Twitter as a Potential Lifelong Learning Environment in Higher Education from Saudi Students' Practices and Perceptions: A Case Study

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Abstract

One of higher education's commitments is to provide students with the skills and knowledge needed for continued learning. Blending formal and informal learning approaches is the suggested approach to close the gap between learning in the real world and in classrooms. Social media is viewed as a bridge that can make learning seamless. This qualitative study aims to examine the use of Twitter as an educational environment in which to expand students' informal lifelong learning. The case study itself discusses female Saudi master's degree students engaged in learning activities on Twitter for a course at a university in Saudi Arabia. The study aimed to understand their perceptions of Twitter's integration with course activities and investigated whether the integration of Twitter motivated students toward lifelong learning. Three students from the course participated in in-depth interviews and a content analysis of their tweets. The results indicate that students receive benefits from the integration, such as self-confidence, but also drawbacks, such as lack of information literacy skills. Key results from the content analysis indicated that participants engaged with the course's Twitter account after the course formally finished. Formal learning hashtags in Twitter led some students to engage in a broader community. Suggestions for pedagogies were to be supported with necessary skills for lifelong learners and for the teacher to continue to engage with learners' communities informally.

Keywords: informal learning, Twitter, higher education, lifelong learning

1. Introduction

Higher education (HE) has recognized the critical importance of creating new opportunities for lifelong learning (Oliveira Pires, 2009; De La Harpe and Radloff, 2000). The term *lifelong learning* is recognized widely as the need to develop skills and knowledge continuously to cope with a rapidly changing world (Sharples, 2000). HE institutions need to consider the main characteristics of the lifelong learner: self-motivation; self-confidence, metacognitive skills, and sociability (De La Harpe and Radloff, 2000). The Organization for Economic Cooperation and Development (OECD) (2018), in the report *The Future of Education and Skills: Education 2030,* emphasized the role of "learner agency" as the means to navigate through a complex and uncertain world. To do so, one of the suggested factors in the report was to enable agency by applying a "personalized learning environment that supports and motivates each student to nurture his or her passions, make connections between different learning experiences and opportunities" (p. 4).

In the 21st century, the Internet as a learning resource poses a challenge to pedagogies, as it helps learners learn and understand on their own, placing them at the center of their own learning experience, rather than having curriculum-based learning imposed on them. In this digital age, with the advance and variety of Web 2.0 tools, pedagogies must renewed make learning active rather than passive, and allow the learner to connect to real learning societies (McLoughlin and Lee, 2008). Alshahrani and Ally (2016) argue that educators need to be aware of the expectations that these younger generations bring to the classroom so that they can guide them effectively toward becoming lifelong learners. Therefore, technology needs to respond not only to the pedagogies that a teachers intend, but also to students' (users) needs, even after formal learning . Indeed, during the COVID-19 pandemic, these technologies has been introduced to learners in higher education more than before the pandemic. Hence, a question might be raised how to design pedagogies using these technologies to provide lifelong learning.

One of the suggested approaches is blending formal and informal learning using the Internet and smart learning environments (Cheung Cheung, Kwok, Phusavat, & Yang, 2021; Lai, Khaddage, and Knezek, 2013; Viberg,

Andersson, and Wiklund, 2021). The Horizon Report for Higher Education in 2017 reported that one of the challenges that HE can solve is the blending of formal and informal learning (Educause, 2017). The report stated that universities should take formal and informal learning into account and play a bigger role in helping students discover and maximize credible digital tools and resources to pursue their curiosities. Thus, social media has been considered as an environment for learning with varying attributes of formality and informality (Greenhow and Lewin, 2016; Lai, Khaddage, and Knezek, 2013). In general, social media networks is described as forms of communication through which users create online discussions to share ideas, engage in communities, exchange personal messages and link to other websites. There are many types of social media such as social networking sites (e.g. Facebook), blogs and microblogs (e.g. Twitter), projects produced collaboratively by users (e.g. Wikipedia), content communities (e.g. YouTube) and virtual social worlds (e.g. SecondLife). However, this study focused on Twitter.

Twitter is a social networking microblogging that allows users to broadcast short posts called *tweets* and follow other users. Users can connect tweets to a general topic through adding hashtags, which acts like a meta tag, to a keyword in their post. Many studies have emphasized that Twitter can be used for learning activities in HE by engaging students to tweet and build a learning resource network, while considering the teacher as facilitator (Ricoy and Feliz, 2016; Kassens-Noor, 2012; McLoughlin and Lee; 2008; Junco, Elavsky, and Heiberger, 2011). In the Saudi context, the number of Saudi users was calculated to be around 15.5 million in October 2021 (Statista, 2021). Twitter is already used widely among Saudi HE students (Aifan, 2015; Almankory, 2019).

Many studies in the field of connecting formal and informal learning have examined methods to design and evaluate the experience for learners using advanced technology (e.g., Serrano-Iglesias, Gómez-Sánchez, and Bote-Lorenzo, 2021). However, this study focused on understanding a case in which learners expanded the formal learning context to an informal one and examined students' motivations in a Saudi context while using Twitter.

2. Literature Review

2.1 Blending Formal and Informal Learning: Pedagogies and Technologies

The use of mobile devices and the Internet in learning increases the difficulties when defining *informal learning* (Viberg et al., 2021). Informal learning is an intentional interest rather than curriculum-based learning; it's what happens beyond the classroom and happens accidentally in leisure and in unpredictable ways (Lai, Khaddage, and Knezek, 2013). Informal learning differs from formal learning based on 'the degree of control that teachers and students have over the selection, organization, and pacing of knowledge transmitted and received' (Furlong and Davies, 2012, p. 52). Generally, Informal learning differs in the sense that formal learning requires a management system, a teacher, or an educational software program to directed student's learning. (Greenhow and Lewin, 2016). Lai, Khaddage, and Knezek (2013) conceptualized the relationship between formal and informal learning as mutually influential. Informal learning can help shape formal learning, and formal learning can help motivate informal learning.

Pedagogies need to be explained through appropriate learning theories to help us see the big picture and be able to make connections from this broader perspective (Anderson, 2004). Learning theory depends on how we look at the blending of formal and informal learning. For instance, previous studies (e.g., Kassens-Noor, 2012) encouraged participants to bring their informal experience in formal learning using Twitter. This blend of informal and formal learning has been conceptualized as active learning, in which learners are involved in activities that enable them to discover, process, and apply knowledge through engagement (Kassens-Noor, 2012). In this case, constructivist pedagogies can explain their learning. Lai, Khaddage, and Knezek (2013) discussed the importance of recognizing students' technology-enhanced informal experiences with formal learning by finding the best ways to enable students to transfer these experiences from one context to the other to enrich knowledge and enable seamless learning, which encourages prior knowledge and experience as being fundamental to constructing learning. The blend of informal and formal learning has been conceptualized as active learning, in which learners are involved in activities that enable them to discover, process, and apply knowledge through engagement (Kassens-Noor, 2012).

In contrast, other studies view formal learning in curriculum-based activities as a gate to move toward informal learning and sustained online engagement. For example, in a study by Salmon, Rossb, Pechenkinac, and Chased (2015), participants used Twitter as a sustained online community for educators involved in professional development through a massive open online course (MOOC). Twitter is preferred by students engaged in structured learning in MOOCs, as it provides a space to improve learning, networking, and knowledge sharing. In this situation, learning would be explained via connectivism by Siemens (2005) as creating links between nodes within their ecology of resources.

Luckin (2008) introduced a model entitled, "learner-centric ecology of resources", to recognize the relationship between the learner and their context, which contains all subjects, technologies, and resources (books, peers, etc.), to explain the learner's situation with and without formal learning. The ecology of resources, in Luckin's words, refers to a "set of inter-related resource elements, including people and objects, the interactions between which provide a particular context" (p. 451). The model suggests that in some situations, these resources can be filtered by teachers and curricula. This conceptualization helps understand the dynamic of learning and pedagogical interventions. Some scholars view this intervention as an important aspect for preparing and empowering students. McLoughlin and Lee (2010) indicated that appropriate strategies with the use of learning technologies are "capable of supporting and encouraging informal conversation and dialogue, collaborative content generation, and the sharing of knowledge" (p. 29).

In terms of technologies and tools that support the blends between formal and informal learning, social media, has a potential to help learners bring knowledge from different contexts (Atwell, 2007; Greenhow and Lewin, 2016). Lai, Khaddage, and Knezek (2013), provide a conceptual framework that demonstrates the location of social media in the middle of formal and informal learning. They emphasized the role of digital technologies and appropriate pedagogies: The former has the potential to support the redesigned learning environment by creating a link between formal and informal learning. By using the appropriate pedagogical approaches, teachers can redesign learning experiences to connect students to the real world and help them find their own space for informal learning (Lai, Khaddage, and Knezek, 2013). Hall (2009) described the relationships of formal and informal learning as perceived by learners, as Web 2.0 tools extend their own formal learning into more informal places. In his words, "Critically, they are able to define with whom to share their personal approaches, and how they can best connect the informal learning that occurs across their life to their formal, academic work" (p. 29). Studies also have investigated the support offered by mobile and ubiquitous learning, relying on mobile devices' context-awareness capabilities to provide seamless learning experiences across spaces (Pimmer, Mateescu, & Gröhbiel, 2016; Pishtari et al., 2020; Viberg et al., 2018).

Studies varied regarding the accommodation of social media in formal learning activities. When discussing Twitter, some studies favored keeping participation in Twitter voluntary such as Reed's study (2013). Others see the potential to introduce these environments in learning and teaching activities to enable learners to sustain their learning and build their own learning resource networks (Kassens-Noor, 2012; McLoughlin and Lee, 2008). An empirical study by Junco, Elavsky, and Heiberger (2013) examined two different ways of integrating Twitter into a college course:

> *When students are required to use Twitter for a course, and faculty engage with them regularly on the platform, there is an increase in student engagement and grades that was not seen when students were allowed to choose whether or not to use Twitter and when faculty rarely interacted with them on the platform (p. 11).*

Many studies explore the formal integration of Twitter as apart of learning activities, and different aims regarding the use of Twitter, such as a learning community and for improving critical thinking (Ricoy and Feliz, 2016), academic achievement (Junco et al., 2011), and knowledge creation and sharing (Kassens-Noor, 2012), were explored. Although many studies indicate that Twitter has the potential to promote how students use the tool in formal learning (Yakin and Tinmaz, 2013; Ricoy and Feliz, 2016), understanding how students perceive or feel about the potential of Twitter for academic practices is needed. Considering that these studies entailed different contexts, this study expands the focus to Saudi Arabia and master's degree students, following Yakin and Tinmaz's (2013) recommendation to perform in-depth interviews with students beside content analysis of tweets. Investigating Saudi master's degree students' perceptions about Twitter as a learning environment is significant because Saudi students already using social networks for learning (Aifan, 2015; Almankory, 2019).

2.2 Lifelong Learning and Higher Education

Knapper and Cropley (2000) stated that "deliberate learning can and should occur throughout each person's lifetime" (p. 1). Furthermore, Sharples (2000) views lifelong learning as "primarily collaborative" learning, and this collaboration is obvious in situations where learners belongs to communities that provide support.

Bentley (1998) argued that educational institutions should empower people to manage their learning in different contexts during their lifetimes. Siemens describes how that could be achieved: stating that "Schools and universities play a dual role: accommodating a learner's method and mode of learning, and transforming learners and preparing them to function in the world that is unfolding" (cited in McLoughlin and Lee, 2008, p. 11).

Bentley (1998) also argued that, not only would good practice in teaching help equip students for lifelong learning, but it also engages them in situations to see how they use such knowledge in varied ways. Leadbeater (2000)

discusses this aspect as an integrated part of educational institutions' responsibilities. Schools and universities should become more like learning hubs within the community, capable of extending into the community (p. 112).

2.3 Sustainable Online Engagement

After a formal course is finished, it is important to understand what makes some individuals continue to use and develop their ecology of resources. According to Kop and Hill (2008):

> *People can move from a learning environment controlled by the tutor and the institution, to an environment where they direct their own learning, find their own information, and create knowledge by engaging in networks away from the formal setting. They still communicate with others, but their personal interests and preferences – rather than institutional requirements and choices – are the main drivers for their engagement with more knowledgeable others in their learning (p. 9).*

The sense of community makes members feel responsible and motivated to participate, as Mayes and Freitas (2013) explained:

> For long-term stable communities, there are two different ways in which the community will influence learning. First, there is the sense most directly addressed by Wenger – someone aspires to become a legitimate participant of a community defined by expertise or competence in some field of application. The learning in this case is the learning of practice that defines the community. […] The second sense is that of a community of learners, for whom the practice is learning per se. That is, a very broad community identified by shared high level value placed on the progress of continuous intellectual development (p. 19).

Ricoy and Feliz's (2016) study reveal that the curve of learner engagement in the final phase of the program curved down; this would be normal in many courses. The process of conducting many studies regarding student engagement occurred simultaneously with teaching the course, and studies that examine student participation and perception beyond course time to investigate formal courses' effect on their informal learning are lacking. Indeed, it is worth investigating students' motivations to continue engaging in a subject by implementing Twitter for lifelong learning.

3. Research Statement

This research aims to explore the use of Twitter as an educational environment in which to expand students' informal lifelong learning. This research seeks to understand Saudi master's degree students' perceptions of the integration of Twitter in formal learning. Furthermore, the research aims to investigate whether the integration of Twitter motivates students toward lifelong learning.

This study sought to answer the following questions:

1- *How do students perceive the integration of Twitter into learning activities?*

2- *Does the integration of Twitter into learning activities motivate students to use Twitter for lifelong informal learning? Why?*

In the process, the study functioned under the following objectives:

1- It will understand the pedagogies used for the integration of Twitter into the course's learning activities.

2- It will identify the benefits, drawbacks, and motivations of the integration of Twitter into learning activities from the students' perspective.

3- It will describe the students' participation during and after the course.

4- It will identify students' motivations – if any – to continued participation after the course ends.

4. Case Description

I found an active educational account on Twitter that provided informative and various resources in Arabic regarding the educational technology field. After contacting the teacher, I found that this course blended online activities on Twitter and face-to-face learning as part of a learning activity for a master's degree course called Educational Technology (ET). The teacher created the course's Twitter account, and it has more than 5,500 followers (comprising teachers, educators, professors, and students), with more than 5,000 tweets at the time this current research was conducted. These numbers provide an indicator of this educational account's activity. An initial overview of this account's content indicates that the students engaging are sharing resources and tweeting about specific topics within the educational technology field using hashtags. I focused on investigating students' experiences on Twitter with an

eye toward how they might motivate informal learning.

Although this case study was limited to a small number of students, it will conceptualize a HE course's attempt to merge the formal and informal learning landscapes. This study also provides information about student perceptions and activities regarding the incorporation of social media into formal learning environments, which might help teachers and educators better understand what motivates students to continue engaging in learning, particularly within the HE context.

5. Research Methodology

5.1 Methodology Design

Cohen, Manion, and Morrison (2011) suggested that interpretive and qualitative approaches can be used to understand what happens in a given situation. "Interpretive paradigms rests, in part, [...] on an epistemology that recognized multiple realities, agentic behaviors, and the importance of understanding a situation through the eyes of participants" (ibis, p. 116). Case study research can be used to "focus on individual actors or a group of actors and to understand their perceptions of events" (Hitchcock and Hughes, 1995, p. 314, cited in Cohen *et al.*, 2011). This study will employ a case study design that relies on qualitative approaches in data collection and analysis. Denscombe (2003) categorized qualitative data collection into two approaches: one concerned with "meaning and the way people understand things" and another concerned with "patterns of behaviors and how people express them" (p. 267). This study aims to collect and analyze students' perceptions regarding their engagement with Twitter and behavioral patterns, and how these patterns are expressed. Interviews and content analysis were utilized.

The interview method was chosen to acquire in-depth information about students' backgrounds and course activities, and to understand their perceptions regarding this experience. To this end, Robson (2002, p. 310) claimed that "what people do may differ from what they say they do". Therefore, a qualitative content analysis was used to take a closer look at participants' Twitter activities to uncover what they do outside of formal learning boundaries. Thus, this analytical method was used to better understand participants' tweets based on the patterns that emerge from the interviews, not only to count tweets, but also to explain them based on context.

Findings from the interviews indicated that some students from last year's course still engage with the course's official Twitter account. I identified one such student and asked her to participate in this study. An analysis of the content of her tweets led me to investigate her motives, as well as her understanding of the experience (see Figure 1).

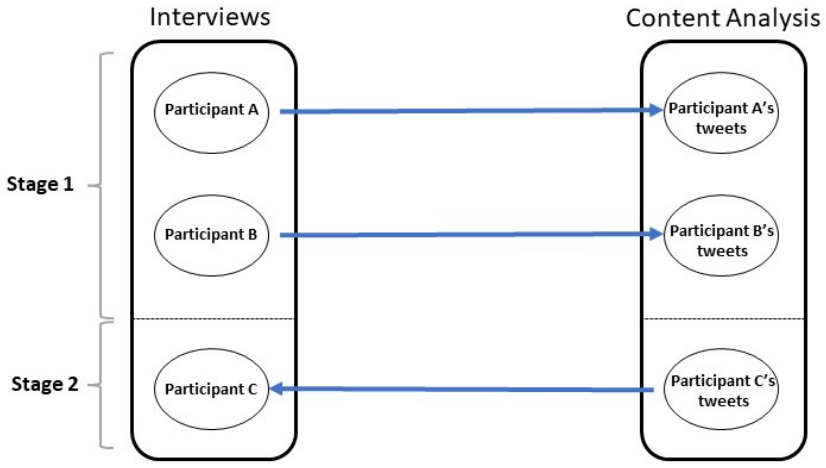

Figure 1. Methodology design

5.2 Discussion of Trustworthiness

One of the limitations of this study centers around the fact that participants were students of an educational technology course that discusses topics relating to technology use in education, which might raise concerns. For example, what students might say Twitter should be used for might not be what they truly believe or what they might actually do on Twitter. Therefore, to address these credibility issues, I designed the interviews to be semi-structured

to enable participants to tell stories, explain their feelings, and provide examples. Furthermore, I triangulated this method with an analysis of their tweets. Bell (2005) suggested that documentary evidence – in this case, tweets – can be used to supplement information obtained by other methods and to check the reliability of data gathered from questionnaires or interviews.

A question may arise regarding how this research attempts to achieve transferability. Though the case is related to context, it will provide insight into how female Saudi master's students perceive the integration of Twitter, as an open platform, in their learning. This research is oriented toward educators, teachers, and postgraduate students seeking the utilization of potential social networks in their learning practices.

5.3 Research Sample

The sampling strategy used in this study is purposive sampling. The target population is students who have taken the ET course and who have engaged with the course's Twitter account. The common number of participants in qualitative research depends on how participants provide data to cover the phenomenon (Cohen *et al*., 2011). I chose two students – after they agreed to participate in this study – who continued to engage with the course's Twitter account even after formal completion of the course. More specifically, these students tend to create tweets and "mention" the course account. They completed the course in one month. A third student completed this course a year prior. The introduction of this third participant was deemed necessary because one of the interview participants mentioned that some students from the previous year's course continued to engage with the account (see Figure 1).

At the beginning of this study, it was a challenge to establish a sample, as I did not have previous relationships with any of the participants, the teacher or with any of the college staff. When I contacted them privately via Twitter, the participants were welcoming and agreed to take part in this study. I decided to ask their initial permission from a very early stage, as the study is entirely dependent on their willingness to participate. To this end, I introduced myself as a researcher, provided a brief of the research topic and explained the nature of their participation (Cohen et al., 2011). Finally, it is worth noting that I have taken steps to protect information regarding participants' names, accounts, the course's account and the university to which the participants belong. I did not include in this research any other students' tweets regarding this course. Research methods

1- Interviews

Using in-depth interviews in a case study design is important to cover all aspects of a phenomenon (Cohen *et al*., 2011). Therefore, semi-structured interviews aimed to examine the following areas:

1. Participants' background experiences
2. Background information about the ET course
3. Participants' perceptions about ET activities and Twitter's role in those activities
    - Their experience engaging in ET activities via Twitter and the role of the teacher
    - The resources (people, sites, Twitter accounts, books, self-reflection) that students draw on to participate in ET activities via Twitter and the teacher's role in forming those resources
4. Twitter's use beyond the needs of the course activities

The participants agreed to let me record our conversations, which lasted 30–50 minutes each. The interview audiotapes were converted to transcripts, with silences and pauses included.

I followed Gibbs' (2007) procedure for analyzing interviews. He suggested four main steps for transforming texts into "thick descriptive" information: (1) description; (2) categorization; (3) analyzing codes; and (4) marking codes. Considering the goal of interviews, it should be noted that many unpredictable themes emerged. I created a table in a word processor for each participant, grouped all these categories into analytical codes, then combined the tables for all participants and reorganized them based on the analytical codes and categories. The themes of the interview analysis then became the following:

1. Course pedagogics and activities (how courses generally work, how the activities work, hashtags, and student impressions of the course)
2. Student self-evaluations and perceptions of the course (perceived changes in use, perceived benefits, perceived drawbacks, perceived improvements in skills, barriers)
3. Motivation (in-course motivation, motivation after the course)

4. Informal use of Twitter for learning (outside course time, community engagement: student to member or member to student)
5. Other codes also emerged, namely reliability of resources, teacher aims, and personal-professional environment

2- Tweet content analysis

Qualitative content analysis is defined as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh and Shannon, 2005, p. 1278). In this study, a content analysis was conducted in two stages:

- First stage: content analysis guided by the interviews: I collected tweets indicating formal participation in ET topics via hashtags. I used Twitter's advanced search tool to search for tweets matching specific criteria (participant's username tweets during the course time, and the hashtag symbol). I filtered the results for the appropriate hashtags and collected the tweets of Participants A and B in separate documents. The key theme that appears is the type of tweet:
    - Sharing media
    - Sharing articles
    - User-generated tweets
        - Reflections on course activities
        - Resource suggestions
        - Advantages or disadvantages of an issue
        - Future predictions
        - Other information (such as definitions and principles of concepts related to the topic)
- Second stage: content analysis to guide the interviews: For the second stage, it was necessary to collect data from a longer period of time to see whether the integration of Twitter into formal learning involved sustained engagement. I looked for students who had participated during the previous semester's ET course (approximately 13 months). I found several students who fit the criteria, but due to time constraints, I chose just one (Participant C). With her permission, I collected tweets in which she mentioned the ET course after her course ended. I was not only considering the content, but also whose tweets she shared, to better illustrate her social media environment. Several themes were considered:
    - Number of tweets during and after the course
    - Kind of participation (media, quote retweets, tweets, and sharing links)
    - Which sources did she use most often?
        - Twitter users
        - Blogs/websites
    - Kinds of topics
        - Tips for technology
        - Announcements of conferences
        - New mobile applications
        - Theses, dissertations, and scientific papers or libraries
        - Tool ideas to apply technology in education
        - Course announcements

Then, I arranged an in-depth interview with participant C to investigate her motivations.

6. Results and Discussion

The data were collected from three in-depth interviews and content analysis of the participants' tweets in response to the following research questions:

How do ET students perceive the integration of Twitter into the course's learning activities?

I reported findings from the interviews that form the foundation of the course's context and reviewed the nature of the integration of Twitter into course activities. Then, I explored students' perceptions about the integration of Twitter by considering four aspects – drawbacks, use of Twitter, benefits, and motivations.

6.1 Background: Participants and the ET Course

All participants were in the curriculum and instruction master's program and had varied backgrounds. Participant A was an art teacher with 14 years of experience teaching middle school. Participant B was an English teacher with one year of experience in private primary schools. Participant C was a math educator consultant for primary public schools. All participants in this case study were female due to the implementation of gender segregation in Saudi Arabia. A study by Aifan (2015), which aimed to investigate the attitudes of Saudi HE students toward social media to support their learning (n=510), found no significant difference between males and females in using social media for learning.

Participant C stated that ET's topics attracted her because they included new information on education. Participants A and B reported that ET combined theory and practice, enabling students to apply what they learned in real situations. Indeed, Carr and Kemmis (1986) argued that educational knowledge is best developed when it melds theory and practice, also known as praxis. Therefore, a teaching background helps students in activities by enhancing the potential of combining knowledge and practice.

6.2 Pedagogies and Activities of the ET Course

One of the main activities that Participants A and B reported was the division of certain curriculum topics, such as MOOCs and augmented reality, in which they worked in groups of five. They explored the concepts and applications of the topic assigned to them and sheard them in classroom and twitter through videos, infographics, and tweets in course accounts on YouTube, Instagram, blogs, or Twitter. Participant B stated the following:

> We obtained information from conferences and Twitter.… We used them all. The doctor gave us the syllabus for the curriculum and topics. She added some references, but honestly, I did not draw on them totally and depended on my own knowledge.

It appears that the teacher in this activity partially supported them with resources. This kind of learning design suggests that student ownership of the task can be linked to the concept of learner-centric ecology of resources. This design encourages students to search many resources that exist outside the formal learning spaces which might create opportunities for authentic learning that are personally meaningful and relevant to the learner (McLoughlin and Lee, 2010).

Participants A and B stated that the teacher clearly emphasized working together to enrich Arabic content in the field of educational technology, due to a lack of both up-to-date and reliable resources. Notably, the students expressed strong support for this idea.

> The teacher kept repeating that knowledge is participatory and that I keep this in my mind (Participant B).

This idea might help students to consider themselves as responsible members in larger community.

Participant A indicated that Twitter has been more active than other platforms. Students began using specific **hashtags** for the lecture topic, according to Participants A, B, and C. Tweets related to these hashtags would be viewed as curriculum-driven tweets. The content analysis found that Participants A and B created 62 and 26 tweets, respectively, and that they used a variety of different hashtags related to the course. The tweets had many different patterns. Some tweets were about the advantages and disadvantages of certain topics, such as augmented reality. Furthermore, Participant A created tweets about the future of such a technology (n = 4) (see Table 1). Interestingly, Participant A shared 24 articles on her ET topic. Participant B stated that her critical thinking was enhanced by searching for articles and determining which were appropriate. This idea was supported by Ricoy and Feliz's (2016) argument that Twitter helps students improve their critical judgment and information selection skills.

Table 1. Participation in ET formal activities during the course – Participants A and B (content analysis: Stage one)

Content analysis of the tweets created by Participants A and B for the ET formal activities during the course								
Participant	1- Sharing media	2-Sharing article	3- user-generated tweets					Total
			Reflections on course activities	*Resource suggestions*	*Advantages or disadvantages of an issue*	*Future prediction*	*Other information for the concepts around the topic)*	
A	5 (3 flowcharts 2 YouTube)	24	2	2 (book and website)	9	4	17	62
B	2 (summary of a report – video)	8	-	1 (author website)	6	-	9	26

The analysis of Participant A and B's tweets in the course hashtags revealed a lack of interaction between the students (i.e. discussions or comments on each other's ideas). This may have been because they viewed this use of Twitter as a formal environment. For example, Participant A mentioned that her tweets sometimes were retweeted by university lecturers who are experts in educational technology. Thus, the seriousness of the environment could have led students to feel less comfortable.

The results in this section help explain the integration of Twitter into ET learning activities. McLoughlin and Lee (2008) argued that integrating Web 2.0 into teaching and learning activities requires new pedagogies that respond to the main concept of Web 2.0, which is to change users into producers and consumers simultaneously, and, thus, have them play active roles in different communities. Self-regulation and engagement in an open space to create ideas and concepts have become embedded in ET learning activities. Thus, pedagogies often used in ET activities tend to be more responsive to the nature of Twitter as a learning environment.

6.3 Perceptions about the Integration of Twitter

The implementation of the mentioned pedagogies and technologies will be examined from the students' perspectives, as well as the main themes that emerged from the data analysis on their use of Twitter and perceived drawbacks, benefits, and motivations. The results were drawn primarily from in-depth interviews.

6.3.1 Participants' Use of Twitter

Participants A, B, and C mentioned that they each had a Twitter account prior to taking the course, but Participant A viewed herself as more active after the course, as she used it **regularly for educational purposes**. Participant B previously used Twitter for private tweets with friends. After the course, she stated that she also wanted to be informed about topics within her major.

Participant C, who was chosen for her engagement with the course's account for more than 13 months, felt that Twitter **lacked privacy**; thus, she stated that she uses other social networks for personal use, and Twitter mainly as a learning environment. Furthermore, Participant B believed that Twitter should be used for **academic purposes and isolated from personal spaces**. She used the term "distract" to describe how, as a teacher using Twitter for learning and teaching, she should not distract students with her personal business. Concerns regarding boundaries between personal and academic uses emerged in the students' responses. Almankory (2019) also found privacy and security to be a concern among Saudi students regarding the use of social media for learning.

6.3.2 Drawbacks

A Lack of information literacy skills emerged in Participant B's answers. She mentioned that skills for searching and locating reliable information are needed. All participants reported that the teacher emphasized the issue of **reliability of resources**. According to Participant B, the teacher did not retweet all tweets, but, rather, only those with reliable resources,. Another issue associated with information literacy, as reported by Participant B, was that, with the use of Twitter for learning in an educational setting, some students were **not aware of intellectual property laws** when sharing or tweeting. This problem can often occur considering the fast and easy nature of Twitter communication.

Most of the difficulties that were mentioned relate to this course's activities. The barriers associated with finding resources were an expected challenge of the pedagogy for Web 2.0, according to McLoughlin and Lee (2008). They argued that new pedagogies, which draw on the learner's abilities to locate and share information by placing themselves at the centre of learning, must equip learners with needed skills. One such skill is information literacy, which is viewed as an individual's ability to "seek, evaluate, use, and create information effectively to achieve their personal, social, occupational, and educational goals" (Alexandria Proclamation 2005, cited by Catts and Lau, 2008, p. 5).

6.3.3 Benefits

Deep learning was reported by participant B, which she linked to her use of hashtags. For example, she felt that writing in her own words and summarizing helped her keep the information in her mind more thoroughly than she would have if she only searched for and shared resources. The content analysis in Table 1 supports this claim; she created more tweets than she shared. Participant C acknowledged the benefit of **openness** and felt that learning in a course should not be limited to students being in a closed classroom.

Participant B emphasized **skills development**, specifically noting the development of her communication skills related to the academic field. She also noted her increased self-confidence, which enabled her to use Twitter freely in her future teaching. Yakin and Tinmaz's (2013) study also noted that self-confidence increased when they investigated student perceptions throughout the course's three phases.

6.3.4 Motivation

Regarding the motivation to participate in topic hashtags, all students reported that 10% of their total **grades** for the ET course included participation in hashtags at the end of each class session. When students were asked whether they would participate in learning activities on Twitter at the beginning of the course, if it was not grade-dependent, Participants A and B were both unsure. Participant A admitted how little she had known about Twitter and its affordances prior to the course. Nevertheless, both participants acknowledged that this kind of motivation led them to appreciate this environment and encouraged them to continue using Twitter for other academic interests and areas of study.

Another motivation factor that appeared was a **retweet** from the ET account (managed by the teacher), which all participants mentioned. It was appropriate that, as Participant B explained, the teacher monitored and implemented retweets. Participant B also stated the following: "There was affectional support ... emotionally, which made me strive for excellence. I did not expect this [retweet] to have such a significant effect on me."

Thus, this information indicates that students may have underestimated Twitter's benefits. They might have felt overloaded with requirements for this and other courses; however, this compulsory task gave them a new experience. During the course, using hashtags in the teacher's presence might be important to them. Junco et al.'s (2013) study indicated that a teacher's presence plays a vital role in student engagement on Twitter, as it motivates students to familiarize themselves with a new environment. They stated that if the environment met the students' expectations, students could create a network of resources (educators, friends, etc.) after the course. This then would continue to be a motivational factor and be either intrinsic or driven by the community in which they were involved.

Does the integration of Twitter into ET's learning activities motivate students to use Twitter for lifelong informal learning? Why?

In response to the second research question, the researcher analyzed the use of hashtags and course accounts after the course formally ended, as the participants cited their reasons for continued engagement in interviews.

6.4 Practices and Motivations beyond the ET Course

The nature of students' participation beyond the course (guided by content analysis of the three participants' tweets) and their motivations for continued engagement with the ET Twitter account (guided by interviews) were investigated.

Content analysis Stage one found that participants A and B mentioned the ET account within two months after the formal end of the ET course. The results reveal that Participant A tweeted twice to share news about new digital technologies. However, Participant B shared six articles and one video (totaling seven tweets). The tweets' content related to topics discussed throughout the course. All tweets being related to the ET course suggested that students were attracted to these topics even after the course ended (see Table 1)

Participant C participated for an additional 13 months after the course. The results from content analysis Stage two uncovered the fact that participant C's tweets mentioned the ET account 104 times over the previous 13 months,

compared with her 78 tweets during the five-month course (see Table 2). The nature of her tweets focused on sharing links, media, or retweets from others. It is also interesting to see a pattern in the resources that she shared. For example, she quoted different tweets from the same educator seven times. She also shared 15 articles written by specialists in the educational technology field, indicating that she consistently accessed these resources and found them relevant and interesting enough to share with the ET course account.

The content analysis indicated the topics she discussed most frequently, such as conferences and online course announcements (11 total tweets). This indicated her interest in informal knowledge development. Furthermore, concerning subjects such as technology tips. This suggests an interest in informal lifelong learning to cope with a rapidly changing world (Sharples, 2000).

Table 2. Content analysis Stage 2: tweets by Participant C

Content analysis Stage 2 – Participant C		
Number of tweets during and after the course		- During (5 months): 78 - After (13 months): 104
Tweets after the course	Participation types	- Media: 16 - Quote retweets: 40 - Tweets: 1 - Shared links: 47
	Which source did she most often reference?	Twitter users: - Professors and authors: 4 - Educators: 7 - Other educators: 5 Blogs/websites: - Website-produced articles about educational technology by different authors: 15 - Blogs for educators: 5
	Topics	- Technology tips: 15 - Conference announcements: 8 - New mobile applications: 7 - Theses, dissertations, and scientific papers or libraries: 10 - Tools and ideas about the application of technology in education: 11 - Course announcements: 3

The **interview findings** indicated that students were motivated to engage beyond the formal course as a method of informal learning, and their reasons were revealed during the interviews. For instance, Participants A and B believed that the **teacher** provides the initial motivation to participate, as the teacher "gave us a push and introduced us to many things" (Participant A).

Specific interest was garnered around the second motivational factor that the participants mentioned. That is, all of them shared materials that they found interesting. Exploring these topics became driven by **personal interest,** rather than the desire to participate with the hashtags because they were topics of the curriculum. More specifically, Participant C mentioned in her interview that she liked to be informed about technology in general, and that she also liked to **disseminate knowledge** by sharing resources; indeed, she is **followed by many experts** in the course field.

In this situation, learners can create links to new resources in the online environment. This process can be explained by the principles of connectivism, which state that learning is a process of connecting specialized nodes or information sources (Siemens, 2005). The potential for integration can appear here, as some learners may begin to expand their formal learning landscape to an informal learning landscape.

The relationships between formal and informal learning are suggested by Lai, Khaddage, and Knezek (2013). Essentially, formal learning can motivate individuals to continue learning through informal means. Although Reed (2013) argues that the compulsory use of social networking would result in short-term participation, this case (at least in this context) demonstrated that students utilized Twitter's educational potential well after the course concluded. Accordingly, empowering students and preparing them for lifelong learning can be done by supporting them through such pedagogies (e.g., McLoughlin and Lee, 2010).

Another motivation factor appeared was **Community engagement**. The course introduced students to the learning communities of the course area, which is the educational technology field. Two patterns emerged after analyzing the interviews: (1) members in the learning communities interacted with these students, and (2) these students interacted with members in the learning communities. In the former scenario, all participants reported that when they started engaging with hashtags for formal activities, educators and students outside of their formal learning landscape followed them. For example, participant A described how she became a resource for someone else: a university lecturer retweeted her, and many masters' educational technology students did as well. It is worth noting that her tone in the interview implied that she was simultaneously proud and surprised by these interactions. For the second pattern, participant C perceived the potential of being able to access large learning communities. She stated that she easily conversed an issue that needed to be clarified with a book author in the educational technology field.

Hall (2009) describes Web 2.0's potential, noting that this phenomenon expands learners' formal learning into more informal spaces, as students can define critically "with whom to share their personal approaches and how they can best connect the informal learning that occurs across their life to their formal, academic work" (p. 29). Reflecting on Participant C's case, she chose members from a broader learning community who were best able to solve a real-world problem. This is an indication of lifelong learning. As Kob and Hill (2008) describe them, lifelong learners are people who "can move from a learning environment controlled by the tutor and the institution, to an environment where they direct their own learning, find their own information, and create knowledge by engaging in networks away from the formal setting" (p. 9).

7. Limitations and Challenges

One of the limitations of this study focused on understanding student perceptions regarding the integration of students who were active on Twitter. I think there is a need to consider whether or not students who are not active can see the big picture more clearly. Another challenge dealt with conducting interviews and keep participants focused on only the learner's experience in this context.

8. Conclusion and Recommendations

In response to 21st century requirements, HE plays a vital role in empowering students to be lifelong learners. Shifts in pedagogies have been suggested to respond to the requirements for this new age – pedagogies that support the blend of formal and informal learning to help students use their resources to shape formal learning to be meaningful to them, and simultaneously expand their formal learning landscape to broader contexts. Thus, during the ET course, participants created an ecology of resources that they felt helped them make a connection to the learning community. Thus, after the course, students still could engage with the community because members of the community provided them with support, either motivational (the teacher in this case) or beneficial for real life, or by the feeling of responsibility to the role they play in this community.

In this case study, the results from the ET course context indicate the dynamic between pedagogy and students' formal and informal learning. Participants were given a topic in educational technology and searched for information while remaining dependent on themselves to provide the resources needed. According to connectivism principles, learning happens as a process during which the learner creates their own path for a new resource. However, students reported challenges in finding and accessing information. Therefore, pedagogies that draw on self-regulation need to support students with new skills (McLoughlin and Lee, 2008). One suggested solution is to introduce information literacy education, especially for master's degree students.

The main result from students' perceptions about Twitter use for the ET course indicates that some students preferred to keep their personal and academic environments separate. This suggests that teachers should be aware of the context regarding the use of such a Web 2.0 tool .

Furthermore, the emphasis from the students in this study on the teacher's role cannot be ignored. Students reported that teachers still had an impact on their learning, even after the course. Moreover, all the tweets they shared about the educational technology field, they mentioned their teacher, who also retweeted them. Thus, I would conclude that if we want lifelong learners, we need lifelong teachers who play as active members in the learning community.

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