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Acceptance-Promoting Practice Framework for Online Collaborative Learning and EdTech in Formal Education: a Thematic Analysis of Literature

Completed research paper

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Abstract

This exploratory quantitative study seeks to identify (a) the e-learning practices that can improve the acceptance of online collaborative learning (OCL) and the associated EdTech in formal learning contexts and (b) the characteristics or features of such EdTech. A systematic review was conducted combined with a thematic analysis of literature (i.e., 42 journal articles relevant to OCL that was published from 2001 to 2020 from Scopus database), the findings of which not only attained all research objectives with the proposed the acceptance-promoting practice framework for OCL and EdTech (APPFOE) in formal education (see Figure 7), but also identified the challenges that OCL learners generally confront. The proposed APPFOE reveals a number of practices in three main themes (viz., teacher presence, OCL EdTech, and learners' control over learning) that can handle those challenges and promote the acceptance of OCL and the associated EdTech in light of the extended unified theory of acceptance and use of technology model. The implications for positive social change include the potential to guide educators in their class interactions, aid policymakers with their alignment of resources, assist EdTech professionals and entrepreneurs in their product development, and contribute to the growing body of academic knowledge in some respects, hence lay out the basis for some future research.

Keywords online collaborative learning, collaborativism, EdTech, OCL practices, UTAUT2, thematic analysis of literature, exploratory quantitative research, promote acceptance of OCL and Edtech

1 Introduction

The historical development of e-learning and ICT is linked to each other; however, it appears that meaningful e-learning sessions do not merely put another layer of technology to the traditional educational practices. Doing so would likely cause misalignments between the pedagogies and the technological tools, yet it is quite common. For instance, many educators did not consider the novel digital environment in their pedagogies, while software programmers were generally not equipped with pedagogical frameworks (Harasim 2017). Similarly, research and practices on e-learning largely laid stress on technology applications without being sufficiently attentive to appropriate pedagogical frameworks (Wang 2018). Electrification of education, or merely adding a layer of technology onto the traditional pedagogy, succeeded in achieving quantity measures (viz., scale and speed) but failed in quality measures. Besides the electrification, almost all learning and teaching activities stay the same as decades ago (Harasim 2017). Technologies do not define the success of the digital conversion of education, but how they increase students' engagement, deepen their understanding, and enhance the learning (McKnight et al. 2016), so such electrification would be a serious problem (Rovai 2004).

Responding to the call for a transformation of pedagogy, collaborativism, otherwise known as online collaborative learning (OCL) theory, has been researched and developed since the 1980s (Harasim 2017). OCL considers the growing ICT and educational practices from the outset. Various prior research is consistent in showing that OCL can help with efficacious knowledge acquisition. Cases in point include positive effects on learners' perception (Havard et al. 2008), higher learning achievement (Young 2008), deep and meaningful learning (Garrison and Cleveland-Innes 2005).

However, facilitating acceptance of e-learning systems such as active engagement is a challenge (Allione and Stein 2016; Eriksson et al. 2017). To make matters worse, little attention was paid to promote the acceptance of e-learning, or rather OCL. The overall picture of OCL and EdTech practices are relatively fragmented, lacking a coalesced archetype. Thus, this research aims to fill in this gap with the following **research questions: (a)** What are the e-learning practices that can improve the acceptance of OCL and the associated EdTech in formal learning contexts? **(b)** What are the characteristics or features of such EdTech? To that end, an exploratory qualitative study was conducted, comprising a systematic review combined with a thematic analysis of literature (i.e., published journal articles from Scopus database, in the period of 2001–2020) on OCL and EdTech practices. The four successive sections discuss the literature review, methodology, findings and discussions, and conclusions which lays out the implications, future research recommendations, and research limitations.

2 Literature Review

2.1 User Acceptance and Adoption of Technology Frameworks

Numerous frameworks and models were constructed to understand human intentions and behaviors toward the acceptance and adoption of new technologies. Among them, the unified theory of acceptance and use of technology (UTAUT) is considered one of the most popular frameworks in the field of Information Management that focus on technologies (Taherdoost 2018).

UTAUT integrates the factors across other models and comprises four main constructs, namely, (a) Performance Expectancy, (b) Effort Expectancy, (c) Social Influence, (d) Facilitating Conditions (Venkatesh et al. 2003). UTAUT model is a reliable and valid instrument for practitioners to produce highly robust results in different markets and conditions (Myung Soo Kang et al. 2017). From a theoretical perspective, UTAUT provides a more refined, comprehensive view of the dynamic nature of individual perceptions (Venkatesh et al. 2003). For the e-learning area specifically, UTAUT model is highly relevant in investigating the acceptance and adoption of various EdTechs, as illustrated in the work of Isaias et al. (2017). Nearly a decade later, Venkatesh et al. (2012) extended the model to accommodate the consumer use contexts (vs. the organizational contexts in the original model) in the new proposed UTAUT2. Building on the past extensions, UTAUT2 adopts three additional constructs. The resultant seven constructs are as follows: (a) Performance Expectancy: the degree to which using a technology will provide benefits to consumers in performing certain activities, (b) Effort Expectancy: the degree of ease associated with consumers' use of technology, (c) Social Influence: the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology, (d) Facilitating Conditions: the consumers' perceptions of the resources and support available to perform a behavior, (e) Hedonic Motivation: the fun or pleasure derived from using a technology, (f) Price Value: consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them, and (g) Habit: the extent to which an individual believes the behavior to be automatic.

UTAUT2 outperforms the original UTAUT model in the variance explained in behavioral intention and technology use (Venkatesh et al. 2012), and thus far, is deemed to be the most comprehensive model in interpreting individual adoption and use of technologies (Tamilmani et al. 2020). Due to its robustness, relevance, and comprehensiveness, UTAUT2 is applied in this research as the theoretical framework for interpreting the data and developing a conceptual framework.

2.2 Online Collaborative Learning (OCL) Theory

OCL, also known as Collaborativism, was initiated in the early 1980s. It has been researched and advanced for over three decades based on massive data as a learning theory and pedagogy. OCL builds on the constructivist learning theory by focusing on the knowledge construction process; hence, they both share the same constructivism epistemological perspective about what is considered legitimate knowledge (Harasim 2017; Picciano 2017). That is, learning is a dynamic knowledge-building process instead of a static information-transmission process as in didactic pedagogies. Pedagogies and assessments lay stress on critically thinking, analyzing, evaluating, and determining the best answer at a given point of time in lieu of transmitting, memorizing, identifying, and recalling the “correct answers. On the other hand, OCL theory differs from constructivist learning theory in (a) emphasizing active learning in the process of social and conceptual development based on knowledge discourse and (b) considering online communication technologies and educational practices in various contexts. Teaching is to guide learners to induct knowledge through three progressive stages of OCL: (a) Idea Generating (IG): comprises divergent thinking among the learners in groups, such as brainstorming and sharing ideas regarding a problem; (b) Idea Organizing (IO): refers to the stage when learners start to evaluate all the positions and learn by collaboratively applying the concepts to solve a knowledge problem instead of rote; and (c) Intellectual Convergence (IC): demonstrated by shared understanding and mutual construction of a knowledge product or solution in forms of a coproduced final product. Consequently, the role of teachers is not replaced but enhanced by online technologies (Harasim 2017).

The OCL environments proposed by Harasim (2017) have five essential attributes:

- The environment is place-independent. This factor contributes to the diversity of cultures and ideas of the course, despite the necessity for learners to be sensitized to cultural gaps.
- Discourse is typically time-independent or asynchronous. Asynchronous communication allows 24/7 access across different time zones and ample time that the learners need to read, think, research, and compose well-thought-out responses (Havard et al. 2008); hence, asynchronous mode is appropriate for meaningful learning (Garrison and Cleveland-Innes 2005). Nevertheless, the lack of face-to-face interaction and the delay factor in asynchronous communication may impact the students’ learning negatively (Vonderwell and Turner 2005).
- Many-to-many discourse is encouraged for increased diversity of ideas. The substantive value of discourse lies in sharing and subjecting ideas to critics (Scardamalia and Bereiter 2014).
- OCL discourse is primarily text-based. Written texts allow space for analytical deliberation and thinking examination (Harasim 2017). Thus, text-based communication is well adapted to deep learning (Garrison and Cleveland-Innes 2005).
- OLC environments are Internet-mediated discourse that provides a large pool of information, resources, rich digital media, and hyperlinks.

OCL has faced several challenges in its implementations. A huge stumbling block is that many teachers and educational facilities still resist the educational transformation and adoption of online learning, let alone the lack of public understanding of online education (Harasim 2017). Another drawback is that OCL relies exceedingly on the facilitation of a teacher; hence, scaling up the teaching activities is hard. Rather, collaborativism befits small-size online learning environments (Picciano 2017).

3 Methodology

This exploratory qualitative research was primarily based on a systematic review combined with thematic analysis of literature, not only to position the research in extant publications but also to identify received ideas and practices. A deductive and inductive approach was applied in sequence, as demonstrated in the work of Azungah (2018). The study first embarked on a deductive process by using UTAUT2 and OCL theoretical frameworks as guides for data collection and data analysis. Data were then analyzed as being collected, and the inductively developed insights guided subsequent data collection and analysis (Saunders et al. 2015). Overall, this qualitative research used theoretical frameworks as guides to develop a conceptual framework a posteriori (Imenda 2014). Collectively, the study followed the pragmatism research philosophy because it focuses on contributing a practical body of knowledge to the OCL and EdTech practices. The study was based on the five-stage systematic review combined

with thematic analysis of literature due to the need for evidence and an overall picture of OCL and EdTech practices (Saunders et al. 2015).

Data Collection: The search used initial keywords were derived from OCL, which include several combinations of “online collaborative learning,” “strategies and practices,” “educational tools and technologies.” Afterward, CRAAP test (Blakeslee 2004) was used to evaluate journal articles as follows:

- *Currency:* seminal, up-to-date articles, from 2001 to 2020 inclusively
- *Relevance:* relevant to OCL and EdTech practices in formal contexts; relevant to acceptance of EdTech; high practicality and practicability; intended for educators, e-learning academics
- *Authority:* peer-reviewed scholarly articles as an assurance of the credibility of the author, from active and qualified journal titles only in Copus and their reference, in English language only
- *Accuracy:* unbiased articles that consider counter-arguments, demonstrate clear evidence
- *Purpose:* articles with clear intention of informing the knowledge gap

The data collection process for a specific search term ceased when three articles in sequence passed the CRAAP test but provided no additional crucial insights, which suggests a theoretical saturation point. The search process retrieved 123 journal articles, 42 of which were suitable for the coding process.

Data Analysis: Thematic analysis was deployed to the pool of collected journal articles to explore and identify themes for the research question. This study followed the six phases of thematic analysis (Braun and Clarke 2006, 2013; Nowell et al. 2017). Atlas.ti, a qualitative data analysis software, was used to aid the efficiency of the coding process (Braun and Clarke 2013). Yet Atlas.ti is merely a facilitating tool.

The data was perused at least once before coding. Any interesting pieces of data were attached to one or several codes. Afterward, codes were reviewed, rephrased, modified, merged, and split to avoid redundancy in those codes. These coded data extracts were then grouped into themes, which can be derived either inductively from raw data or deductively from existing frameworks. Each data extracts were under constant comparison with the others and the existing themes to ensure consistency. A visual thematic map, a feature of Atlas.ti, was utilized to aid this process. Codes and themes were revised and interpreted accordingly in relation to the overall picture of the research questions. The final resultant themes impart the twofold findings as discussed in the next section.

4 Findings and Discussions

The thematic analysis of the 42 journal articles revealed twofold findings: (a) the challenges confronting learners and teams in OCL formal contexts and (b) the practices that not only help respond to those challenges, but also encourage people to participate and capitalize on OCL activities.

4.1 Challenges for OCL Activities in Formal Educational Contexts

4.1.1 For Individual Learners

Attitudes Toward Learning: Students may lack self-direction, which results in reluctant participation in OCL activities and half-hearted attempts to complete assignments (Said et al. 2014). They also tend to suffer from social comparison and become excessively worried about others’ opinions as well as their relationships with others. For instance, “loss of face” is a common source of depression among students (Jung et al. 2012). The OCL is derived from constructivism, so the effectiveness of OCL activities depends largely on the extent to which learners display the initiative to learn.

Unfamiliarity With Basic ICT Skills: Students may struggle if they are relatively new to OCL environments. Ignorance of collaborative tools and their capabilities (Pilkington and Sanders 2014) as well as students’ discomfort with ICT (Emerson and Gerlak 2016) contribute to unsuccessful implementations of OCL. Students may even display disinclination to embrace new, more suitable tools and revert to the accustomed internet technologies (Curtis and Lawson 2001). The unfamiliarity with the ICT tools negatively affects the Effort Expectancy in UTAUT2, and may cause students’ rejections.

Diverse Backgrounds: Macdonald (2003) and Said et al. (2014) found that there is variation among the students in terms of how accomplished they are at conducting an OCL discourse. Kumi-Yeboah (2018) also agrees that a large proportion of students do not equally capitalize on OCL discourse. This variation might be because students are diverse in terms of their prior knowledge, experience, background, and learning capabilities such as language barriers (Kumi-Yeboah 2018) and writing skills (Wang 2007). Differences in learning preference can account for the variation too. Some students may focus on learning rather than socializing, whereas other students may prefer to see the reactions of others before posting (Du et al. 2015). Consequently, some students may believe OCL seems to be unfit or that they are not ready for OCL because of their higher perceived Effort Expectancy.

4.1.2 For Teams

Ignorance of Online Communication and Negotiation Skills: Students may feel unfamiliar and uncomfortable with online collaborative work. Collaboration in online settings can be arduous work that requires a high level of commitment in planning, preparation, and execution (Robinson et al. 2017). This situation is compounded by the fact that they barely know each other, yet have to nurture positive relationships for cohesive team dynamics. The lack of acquaintance with other team members often spawn delays, conflicts (Curtis and Lawson 2001; Havard et al. 2008), and stumbling blocks to reach consensus (Wang 2007). Furthermore, individuals who are inefficient in online communication skills can encounter frustration and spend excessive time to work collaboratively. These difficulties are due to the absence of nonverbal communication cues (Kumi-Yeboah 2018) and immediate social presence associated with asynchronous discussion (Capdeferro and Romero 2012). Team members may not be conscious of relationship-building skills and negotiation etiquette, such as amiability, openness, and respect for others, which cannot be assumed (Wang 2007). For example, a dominant member's presence may hinder argument contributions and impede shared understanding (Capdeferro and Romero 2012; Weinberger et al. 2010). Generally, the ignorance of online communication and negotiation skills negatively impacts the students' perception of Effort Expectancy within UTAUT2 and hampers three constituent processes of OCL discourse.

Commitment Imbalance: There are enormous disparities in the commitment and effort that team members contribute to the collaborative work (Kumi-Yeboah 2018; Macdonald 2003). Such nonparticipation, suboptimal distribution of complementary roles often cause delays and conflicts (Capdeferro and Romero 2012; Pilkington and Sanders 2014; Wang 2007; Weinberger et al. 2010). Ostensibly, commitment imbalance among team members obstructs the production of collaborative work and decreases Hedonic Motivation as well as Performance Expectancy within UTAUT2.

These findings have extended the understanding of the common difficulties during implementations of OCL, in addition to those from the educators' perspective (i.e., the resistance from teachers and educational institutes; Harasim 2017) and those from the operational perspective (i.e., the scalability challenge of OCL e-learning model; Picciano 2017). Next, a conceptual framework is proposed to remedy against those challenges and promote the acceptance of OCL in formal educational settings.

4.2 The Acceptance-Promoting Practice Framework for OCL and EdTech in Formal Education (APPFOE)

Based on the emergent themes theoretically saturated, the author proposes the APPFOE (see Figure 1), which could be an appropriate answer to both research questions.

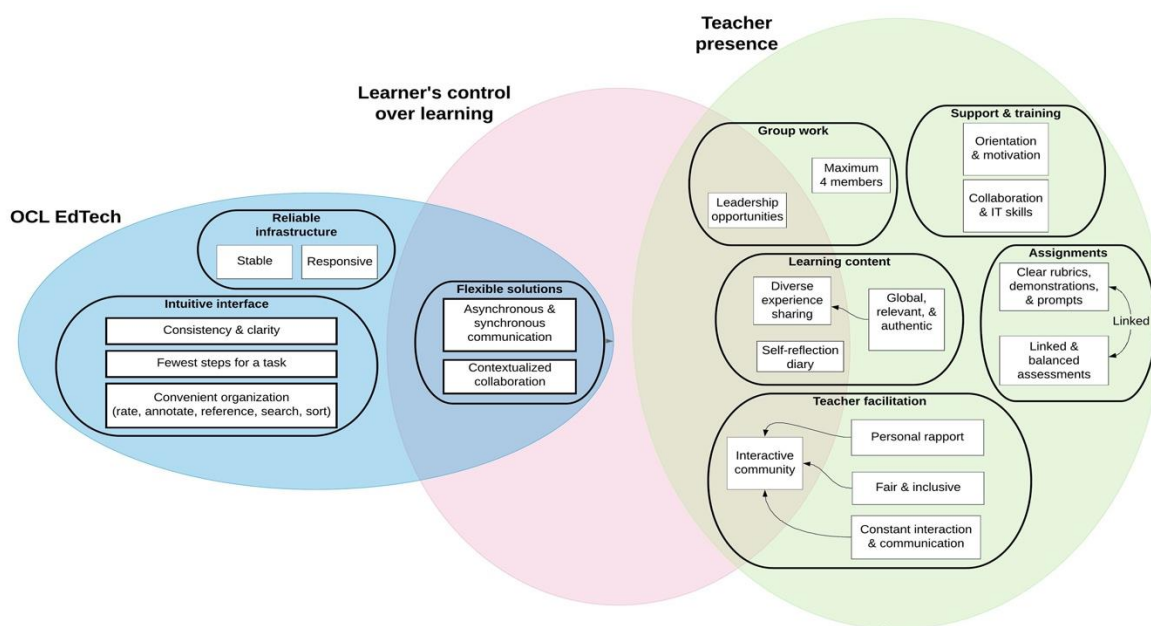


Figure 1: The Acceptance-Promoting Practice Framework for OCL and EdTech in Formal Education (APPFOE)

4.2.1 Teacher Presence

Group Work – Four Members Maximum

Teachers should structure OCL groups to avoid any excess of four members for the purpose of task engagement and meaningful contributions (Kumi-Yeboah 2018; Wang 2007). As such, it would be easier to follow the conversation threads (Wang 2007), and hence promote collaboration and discourse (Lock 2015; Tu and Corry 2003). Limiting the group size to four also helps nurture group cohesion and a sense of belonging. Small groups are of the essence to encourage students' sense of an online learning community for prolonged meaningful interaction (Shen et al. 2006; Xie et al. 2019), because students could feel increased confidence and recognition in online discourses (Kumi-Yeboah et al. 2017).

Students would feel more comfortable in group work and less worried about others' opinions; and thus, their attitudes toward learning and sense of belonging could be enhanced. The resultant increased meaningful contributions such as sharing different experience could help bridge the gap of diverse backgrounds that exists. In addition, it would be more straightforward to distribute the roles in small groups and thus reduce the likelihood of commitment imbalance. Overall, the practice of limiting group size to four members could both encourage OCL discourse and improve the students' perceived Effort Expectancy and Hedonic Motivation in light of UTAUT2.

Group Work – Leadership Opportunities

Teachers can seize the initiative to support students assuming leadership roles through various means, such as volunteering, appointment, and rotation. Group work is a great opportunity for students to be the group facilitator of their learning paths (Kumi-Yeboah 2018; Unuakhalu and Kumar 2008) and boost their learning performance. Students assuming leadership tend to be diligent in their participation, strive harder to contribute meaningfully, and engage in deep learning (Du et al. 2015; Garrison and Cleveland-Innes 2005). Accordingly, they gradually build up self-confidence (Du et al. 2015). A reason behind the students' disposition toward the assumption of leadership might be the ability to exert the control over learning. Being a leader helps students control the group decision-making process for their learning needs, self-regulation, and behavioral engagement (Du et al. 2015; Kumi-Yeboah et al. 2017; Xie et al. 2019).

Such a tendency toward improved self-confidence and diligence would adjust the students' attitudes toward learning. Leadership rotation is also a great tool to sharpen communication and negotiation skills, and fight against commitment imbalance. Finally, the sense of control from the leadership opportunities would help students to be actively engaged and feel more gratified with the group tasks. Ostensibly, supporting leadership could be a practice in line with the Hedonic Motivation and Performance Expectancy in UTAUT2.

Support and Training – Orientation and Motivation

Teachers must ensure proper orientation to assist students concerning materials, online settings, technologies, communications skills, and so on, for higher chances of OCL success (Sulisworo 2012). For each EdTech tool and OCL activity, its purposes, characteristics, challenges, and possibilities must be clearly communicated (Valtonen et al. 2009; Wang 2007). It is essential to provide students with the details of the learning model, including objectives and requirements (Capdeferro and Romero 2012; Lock 2015) with several repeats in other sessions (Appavoo et al. 2019) so that they can adapt their expectations regarding responsibility and commitment involved with OCL. Consequently, students could develop a positive perception and intrinsic motivation for OCL activities (Xie and Ke 2011).

With the adjusted expectations, the students could adjust their attitude toward learning accordingly and be conscious of important online communication and negotiation skills. The groups could thus experience less commitment imbalance. Such conditions are paramount for OCL group work and discourse. Because of positive perceptions and high intrinsic motivation, the practice is seemingly linked to Performance Expectancy, Facilitating Conditions, and Hedonic Motivation in UTAUT2.

Support and Training – Collaboration and ICT skills

The awareness of collaboration and ICT skills cannot be assumed (Wang 2007), so teachers should devote resources to train their students relevant skills, such as guidelines for effective participation, interaction standards, open-mindedness, conflict resolving strategies, and so on (Brindley et al. 2009; Yeh 2010). Teachers could also facilitate the teams to devise their learning contract regarding collaboration such as rules and schedules for consensus reaching (Curtis and Lawson 2001; Yeh 2010). Not only collaboration skills but also e-readiness—that is, the ability to use the technology—should be facilitated. Students must develop their technology competencies and understand the possibilities of

various software functions to use them effectively (Curtis and Lawson 2001; Geng 2011). Teachers could challenge them to make rational choices based on the needs for specific tasks (Havard et al. 2008; Wang 2007). Such learning predisposition is of paramount importance for students to make the most of their OCL experience. Students would be more self-confident, intrinsically motivated, and perceive higher self-efficacy when learning online (Du et al. 2015; Valtonen et al. 2009). Their social and cognitive presence would be strengthened via such teachers' organizational, emotional, and educational support (Hernández-Sellés et al. 2019). Ergo, their teamwork satisfaction would be augmented (Ku et al. 2013).

This practice would help students narrow the gap of their diverse backgrounds and handle the unfamiliarity with ICT and collaboration issues. The devised learning contract could also assist students to adjust their learning attitudes and thus diminish commitment imbalance problems. As such, this practice is accorded with Facilitating Conditions and Hedonic Motivation in UTAUT2.

Learning Content – Promote Diverse Experience Sharing via Global Content

Teachers are encouraged to stimulate global, relevant, and authentic learning content, including real-world problems (Robinson et al. 2017 2018), cultural inclusion (Kumi-Yeboah et al. 2017), personal and professional interests and experience (Emerson and Gerlak 2016; Robinson et al. 2017), or even content contributed by invited specialist guests (Tu and Corry 2003). Such content, combined with heterogeneous groups (Du et al. 2015; Jung et al. 2012) and appropriately complex tasks that require diverse resources from each member (Weinberger et al. 2010), would significantly stimulate the motivation for OCL (Brindley et al. 2009) and promote interaction and experience sharing (Lock 2015).

Clearly, when students are willing to interact and exchange ideas, they would capitalize on OCL activities for augmented knowledge construction, team performance, and final product quality (Zhu 2012). Owing to the opportunities to coalesce personal experience, the students would be more intrinsically motivated for social presence (Nam 2017); thus, their sense of belonging and perceived learning would heighten (Shen et al. 2008). They would become more open toward discussion, benefiting from others' diverse experience, and hence could narrow the gap of diverse backgrounds. Overall, this practice might agree with Hedonic Motivation and Performance Expectancy in UTAUT2.

Learning Content – Self-reflection Diary

Teachers could initiate the self-reflection habit in students via journal writing, learning portfolio, digital storytelling, to name a few (Jung et al. 2012; Nam 2017; Yeh 2010). In addition to the learning experience, students can reflect on their leadership journey in various OCL activities (Xie et al. 2019). Such self-reflection activities could help predict and encourage higher order levels of thinking and knowledge construction, such as critical thinking and problem-solving (Xie and Ke 2011).

This practice might be helpful in adjusting the students' learning attitudes and awareness of their commitment and collaboration competence. Furthermore, students would have the complete control over this activity. The practice might be aligned mostly with Hedonic Motivation in UTAUT2.

Assignments – Clear Rubrics, Demonstrations, and Prompts

It is paramount that teachers impart straightforward instructions together with examples or demonstrations in a structured fashion. Virtually any teachers' expectations should be clearly conveyed via explicit rubrics (Wang 2007). The rubrics must be detailed and consistent in many places (Emerson and Gerlak 2016), well-structured (Ku et al. 2013), and should avoid jargon or colloquialisms (Jung et al. 2012). Accompanying the rubrics, examples or models by the teachers should be demonstrated at least once (Xie and Ke 2011), even for simple tasks such as self-introduction (Curtis and Lawson 2001), otherwise some students could be too petrified to know what to do (Robinson et al. 2017). Moreover, instructors need to provide prompts to scaffold the learning process. Prompting students to elaborate on various parts of their arguments (e.g., claims, data, evidence) is a great practice to help them conquer some possible barriers such as writers' block, hence stimulating social interaction (Curtis and Lawson 2001) and specific interaction patterns (Weinberger et al. 2010). This practice is believed to promote higher order thinking levels, argumentative knowledge acquisition (Sun et al. 2018; Weinberger et al. 2010), improve students' awareness of their behavioral engagement (Lock 2015), and induce meaningful contributions, which are crucial for well-functioning online learning communities (Yeh 2010).

Scaffolding via prompts and models is consistent with the constructivism epistemology of OCL. Thorough understanding of teachers' expectations and clear guides during execution help students be confident to contribute to their best. As such, the practice might be efficacious to parry commitment imbalance and could be accorded with Effort Expectancy and Facilitating Conditions in UTAUT2.

Assignments – Linked and Balanced Assessments

Teachers should ensure that the assessments are all linked to the intended goals of OCL tasks (Judith and Catherine 2009; Wang 2007). For example, students can receive grades associated with the level of their participation in a discourse (Said et al. 2014), the extent of their collaboration with others, reference to professional experience, the caliber of their written expression (Judith and Catherine 2009), or even additional competence such as peer review and task negotiation (Macdonald 2003). It is an efficacious practice to convey what the students are expected to achieve for a specific task. Besides, the assessments ought to be balanced between individual contributions and collaborative efforts. Incorporating both individual (process-oriented) and group performance (product-driven) components in various assessments could be an effectual practice to warrant both individual accountability and positive interdependence (Jung et al. 2012; Wang 2007). Otherwise, some members would lose their enthusiasm for collaborative tasks and prefer to work alone (Capdeferro and Romero 2012).

On balance, the practice of linking and balancing assessments would be suitable to counter commitment imbalance and to induce certain behavioral engagement that are aligned with OCL practices. Students would generally be more satisfied with their collaborative experience when being assessed fairly in a balanced fashion. As such, the practice might be in accordance with the Hedonic Motivation in UTAUT2.

Promote an Interactive Community via Teacher Facilitation

OCL is based on Constructivism that lays the utmost importance to the facilitation of a teacher for the students' knowledge construction. Teacher facilitation is expressed through the following three aspects: (a) establish a personal rapport: teachers can develop a human connection with students by attending to personal issues (Xie et al. 2019), attending discussions and providing support for teams (Tu and Corry 2003), and giving frequent positive feedback and encouragement (Jung et al. 2012); (b) warrant fairness and inclusiveness: teachers should moderate and direct the discourse by addressing all threads and original posts (Emerson and Gerlak 2016), so no students could feel marginalized; and (c) maintain constant interaction and communication: frequent communication and timely feedback is the key to maintaining students' enthusiasm (Capdeferro and Romero 2012; Emerson and Gerlak 2016; Kopp et al. 2012). Students could feel comfortable to ask questions and seek assistance (Kumi-Yeboah 2018).

These three aspects of teacher facilitation are crucial to foster a strong sense of community for active participation and knowledge construction (Brindley et al. 2009). Once team acquaintance and the sense of belonging are gradually developed, the team members could feel more comfortable to contribute, and it is easier for the team to reach consensus (Yeh 2010), moving from lower levels of interaction (viz., socializing) to higher levels of interaction (viz., sharing, elaborating, synthesizing, and application; Xie and Ke 2011). This practice is of paramount importance to adjust students' learning attitudes, realize any ignorance of collaboration and ICT skills, narrow existing background gaps, parry commitment imbalance issues, and make the participation more gratifying. The practice, for the most part, might be congruent with Performance Expectancy, Hedonic Motivation, and Facilitating Conditions in UTAUT2.

4.2.2 OCL EdTech

This section discusses EdTech's characteristics, features and/or EdTech practices that promote OCL.

Reliable Infrastructure

Reliability refers to the extent to which an online learning environment or system can consistently meet the users' expectations of quality and performance. To that end, such a system must have two features: (a) **stability**: a stable system is firmly established that system failures are improbable, users care about the usability of the system (Robinson et al. 2017) and would be satisfied when the functions could work properly (Ku et al. 2013); (b) **responsiveness**: some technology failures that cause users waiting and hence dissatisfied include bandwidth issues, lags during synchronous video conferencing (Robinson et al. 2017). A reliable online learning environment helps OCL learners avoid unproductive activities such as seeking technical support. Therefore, this characteristic of EdTech would be highly embraced and aligned with Effort Expectancy in UTAUT2.

Intuitive Interface

Such characteristic allows users to use their intuition to navigate through the system effortlessly. The three corresponding features are as follows: (a) **consistency and clarity**: the interface (e.g., a website's graphic design and navigation) should be well-structured, consistent in different places, and free from distraction to enhance its ease of use and user-friendliness (Curtis and Lawson 2001); (b) **fewest steps to complete a task**: users, for instance, can execute new functionality without installing additional plug-ins (Glover Ian et al. 2004), or navigate in fewest mouse clicks (Curtis and Lawson 2001); and (c) **convenient organization**: there is a call for effectual tools to help process and organize the massive volume of data in a straightforward fashion (Gao 2013), such as tags, annotation, rating

system, reference between the messages, sorting, filtering, searching, visualized reports, among others, and hence aid users in analyzing discussions effectively (Al-Samarraie and Saeed 2018). The purpose of intuitiveness in design is to make the online learning environment pleasing to use and to assist students with very basic ICT skills. On this account, the practice might be accorded with Effort Expectancy and Hedonic Motivation in UTAUT2.

Flexible Solutions

It is essential to integrate various, different technical tools to support a wide range of OCL activities (Curtis and Lawson 2001), and permit students to choose the tools they feel appropriate based on the tasks requirements, communication styles and contexts (Havard et al. 2008; Tu and Corry 2003). For example, wikis and forums have different features for different purposes and can work in combination (Ioannou et al. 2015). Prezi has an infinite canvas and nonlinear presentation style that allows greater flexibility in expressing ideas and creating final products. This flexibility should be extended to the following functionality:

- **integrate synchronous and asynchronous communication tools:** There is a need to combine both communication styles. For example, Wechat, a synchronous chat tool befitting social interaction, and Moodle, a structured-discussion tool for knowledge construction, can both work in tandem to support OCL (Sun et al. 2018). This practice calls for the coalescence of various tools and grants users control, whereas Harasim (2017) emphasizes the prominence, predominance, and supremacy of asynchronous communication.
- **allow contextualized collaboration:** A case in point is an online learning environment that allows learners to collaboratively annotate on a webpage or a document (Glover Ian et al. 2004) or enables teachers to embed questions into a section of content, such as video, sound, or text, to direct learners' attention to specific content and facilitate richer discussions (Gao 2013).

Such flexibility could facilitate knowledge acquisition and improve students' contentment in the learning process (Al-Samarraie and Saeed 2018). Flexibility (i.e., various tools, functionality with high adaptability) could also assist students of different ICT skills because it allows users to choose the suitable tools befitting their skills to complete tasks with less effort. Thus, the practice might be consistent with Performance Expectancy, Effort Expectancy, and Hedonic Motivation in UTAUT2.

4.2.3 Learners' Control Over Learning

Several practices of teacher presence and EdTech share a common emergent theme: learners' control over learning. They all offer students the ability to decide and customize their learning experience: leadership opportunities allow students to control the decision-making process of the group tasks, diverse experience sharing and self-reflection diary permit students to design the learning content, interactive communities stem from students' contributions, and flexible EdTech solutions empower students to choose the tools they need. When teachers offer students opportunities to design their learning experience, students could be more proactive in improving their learning (Ouyang et al. 2020). Therefore, the sense of control over learning seems to be an important factor in promoting the acceptance of OCL. Besides, all the practices within this theme are congruent with Hedonic Motivation in UTAUT2 framework (see previous subsections), so the sense of control appears to be associated with Hedonic Motivation despite not being reflected in UTAUT2.

5 Conclusion

The study not only attained all research objectives with the proposed APPFOE but also revealed the challenges that individuals and teams generally confront in OCL. The proposed APPFOE reveals practices in three main themes (viz., teacher presence, OCL EdTech, and learners' control over learning) that can handle those challenges and promote the acceptance of OCL in light of UTAUT2.

Implications: Educators could use APPFOE as a guide for their OCL class interactions, whereas educational policymakers could use it to direct their resource, align the practices, and make well-informed decisions. EdTech entrepreneurs, investors, and engineers, could accordingly clarify their views on OCL and adjust their software functionality or business development paths to enhance the acceptance of their products. For academics, the study has gone some ways toward extending the growing body of knowledge as follows: (a) OCL environments emphasize the prominence of asynchronous communication (Harasim 2017), whereas this study calls for the integration of various tools and grants users flexibility and control; (b) the proposed APPFOE specifies numerous practices in a relatively comprehensive manner that illustrate and enhance the practicality of OCL framework; (c) the study demonstrates the application of UTAUT2 within OCL e-learning environments, resulting in

the possibility to refine UTAUT2 to accommodate new factors such as the sense of personal control; and (d) the study offers a relatively comprehensive conceptual framework of EdTech features and OCL practices to tackle learning challenges and promote students' acceptance that builds on previous fragmented research. As such, the study has filled the literature gap and created a basis for further research.

Future research can expand the study further using different methodological choices/research methods (e.g., multimethod quantitative research) and research strategies/research designs (e.g., experiments, surveys, case studies) to enhance the generalizability and extrapolation of the result to different contexts. Moreover, this study investigated the practices in formal educational contexts, but nonformal and informal educational contexts also merit a thorough investigation. Finally, the extent of the impact that APPFOE have on learners' performance/acceptance have not been addressed and should be the subjects of future research.

Limitations: The data selection is constrained by my subjective judgment of relevance. Another limitation is the access failure to several full-text journal articles; hence, the analysis was subject to the exclusion of some possibly relevant journal articles. Nonetheless, the data sample is relatively "saturated" and sufficed to serve the study's goal of exploration that additional references would not affect the overall themes.

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7 Appendix: Full Research Paper

The link to the full the research paper is as follows.

<https://drive.google.com/file/d/11537rIFIVcenuzlxObM5xi1dhU60b5Mr/view?usp=sharing>

The list of 42 journals articles for data analysis can be retrieved at the Appendix D of the full research.

The process of searching for journal articles can be viewed at Table 2, Figure 4, Figure 5, Figure 6, Appendix F, Appendix G of the full research.

The codes, themes, and data extracts/coded excerpts report can be seen at Appendix H of the full research.

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