarvenpaa 1995). For example, there are a number of learning models available (from the objectivist model, to the constructivist model, to the collaborative model, of learning), but the IS literature currently lacks evidence on what one social media might enable. For example, it has been observed that social media has been used to enhance the current traditional method of teaching, where a blog was used as a tool to allow learners to communicate with the instructor through learners leaving comments on a blog post that contains the class slides, where they could ask questions about particular content in the slides. It was also observed that social media was used as a Q&A tool, where learners could ask questions via Twitter as a class was being conducted, and at the end of the class, the instructor would answer the questions that were asked. However, in these instances, social media is only being used to aid traditional methods of teaching, as Leidner and Jarvenpaa (1995 alluded to with other collaborative technologies, which has often been criticised as generating passive learners (Lave and Wenger 1991; Vygotsky and Cole 1978).

Instead, it has been suggested that a collaborative technology may be better suited to enabling a collaborative learning environment (Hustad and Olsen 2014; Leidner and Jarvenpaa 1995). This is in accordance with Alavi (1994 study, where they used a collaborative technology, namely GDSS, to enable a different learning method, namely, collaborative learning, to enable a collaborative learning environment. The problem comes in the form that there is currently a lack of understanding on whether

the platforms that are enabled by social media are effective at enabling collaborative learning. To begin to address this lack of understanding, it is first necessary to create prescriptive knowledge on how we can build collaborative learning environments with the platforms of social media. This provides an opportunity for research to be conducted, where such knowledge will contribute to the IS knowledge base in the form of nascent theory, where we can begin to understand the impacts of social media on collaborative learning, and learning environments; and to practice, in particular educational institutions, in the form of providing them with knowledge that can help inform decisions on whether or not the adoption of social media is beneficial to their learners. The next section provides an overview collaborative learning, explaining what it consists of, as well as outlining a number of its concepts.

3   Overview of Collaborative Learning

As has been highlighted above, collaborative technologies such as social media platforms, may be suited to the collaborative model of learning. Collaborative learning can be used to implement a learner-centered approach, where students self-govern themselves (Bruffee 1999; Kirschner 2001) and participate in a coordinated effort to complete an assigned open-ended task (Alavi et al. 2002; Dillenbourg et al. 1996; Neville et al. 2005). The principles of collaborative learning are explained in the following sections, beginning with the foundational introduction to a topic.

3.1   Foundational Introduction to a Topic

The knowledge of the learners on the topic(s) they are going to discuss must be considered. The open-ended task is going to focus on a topic(s), and if the learners do not have a foundational knowledge of this topic(s), their solutions to the task will more than likely not be of an acceptable standard to the community they are trying to join (Bruffee 1999). This is why the instructor is required to introduce the learners to any topic first, providing them with the foundational knowledge needed, so they can then communicate with each other with the right language (Bruffee 1999) and build on this foundational knowledge. Learners achieve this by working in groups, which is explained next.

3.2   Group Participation

Group participation in collaborative learning involves small groups, usually with 3-4 learners (Alavi 1994; Kotlarsky and Oshri 2005) working together to learn the language, mores, and values of a particular community that they wish to join (Bruffee 1999) which can be referred to as assigned groups. Assigned groups are forced into consensual learning, where learners must ask questions, justify their opinions, listen to others and as a group, reach a negotiated consensual answer to solve the task (Alavi et al. 1995; Bajwa et al. 2005; Bruffee 1995; Durán and Amandi 2011; Finnegan and O'Mahony 1996; Kwok et al. 2002; Matthews et al. 1995; Mejias et al. 1997; Wiener 1986). Group member roles shift between different members, depending on the nature of the problem and the topic being discussed (Bruffee 1999; Dillenbourg et al. 1996). Further to these assigned groups, Bruffee (1999, p. 8) indicates there are other layers of groups at work in collaborative learning: the class group, which is a larger community consisting of the different assigned groups; and the discipline community group, which is a still larger community in which the learners are trying to become members of, where the class group is nested. Finally, there is also the individual themselves, which consists of each learner in the environment (Bruffee 1999, p. 8). These groups allow for a number of relationships to be formed which are discussed next.

3.3   Learner Relationships

Learning is shared between instructors and learners, where a number of relationships are formed, from learner-to-learner, learner-to-instructor, and instructor-to-learner (Bruffee 1999; Kirschner 2001; Matthews et al. 1995; Panitz 1999). These relationships are formed through interactions between participants (Kreijns et al. 2003), and are an expansion of learning in traditional environments of the instructor-to-learner relationship (Bruffee 1999; Leidner and Jarvenpaa 1995; Panitz 1999). These relationships encourage learners to build closer relationships through negotiation with other learners, their instructors, and ultimately the larger community in which they are trying to join (Bruffee 1995; Bruffee 1999; Smith and McGregor 1992). They are built on trust, where participants foster faith that all others will contribute rather than behaving opportunistically (Brown et al. 2004). Therefore learning occurs between learners, between learners and instructor, between instructor and learners, and finally between learners, instructor and the community (Bruffee 1999; Kane and Fichman 2009; Panitz 1999; Wiener 1986). These learner relationships are fostered through the learners working towards completing an open-ended task, which are introduced next.

3.4   Open-Ended Tasks

Collaborative learning involves the assigned groups solving an open-ended task (Alavi et al. 2002; Brown et al. 2010; Bruffee 1999; Kotlarsky and Oshri 2005; Kwok et al. 2002; Leidner and Jarvenpaa 1993; Panitz 1999) that the instructor must set, that has no definitive answer (Alavi et al. 2002; Brown et al. 2010; Bruffee 1999; Kotlarsky and Oshri 2005; Kwok et al. 2002; Leidner and Jarvenpaa 1993; Panitz 1999). This task should be created with a number of criteria in mind: the learning environment, the knowledge of the learners, and the time they have to solve the task. In terms of the learning environment, the task should be defined around the resources that are available to the learner, i.e. is it face-to-face or a dispersed setting; do they have access to course material; do they have access to the internet? Depending on what is available, the task must de designed around it. When finished, assigned groups should present their findings to the bigger group, the class (Bruffee 1999). This provides other learners with different perspectives and answers to the task, which in turn provides a greater breadth of answers that the instructor couldn't cover by themselves. This requires an understanding of the role that the instructor has in collaborative learning, which is explained next.

3.5   Role of the Instructor

The current role of an instructor is that of a "sage on the stage", where they are seen as the expert in a teacher-centred classroom, passing knowledge onto learners (Kirschner 2001; Matthews et al. 1995; Neville et al. 2005; Panitz 1999; Smith and McGregor 1992). However with collaborative learning, this role changes significantly. The role focuses more on facilitating learners by putting the responsibility of learning with them (Kwok et al. 2002; Neville et al. 2005; Panitz 1999). Here, instructors focus more on designing problem-solving tasks for the learners to solve, than on acting as transmitters of knowledge (Gokhale 1995; Kwok et al. 2002; Leidner and Jarvenpaa 1995; Neville et al. 2005; Smith and McGregor 1992). Therefore the instructor is responsible for being actively present, trusting the learners to engage in conversation and negotiation, and when required providing minimal guidance (Bruffee 1999; Dillenbourg 1999; Kane and Fichman 2009). This guidance involves refraining from interfering with groups, and when this is unavoidable, asking questions to the group as opposed to just giving them the answer (Bruffee 1999). However it is important to acknowledge that the role of the instructor is not being diminished, but merely shifting from "resident expert" to a "qualified guide", as tasks such as holding lectures, assigning projects, and creating exams will still be necessary (Kane and Fichman 2009; Kwok et al. 2002). Lastly, when the groups present their work, the instructor acts as the qualified expert in the field and provides the feedback on whether the knowledge created is acceptable for that particular community (Bruffee 1999).

Following this understanding of collaborative learning, the next section introduces collaborative learning environments, design principles on how to build them, and then adapts these design principles to explain how to build social media enabled collaborative learning environments (SMECLEs).

4   Building Social Media Enabled Collaborative Learning Environments (SMECLEs)

To be able to build a social media enabled collaborative learning environment (SMECLE) it is first necessary to extract and explain the design principles (DPs) to build collaborative learning environments (CLEs). This is done in the next section, which is then followed by how these DPs can be applied to build SMECLEs.

4.1   Design Principles for Collaborative Learning Environments (CLEs)

Collaborative learning environments (CLEs) are defined as "a setting, where there are shared realistic and relevant problems, where there are shared needs and goals, where there is room for multiple perspectives on the problems and their solutions, where there are shared responsibilities both for the process of achieving a final product and for the product itself, and where there is mutual trust in one another such that participants are valued for their contributions and their initiative." (Kirschner 2001, p. 4). These environments can be created at any time, but when building them, a number of design principles (DPs) should be applied in order to allow the potential of collaborative learning to be able to occur. This study developed six DPs from the understanding of what constitutes collaborative learning above, and are presented in Table 1.

When these design principles are applied, a CLE can be built. Consider the following example of a face-to-face CLE: an Information Systems instructor wants to introduce the topic of *"The Role of a Systems Analyst"* and wishes to build a CLE for learners to explore the topic themselves. The setting for this is a

typical classroom. The instructor proceeds over a set period of time to give the learners the foundational knowledge required to understand the topic **(DP1)**. When the instructor feels the learners have the foundations required to understand the topic, they can start to create the groups. This will involve breaking the class into groups of 3-4 members **(DP2)**, and then getting them to sit together in their groups so they can work together, allowing relationships to be formed **(DP3)**. The instructor must then provide them with an open-ended task, i.e. *"what is the most critical skill a systems analyst requires in today's business environment?"***(DP4)**.

DP	Explanation
DP1	The instructor must give a foundational introduction to the topic that they wish the learners to discuss for the task.
DP2	The instructor must create groups, where the size must be 3-4 members.
DP3	Relationships must be able to form amongst the learners, and the instructor, allowing information to flow between them.
DP4	An open-ended task must be assigned for groups to actively seek an answer to, which must not have a definitive answer, in a set time period.
DP5	When the task is completed, groups must present their solution to the class group.
DP6	The instructor then must act as the liaison between the learners and the community that they wish to join by saying whether the solutions are acceptable to the community.

Table 1. Design Principles for Collaborative Learning Principles

This task does not have a definitive answer, and can be answered in many different ways – it will depend on the group's members, their diversity, and their understanding of the task that will determine how they answer it. For example, one group may decide to focus on one particular sector and come to a consensus on why a particular skill is more in demand over another, while another group may focus just on which one is most important in general, and why. The instructor decides how long they want the learners to interact for, i.e. over a single class, or a number of classes. Eventually, when the groups have a solution to the task, they present it in front of the class **(DP5)**. This provides each learner in the class group with different perspectives on what the most critical skill for an analyst is. The instructor must then act as a liaison between the class and the IS community, and say whether the solutions are acceptable for the community **(DP6)**. It is evident from this example how the design principles of a CLE are applied in a classroom setting, but these DPs can also be utilised by instructors to create CLEs that are enabled by technology, where the technology that is adopted must be able to enact the principles. In this study, the collaborative learning environments that are built are done so with social media platforms, and the design principles of a CLE are enacted, which are referred to as social media enabled collaborative learning environments (SMECLEs). The application of these DPs to build SMECLEs is introduced next.

4.2 Applying the Design Principles of CLEs to Build Social Media Enabled Collaborative Learning Environments (SMECLEs)

To be able to build a SMECLE, the design principles of CLEs must be enacted, and an appropriate social media platform to enable the learning environment must be chosen. When enacting the design principles, there are some additional steps that must be followed. For example, when an instructor is setting up a SMECLE, they must choose which social media platform to use, and the specific service; they also need to create rules in relation to setting boundaries for learners when in this kind of learning environment; and they need to create their own instructor profile on their chosen social media platform, as well as getting learners to create their own learner profiles. Presented in Table 2 are the steps that should be followed to build a SMECLE, which have incorporated the design principles of CLEs, and added the additional steps required in relation to social media platforms.

Step	Explanation
1.	The instructor must give a foundational introduction to the topic that they wish the learners to discuss for the task.
2.	The instructor must choose a social media platform to use, and the specific service.
3.	The instructor must create the rules for the SMECLE.
4.	The instructor must set up their instructor profile on the social media platform.
5.	The instructor must create the groups of 3-4 learners in accordance with the amount of learners in their class.
6.	Learners must create their learner profiles on the social media platform.
7.	Learners must connect with every other learner, including the instructor, in the way the social media platform allows, so relationships can be formed, allowing information to flow between them.
8.	The instructor must set an open-ended task, and the amount of time the class is going to run for.
9.	Leaners must present their answer to the class, which can be done on the social media platform or in front of the class
10.	The instructor must review the answers provided, saying whether the solutions are acceptable for the community the learners wish to join.

Table 2. Steps for Building SMECLEs

4.3   Building and Running a Microblog Enabled CLE

A microblog enabled CLE consists of using a microblogging platform to build a CLE. Microblogs are a type of social media platform that allow users to create profiles and make posts about their activities, opinions, and status; these posts often have a character limit on them between 140-200 characters depending on the microblogging service used. Users can connect with other users, which is not reciprocal, and it allows them to see posts from the users they are connected with. Further to this, users can create hashtags to categorise their posts so a line of discussion on a particular topic can be created. In terms of a CLE, microblogs can be used to create groups of learners to be able to interact with each other, and also with the wider audience of anyone else who is using the particular microblogging service. Learners can interact with each other by creating specific hashtags for their group to use, or by mentioning each other's usernames in their posts (this creates a notification for the learners mentioned). In terms of the types of tasks that can be completed, with the platforms character limit, it is best to require short answers. For example, in a microblog enabled CLE, asking learners to define topics would be more appropriate than asking them to create an essay type answer due to a maximum of 140-200 characters per post.

This study presents a microblog enabled CLE that was created for a class, where the steps for building a SMECLE from Table 2 were applied, and are presented in a storyboard in Figure 1. Here, the instructor was teaching a module titled *"Web Development for Business"*, where the objective was to provide learners with an understanding of how to develop and manage web based applications for business environments. The learners consisted of 24 fourth year commerce students who elected to do the module. The learning environment can be viewed at https://twitter.com/IS4428104468261, which is the instructors Twitter account. From here, a number of observations can be made, and they are discussed in the next section.

Step 1

SEO
Testing
Navigation

The instructor provided learners with a foundational introduction to different concepts

Step 2

The instructor chose Twitter as the microblogging service as it was free to use, and learner familiarity

Step 3

- All learners must participate
- All learners must create new Twitter accounts with the set naming conventions
- All learners must follow every other learner in the class on Twitter
- All learners must be signed in to their account at the time the class starts
- All groups must tweet their answers at the end of the class

The instructor created a number of rules that set the boundaries that learners had to work within

Step 4

Cathal Doyle
@IS4428104468261

IS4428 Instructor

The instructor created their own Twitter handle, using the module code and staff number

Step 5

The instructor created assigned groups of 3-4 learners from the class

Step 6

Peter O Donnell
@IS4428108331511 Follows you

Group 7

Learners created their Twitter handles with the naming conventions

Step 7

Learners connected with every other learner in the class group on Twitter, creating a network

Step 8

Cathal Doyle
@IS4428104468261   Follow

The #task is to define what is meant by website #navigation, #testing, and #SEO

At the beginning of the microblog enabled CLE, the instructor tweeted the task out to the learners

Step 9

Mairead Roche
@IS4428108542755   Following

#IS4428G6 so for SEO-combining our definitions.SEO directly addresses the website's need to naturally attract and retain users.

At the end of the class, a number of the assigned groups tweeted their answers to the task
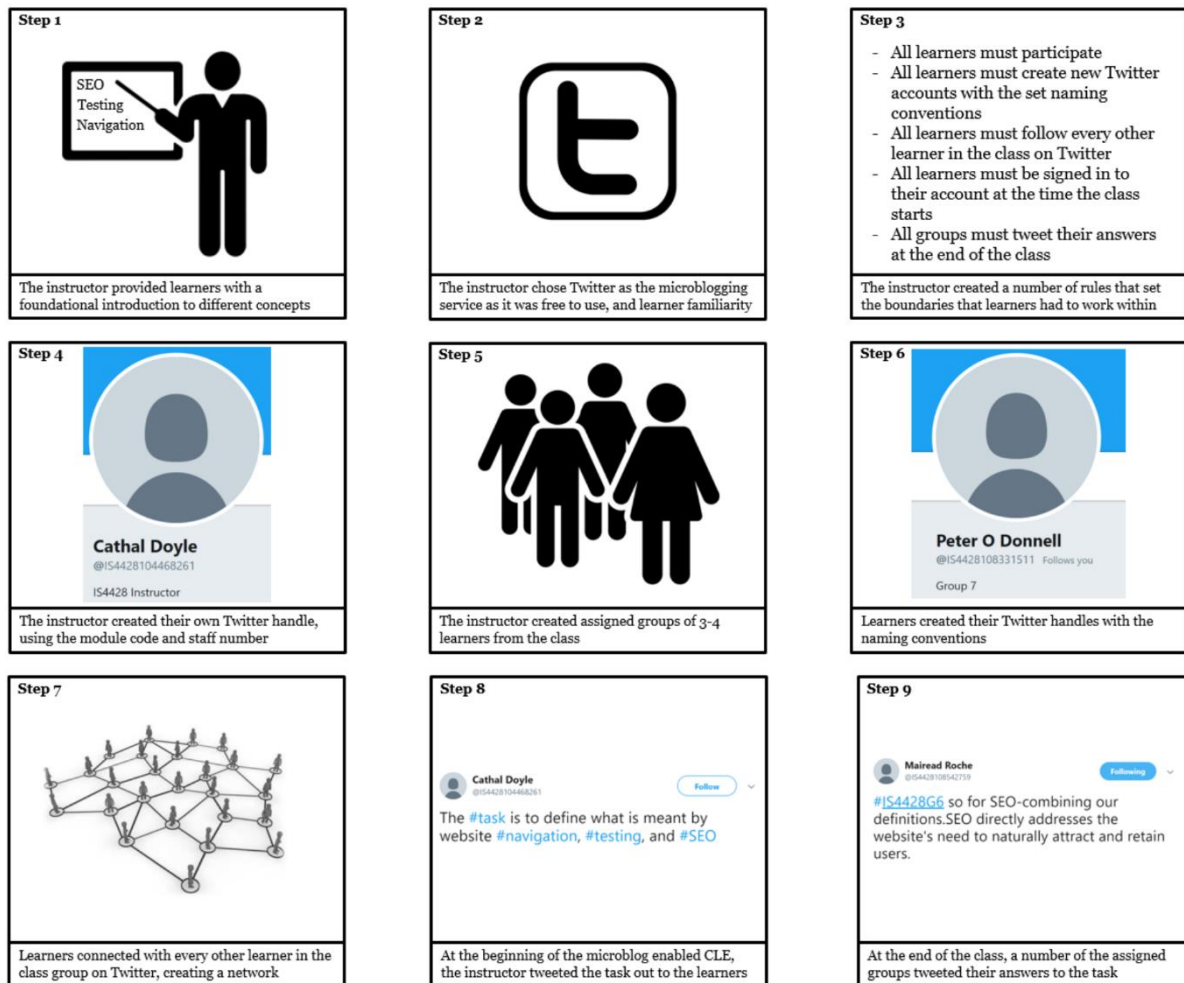
Figure 1: Storyboard of Building a Microblog Enabled CLE

In the next class, which was back to the traditional approach, the instructor reviewed the answers that had been presented by the assigned groups and provided them with feedback **(Step 10)**. This involved acting as the liaison between the learners and the web development community, and indicating whether their answers were acceptable. In the next section a discussion about this study is presented, as well as a conclusion, and future research that should be conducted.

5   Discussion and Conclusion

Motivated by calls that suggest social media, and its platforms, are capable of impacting learning environments of educational institutions, in particular CLEs, this study set out to create prescriptive knowledge on how to build SMECLEs. This was a necessary step before we can start addressing the bigger question, which is whether the platforms of social media are effective at enabling collaborative learning, as we first need to know if the platforms are actually capable of enabling CLEs. This study created such prescriptive knowledge in the form of six design principles for CLEs, and successfully applied them to build a microblog enabled CLE. This is evidenced in Table 3, where explanations of how each design principle was enacted in the SMECLE is presented. This example was presented to provide evidence that the design principles are effective and can be utilised to build different SMECLEs (a detailed review of this case was beyond this study, and therefore not presented). Such knowledge was lacking from the IS knowledge base, and satisfies the criteria for nascent theory. That is to say, it provides a good base on which to start to study, and better understand, the impact that social media can have on learning, in particular collaborative learning. Further, such prescriptive knowledge is also valuable to practice, in particular educational institutions, who can apply this knowledge to help inform decisions on whether or not the adoption of social media is beneficial to their learners. Future research should focus on adopting these principles to other social media platforms, testing their applicability, and refining them as required. Lastly, a limitation of this study is that it did not provide any empirical assessment of the case presented but as mentioned, this was outside of the scope of this paper.

DP	Microblogs
DP1	The instructor provided learners with a foundational introduction to web design concepts, i.e. website navigation.
DP2	The assigned groups of 3-4 learners asked questions about what they had to do to complete the task, shared content such as videos, and provided their opinions on them. Interactions also occurred with class groups when they shared tweets, and with the community group outside the classroom when they asked experts for their opinion on the task.
DP3	Relationships were formed between learners when they interacted with each other. They were also formed with the instructor, and the community, when they asked questions of them and got responses.
DP4	Over a one-hour period, assigned groups completed the open-ended task of defining what is meant by website navigation, testing, and SEO, where groups offered different perspectives.
DP5	Assigned groups presented their solutions to the class by tweeting their answers at the end of the one-hour period, which made them available to the whole class.
DP6	The role of instructor changed to a facilitator for this class, providing advice when asked questions by learners, and marking the solutions that were presented in the end.

Table 3. Explanation of How the Design Principles Were Enacted in the Microblog Enabled CLE

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