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# TECHNOLOGY OR PEDAGOGY? EXPLORING K-12 TEACHER ACCEPTANCE OF LEARNING MANAGEMENT SYSTEMS FOR COLLABORATIVE LEARNING

Master's Degree
FACULTY OF EDUCATION
Learning, Education, and Technology
2022

University of Oulu
Faculty of Education
Technology or Pedagogy? Exploring K-12 Teacher Acceptance of Learning Management Systems for Collaborative Learning (Whitehead Ridwan)
Master's Thesis, 58 pages, 1 appendix
April 2022

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The uptake of Learning Management Systems (LMS) by K-12 institutions has sky-rocketed in the past years, yet a dearth of studies exists measuring teacher acceptance of LMS by taking into consideration collaborative learning. Drawing on this gap, the present study embarks to explore Turkish K-12 teachers' acceptance of using learning management systems for collaborative learning. This study followed a quantitative approach and adopted Technology Acceptance Model as the theoretical framework. Both internal (perceived ease of use, perceived usefulness, attitude, and behavioral intention) and external variables (self-efficacy, compatibility, and facilitating conditions) of the Technology Acceptance Model (TAM) literature were taken into consideration when studying how teachers' beliefs on collaborative learning (learning belief, motivation belief, and effort belief) impact their acceptance of LMS for collaborative learning.

This study involves a survey of 60 teachers at private schools in Turkey. A Likert-scale type survey questionnaire including demographics, technology acceptance, and collaborative learning beliefs was distributed, and to answer the research questions, descriptive analysis and stepwise multiple regression were utilized for data analysis.

Results of the present study indicate that the K-12 teachers accept the use of LMS for CL as easy and useful to use. The teachers reported positive attitudes and willingness to use the LMS for collaborative learning (CL). Both self-efficacy and compatibility positively significantly predicted the acceptance of LMS for CL, while facilitating conditions did not predict acceptance. No significant relationship was found between K-12 teacher CL beliefs and their acceptance of LMS for CL.

The present study concluded that a) the availability of support on an organizational and peer level to support K-12 teachers is essential for self-efficacy and b) the compatibility of the either the LMS with the teacher's way of teaching or vice versa impact K-12 teacher acceptance. The practical implications include suggestions for LMS developers and organizations.

Keywords: technology acceptance model, K-12, collaborative learning, teacher beliefs, learning management system

# Contents

# 1 Introduction

With the development of technology, the use of online and hybrid models (i.e., both online and face-to-face) in education has become more widespread (Cigdem & Topcu, 2015). One of the many solutions utilized in online and hybrid education has become learning management systems (LMS). There is no doubt that this situation has accelerated with the effect of the COVID-19 pandemic, and K12 schools have also started to rapidly adopt LMS for educational and administrative purposes. In fact, the amount of LMS users from K-12 has surpassed higher education thanks to the wide availability of low-cost or free LMS. (Westfall, 2020) Yet this is a new phenomenon as currently 64% of K-12 users report that it is their first time using an LMS, which is a significant number when compared to tertiary education, which reported 38% (Westfall, 2020).

Learning management systems have proven to be effective addressing several aspects of day-to-day education. These include but are not limited to a) providing time management abilities, especially useful for higher number of learners b) learning analytics for effective feedback, and c) the ability to facilitate both synchronous and asynchronous learning activities through features such as video conferencing, forums, and centralized content (Vytasek et al., 2020; Gamage et al., 2022; Quadri & Shukor, 2021).

Despite the evidence pointing towards the effectiveness available for both administrative and educational use of LMS, it was found that K-12 teachers usually use LMS for administrative purposes, often disregarding educational capabilities (Stockless, 2018). Accordingly, it has been observed that teachers' use is generally limited to tasks such as uploading/sending homework, and grading. Teachers find it challenging to consider educational aspects of ICT use (Tondeur et al., 2012) and advanced features within LMS can be unfamiliar to teachers, including blogs, wikis, forums, etc. (Stockless, 2018).

To understand how users of LMS behave within these systems, the technology acceptance model (TAM) has proven to be an effective framework. Within the context of education, a plethora of research exists on the acceptance of educational systems, including e-learning, LMS, and other software, from the perspective of students (Chen, 2011; Lai et al., 2012; Park, 2009). They have also been measured in the context of CL (Cheung & Vogel, 2013). The TAM model has been developed over the years to provide a more accurate understanding of the human acceptance of technologies (Venkatesh et al., 2003; Venkatesh & Davis, 2000). In addition

to the TAM variables, several external variables from other theories have been used in relation to TAM, including self-efficacy and compatibility.

LMS have proven capabilities to provide students the capability to participate in CL. A plethora of research exists on the effectiveness of LMS for CL, mainly stating the possibilities of student engagement, interaction, and social impact (Al-Samarraie & Saeed, 2018). CL has been extensively researched in the literature and it has been discussed that it has significant effects on students' deep learning and preparation for working life (Vuopala et al., 2019). However, for CL to achieve its potential, careful consideration should be given by teachers to ideate, plan, and organize activities (Kirschner et al., 2018; Tolmie et al., 2010).Yet, a dearth of research exists exploring the perspective of the teachers on their acceptance of LMS for CL.

On the other hand, it has been observed that teacher beliefs about learning and teaching influence innovative teaching methods and, consequently, the implementation of CL (De Hei et al., 2015). This is also true for the acceptance of technology for education. Gurer and Akkaya (2021) found that pre-service teachers with constructivist pedagogical beliefs were more open to using technology in the classroom.

Yet, how teacher CL beliefs affect acceptance of CL in learning management systems remains a mystery, especially, at the K12 level (Al-Nuaimi & Al-Emran, 2021). Therefore, this article aims to measure how teachers' CL beliefs and LMS characteristics affect teachers' acceptance and use of LMSs for CL using the TAM. To address these objectives, the present study provides a theoretical framework discussing the theoretical underpinnings. Then, the methodology of the study is introduced, followed by the presentation of the results. The results are discussed and reflected upon in line with the literature, and following that, a conclusion is made. Lastly, an evaluation of the study is stated.

# 2 Theoretical Background

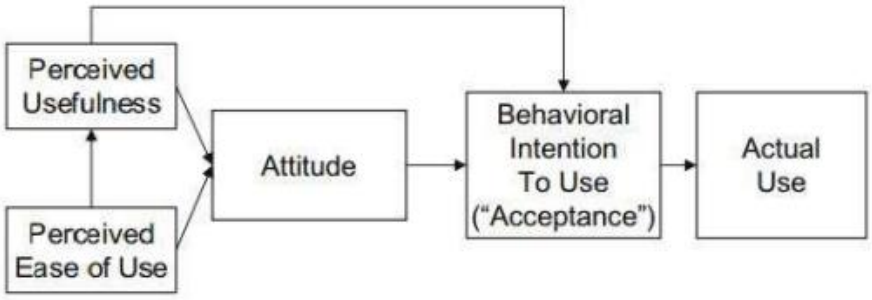
The present study employs Davis' (1989) technology acceptance model as the theoretical framework. They are discussed in terms of existing literature. CL and teacher beliefs are considered under the section of CL beliefs. The research gap is stated based on the state-of-art research on the aforementioned theoretical frameworks.

## 2.1 TAM

TAM is the most widely used and accepted model to describe how users behave within a system (Agarwal & Prasad, 1999; Venkatesh & Davis, 2000). TAM is adapted from Ajzen's (1991) theory of planned behavior (Davis, 1989) to explain the extent to which users accept a particular technological product. Its main variables are perceived ease of use and perceived usefulness (see Figure 1). Perceived ease of use is defined as the degree to which users of a technology can effortlessly use a product (Davis, 1989). On the other hand, perceived usefulness refers to the degree to which a technology user believes their work experience will be enhanced (Davis, 1989). Perceived ease of use affects perceived usefulness.

**Figure 1**

*Original TAM by Davis (1989)*



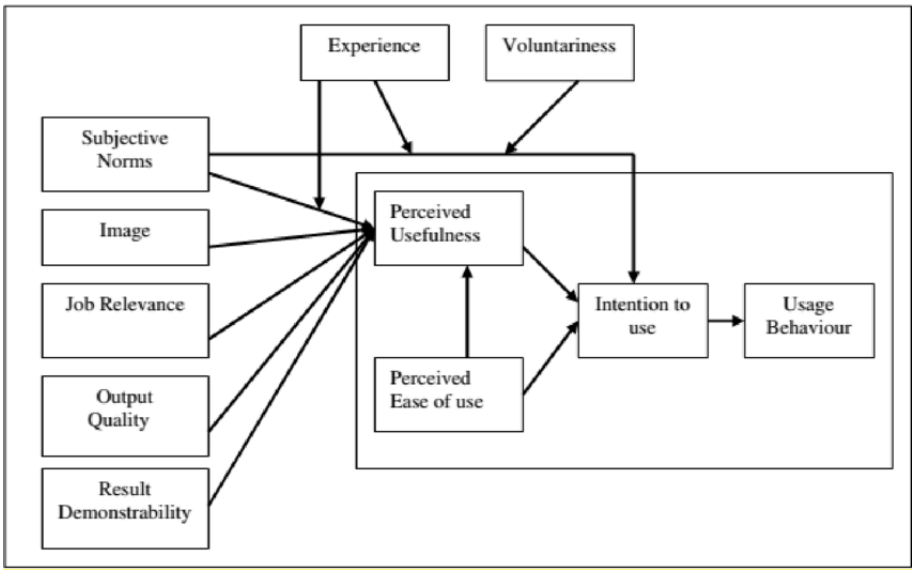

In other words, the perception of a technology being easy to use affected the user's perception of it being useful. These variables influence attitude towards use and behavioral intention to use. Attitude towards use also influences behavioral intention to use. Attitude towards use is defined as an emotional reaction to a given new technology (Davis, 1989; Venkatesh & Davis,

2000). Behavioral intention to use refers to the degree to which a user is willing to use a particular technology in the future (Davis, 1989). As a result, the relationship between these variables determines the actual system usage through actual use. However, this early model of TAM was initially criticized by the researchers for not including external variables to better understand different contexts of technology use. As a response, TAM2 was introduced to include external variables in addition to the original variables (Venkatesh & Davis, 2000).

TAM2 includes variables such as subjective norm, image, job relevance, output quality, results demonstrability as factors that are affected by perceived usefulness (Venkatesh & Davis, 2000). Subjective norm is defined as a "Person's perception that most people who are important to him think he should or should not perform the behavior in question" (Venkatesh & Davis, 2000). Image is defined as "The degree to which use of an innovation is perceived to enhance one's status in one's social system" (Venkatesh & Davis, 2000). Job relevance is defined as an "Individual's perception regarding the degree to which the target system is relevant to his or her job." Output quality is defined as "The degree to which an individual believes that the system performs his or her job tasks well" (Venkatesh & Davis, 2000). Results demonstrability is defined as the "Tangibility of the results of using the innovation" (Venkatesh & Davis, 2000). Attitude was omitted from this particular model as it was found to be weak in its power to predict behavioral intention (Wu & Wang, 2005). Figure 2 shows the relationship between external and internal TAM variables.

**Figure 2**

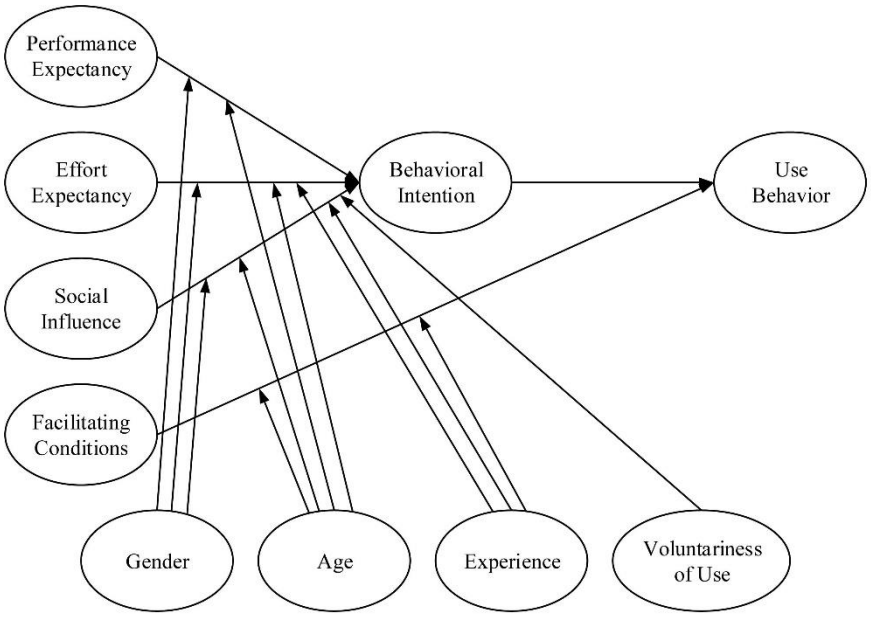
*TAM2 model by Venkatesh and Davis (2000).*



Later, Unified Theory of Acceptance and Use of Technology (UTAUT) was developed to include additional moderating variables which were found to have significant effect on the model (Venkatesh et al., 2003).The variables added were performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003. Effort expectancy refers to "the degree of ease associated with the use of the system" (Venkatesh et al., 2003). Social influence refers to "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003). Facilitating conditions refers to "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003). In addition, demographic variables (gender, age, experience, and voluntariness of use) were also attached to the model and were found to have high predicting power for the model. See Figure 3 for the relationship between the variables in the UTAUT model.

**Figure 3**

*UTAUT model by Venkatesh and colleagues (2003).*



Apart from the established models of TAM, the literature identifies the continuous need for expanding the model to meet the requirements of individual and cultural factors that may affect the acceptance of technology (Hong et al., 2015; Ngai et al., 2007; Teo, 2008; Teo & Noyes, 2011; Tsai et al., 2010). For this reason, the author decided to use self-efficacy, compatibility, and facilitating conditions to provide context to the present study in addition to the original TAM1 internal variables. The following headings discuss these variables in detail, relating them to this study.

### 2.1.1 Self-efficacy

Self-efficacy refers to a person's belief in their abilities to complete a task or job (Lightsey, 1999). In ICT use, it is defined as a person's belief in using technology to complete tasks (Compeau & Higgins, 1995). In relation to TAM, the definition used for self-efficacy is the prior, as the assumption is that teachers with high self-efficacy are more likely to pursue "innovative" teaching practices, and it is not related to technology, but the completion of the task by using a given technology. There are many examples in the literature that associate teacher self-efficacy with higher student achievement rates. Studies by (Brouwers & Tomic, 2003; Henson, 2001) report that teachers with high self-efficacy apply more student-centered instructional strategies than those with low self-efficacy. Teachers with high self-efficacy are more open to adopting new teaching strategies (Gavora, 2010). As a result, it can be stated that teacher self-efficacy enables the adoption of technologies more smoothly (Brouwers & Tomic, 2003; Henson, 2001).

Although self-efficacy was not originally included in the TAM models, studies have tested and linked it to behavioral intention (Anderson et al., 2011; Baker-Eveleth & Stone, 2008; Banas & York, 2014; Valtonen et al., 2015). A study on behavioral intention on university students' acceptance of e-learning courses found that self-efficacy was a significant predictor in TAM (Park, 2009). A quasi-experimental design study with pre-tests and post-tests on pre-service teachers in Finland found that self-efficacy influences behavioral intention to use ICT, given that that they were provided with ICT courses in the classroom in a positive manner (Valtonen et al., 2015). The tools used were a wiki page, Facebook, YouTube, and WordPress. Although the results of the study showed weak relationship between self-efficacy and behavioral intention, the researchers found a difference between the confidence of teacher during the pre-test and post-test phases. This shows that self-efficacy is a good variable to consider, especially

with teachers who have experience in teaching, which negates the problem of assumptions towards an authentic use case scenario.

A study focusing on the effects of technological pedagogical content knowledge (TPACK) over self-efficacy and behavioral intention was conducted in Korea with College of Education student pre-service teachers (Joo et al., 2018). The results of the structural equational modelling found that self-efficacy had a positive impact on behavioral intention, indicating that the more the pre-service teachers trusted themselves to use ICT to teach primary and middle schools, the more they intended to use the technologies.

A study conducted with university instructors on the effect of ICT self-efficacy in their acceptance of LMS found that LMS self-efficacy positively affected perceived ease of use, indicating that when instructors feel more confident in using the LMS, they will actively take initiative to utilize LMS features to carry out administrative and educational tasks within the LMS (Sezgin et al., 2015; Hsia et al., 2014; Zheng et al., 2018).

To sum, it is evident that self-efficacy plays an important role within the TAM. Various contexts have revealed different results; however, a dearth of research is available in detecting the role of self-efficacy in relation to K12 teacher acceptance of learning management systems for CL.

### 2.1.2 Compatibility

Compatibility is defined as the degree of compatibility of a product used with reference to one's job (Venkatesh & Davis, 2000). It is important that a teacher's style is compatible with the affordances provided by a technology. When a teacher finds a technology to be compatible with their teaching style, it is more likely that they indulge in higher innovation practices, such as user centered teaching and collaborative learning. Compatibility originally is one of the five attributes of the innovation diffusion theory, which aims to explore the reasons behind the spread of technology. Within the context of TAM, it has been used extensively to further contextualize research studies.

For example, a self-report study done assessing pre-service teachers' behavioral intentions stated that the incompatibility of teaching styles with technology could result in negative intentions towards the acceptance of a technology (Sánchez-Prieto et al., 2017). Similarly, a study reporting on TAM scales in Turkey confirms the determining power of compatibility in research

(Ursavaş et al., 2014) A study was done to measure the behavioral intention of LMS by university instructors incorporating factors such as task-technology fit, compatibility, convenience, self-efficacy, personal innovativeness, and subjective norms (Mokhtar et al., 2018). They found that compatibility had a significant impact on perceived usefulness and perceived ease of use. They concluded that a technology should be fit to the task that is performed by the teachers.

Lai and colleagues (2012) found that educational compatibility and facilitating conditions are significantly correlated. The study was done with undergraduate students from Hong Kong on their acceptance of the university Virtual Learning Environment. They attribute the correlation to the fact that these two variables denote removing perceived barriers to the use of technology. As a result, they concluded that the more a student found a technology to compatible with their learning, the more they would be receptive of peer's encouragement and support.

A mixed-methodology study in Turkey focusing on LMS acceptance of 250 university instructors found that compatibility did not have an impact on perceived usefulness and behavioral intention. Interviews revealed that programs which have different properties such as laboratory activities were not supported by the LMS (Findik Coşkunçay & Özkan, 2013). This indicates that the context of this study does not support laboratory sessions, as a result, becoming incompatible with the teachers teaching style (Findik Coşkunçay & Özkan, 2013). A recent study measuring factors influencing higher education instructors (N=321) reported that compatibility had significant impact on perceived usefulness and behavioral intention (Şahin et al., 2021). They concluded that instructors prefer technology suitable for their teaching styles (Şahin et al., 2021). This in contrast to the study by Findik Coşkunçay and Özkan (2013), and it can be concluded that the context of the study is an important factor to consider when taking into account the compatibility of LMS.

Chen (2011) conducted a study with university students on the role of educational compatibility of e-learning systems. The UTAUT model was used, and they found that educational compatibility was an important determinant for the acceptance of e-learning. They concluded that usually the technical aspect of acceptance of technology for education is considered, and that the pedagogical element and preferences are seldomly considered. Thus, it is important to view how a certain technological product for education is compatible with the views and wishes of the users. Similarly, a study focusing on the acceptance of students for web-based collaboration found that compatibility has a significant impact on attitude (Cheung & Vogel, 2013). They

argued that the compatibility of collaborative tools with existing practices holds an importance in the acceptance of such technologies.

In light of these studies, we can say that a technology developed for educational purposes must be compatible with the tasks that the users (teacher and students) want to accomplish, the way they want to accomplish it. As a result, it can be inferred that the in addition to teaching styles, the curriculum/content of the teachings performed by LMS users will affect their usage intentions. In this sense, it is of importance to explore how compatibility plays a role in K12 teacher acceptance of LMS for CL. As there are mixed results, there is a need to clarify the impact compatibility might have enabling teachers to use LMS for CL.

### 2.1.3 Facilitating Conditions

Facilitating conditions can be defined as the individual's beliefs about whether there is support for using a technology at the individual, technical and organizational level (Ajzen, 2002). The literature confirms the effectiveness of facilitating conditions in determining a user's attitude towards using learning technologies (Lai et al., 2012; Ngai et al., 2007). There are many studies that measure facilitating conditions, especially in higher education.

Within the scope of these studies, Garone and colleagues (2019) conducted a study on university lecturers on the acceptance of LMS. The results show that the key estimators of TAM, including facilitating conditions, are reliable predictors for measuring attitude towards technology use and intention. However, a series of studies conducted on pre-service teachers found that facilitating conditions did not affect or only indirectly affected behavioral intention, while a study on K12 teachers found that facilitating conditions directly affected behavioral intention (Teo, 2008, 2010, 2011, 2012). This was contributed to the issue that pre-service teachers may not have clear expectations towards the classroom (Lee et al., 2015). Another study conducted during the COVID-19 pandemic on university instructors found that facilitating conditions, including adequate training and technical support, are crucial for technology adoption (Şahin et al., 2021). It was concluded that the more teachers perceived the availability of support from their peers or institution, the more they had positive intention to use technology.

A study by Chen (2011) found that facilitating conditions was especially crucial for users who are less experienced, explaining that experienced users were able to independently acquire as-

sistance or support. This indicates that the availability of support for using a technology is specifically crucial for inexperienced adopters of a technology. A recent study conducted with Ghanaian pre-service teachers found that facilitating conditions did not predict behavioral intention (Buabeng-Andoh & Baah, 2020). They commented that the sole availability of support to use an LMS was not enough for them to accept an LMS. However, they did find that facilitating conditions had a significant predictivity power on effort expectancy. This meant that when adequate support and training was available for the pre-service teacher, the amount of effort it would take to use the LMS would lessen.

However, another study conducted with Turkish mathematics pre-service teachers found that facilitating conditions has a significant effect on behavioral intention for the acceptance of technology (Gurer, 2021). Though, this can be attributed to the fact that the Ghanaian research by Buabeng-Andoh and Baah (2020) included effort expectancy in their model. (Venkatesh et al., 2003) stated that facilitating conditions is a powerful predictor for the TAM model when effort expectancy is not included.

It has been described in the literature that it is especially important for LMS users for teaching purposes to be able to reach help when they need it. As mentioned, there isn't a consensus on the situational difference of the impact of the variable. In the context of the present study, it is important to explore how facilitating conditions would have an effect on the acceptance of LMS for CL.

## 2.2 Collaborative learning

### 2.2.1 Definition & characteristics

CL is mainly characterized with learners working together in a group to solve a given task (Laal & Laal, 2012), which includes co-construction of knowledge, cognitive, motivation, and emotion regulation, shared goals, and shared regulation of learning (Dillenbourg, 1999; Roschelle & Teasley, 1995). In the context of computer supported collaborative learning (CSCL), collaboration occurs through a computer or the internet as the primary source of interaction. In the present study, no restrictions are present to how and when the collaboration occurs, and it is left to the teacher's interpretation.

CL has been identified to have significant benefits when compared to traditional teacher-centered methods. Especially when the right amount of teacher intervention is present (Cohen, 1994; Kaendler et al., 2015; Van de Pol et al., 2010), CL is said to increase student achievement significantly by giving students the space to ask questions, discuss, listen to different ideas, and defend their own, enabling students to develop higher order competencies (J. Chen et al., 2018).

CL, besides its benefits, brings about challenges that must be overcome. Scripts, which act as scaffolding for students, are required to foster co-construction activities, and often take a lot of investment of effort and time by the teacher to adequately design and implement (Vuopala et al., 2019). Moreover, with larger number of students, teachers may not be able to follow the progress within each group, intervening when necessary (Cohen, 1994). Lastly, students may not have the necessary skills, both academic and social, to engage in collaboration that satisfies the requirements of the learning outcomes (Williams & Sheridan, 2010). Hence, it is crucial that such challenges are considered when CL is intended to be implemented.

### 2.2.2 CL in primary and secondary education

The literature identifies CL to encompass both socio-emotional and cognitive dimensions (Isohätälä et al., 2017). Social interactivity and participation lays in the center of the learnable moments of the collaborative activities. This goes hand in hand with the findings by Tolmie and colleagues (2010), who found that CL has both a cognitive and social impact in the primary school context. In addition, they outlined that the social aspect of CL acts as a basis for the cognitive aspect of it.

Several studies exist which prove the effectiveness of CL to enhance learning outcomes for students through increased learning gains, performance, or tests. Ramirez and Monterola (2019), in a study on grade 7 students on the effectiveness of CL on students' logical thinking found that engaging in co-constructive activities significantly improved the achievement of learning outcomes when compared to students who were taught through traditional methodologies.

However, this does not mean that CL results in high achievement all the time. One of the major determinants for the success of collaborative activities is the presence of teacher intervention (Kaendler et al., 2015). Without adequate teacher presence, interaction between students is at

risk (Van de Pol et al., 2010). Thus, it is essential that teacher guidance for CL is present to intervene when necessary.

Not all teacher interventions are equal, and literature identifies a fine line that must be walked by teachers during their support for CL. Teacher intervention, especially at the meta-level, which includes but is not limited to feedback on strategy and conflict resolution, is demonstrated to be useful for increased learning outcomes. For example, a study done with elementary school teachers found that those who probed their students thought processes further, the students achieved higher results in the post-test phase (Webb, 2008).

That being stated, the conditions may not always be suitable for teachers to engage in adequate intervention as it becomes demanding to follow up on several groups. Teachers have several administrative responsibilities aside from teaching and/or may be overloaded with the number of students they have to care for. In this case, the use of collaborative technologies can come to the rescue, which is discussed in the next chapter.

### 2.2.3 CL and LMS

The literature argues that CL can be supported by technology which provides an authentic and meaningful environment for learners to engage (Gurer & Akkaya, 2021). Learning management system have been adopted by K-12 institutions quickly, especially due to the COVID-19 pandemic, where schools had to quickly find alternatives to face-to-face teaching.

The definition for an LMS the author agrees for this study views an LMS "as a comprehensive, integrated software that supports the development, delivery, assessment, and administration of courses in traditional face-to-face, blended, or online learning environments" (Wright et al., 2014). Although a wide variety of LMS exist, the most used ones based on the number of users are Moodle (higher education) and Edmodo (K-12). The learning environments by LMS provide many opportunities to practice CL. Al-Samarraie and Saeed (2018) in a systematic review on cloud computing tools for CL found that LMS tools enable students to (a) engage in deep discussions, (b) keep records, (c) access content on-demand, (d) create an environment of trust, and (e) have more co-constructing opportunities.

Similarly, literature on the usage of Blackboard LMS and Moodle LMS show that various forms of communication exist to enable collaboration (Al-Samarraie & Saeed, 2018). Some of them are listed as discussion boards, blogs, and wikis. These platforms also support tracking features

which help with the tracking of learner input towards their collaboration, and log data. This enables the teacher to assess both individual and group progress and activities with ease (Hershey et al., 2014). The information that the dashboard provides is useful for teachers to keep their students engage throughout the collaboration as they can prompt and adjust based on visualized data (Engellant, 2014).

In LMSs, when students are given the freedom to discuss and collaborate freely, the true potential of collaboration revels itself. Allowing the students freedom on LMS enables them to explore topics freely and positively contribute to both individual level and group level regulation (Al-Samarraie & Saeed, 2018). Although limited, CL has been explored previously within the scope of TAM. Cheung and Vogel (2013), who investigated the acceptance of Google applications for the use of CL by higher education students, found the TAM model to be suitable for measuring the acceptance of CL. A systematic review on research based on Moodle indicates that although there is a plethora of research on LMS, most of them (75%) focus on the university setting, indicating a major gap for research on pre-university context (Gamage et al., 2022). In addition, they add that within the research, only 5% consider educational theories, showing a major gap in the theoretical under-pinning of LMS usage. This indicates that it is further needed to consider how LMS contribute to the facilitation of CL.

### 2.3 CL beliefs

Although technologies support CL extensively, different teacher profiles are said to influence the implementation of such methodologies, often rooted in different teacher backgrounds. It is stated that teacher beliefs, attitude, and background (previous experience with CL, etc.) has an impact on the acceptance of technologies (Looi et al., 2011). Teacher beliefs is a term that refers to a teacher's pedagogical beliefs. It also refers to learning and teaching (Calderhead, 1995). It is well known that teacher beliefs affect teacher practices (Evans & Kozhevnikova, 2011; Richardson, 1996; Zavagnin, 2012). The influence of teacher beliefs may result from differences in individual factors such as age, experience, and background. In addition, the context of learning can also affect teacher beliefs, such as the effect of student attitudes (Donche & van Petegem, 2011). As a result, a teacher whose beliefs are more geared towards their role as a teacher is less likely to apply pedagogy such as CL than those with more student-centered teacher beliefs (Biggs, 2001; Norton et al., 2010).

CL is an important skill that students must master in order to be successful in working life (Slotte et al., 2004). However, due to its complex nature, it is important that teachers are willing to plan and support collaboration for their students (Oortwijn et al., 2008). It has been determined that even if teachers are willing to practice collaboration, they have doubts that facilitating interaction between students will be successful (Reid & Johnston, 1999). As a result, it can be concluded that the educational beliefs of the teachers greatly affect their practices as well as their personal teaching understanding.

De Hei and colleagues (2015) identify three categories for the measurement of teacher CL beliefs, which are based on teachers' beliefs on learning and teaching in the context of primary and secondary education. Learning beliefs is described as "beliefs about the effects of CL on learning outcomes". In other words, it is related to a teacher's predispositions towards the effectiveness of CL to achieve learning goals. On the other hand, motivation beliefs refer to a teacher's "beliefs about the effects of CL on (student) motivation". Teachers may have varying beliefs on the degree students would be motivated to participate in CL. Effort beliefs relates to a teacher's "beliefs about the amount of effort students are willing to dedicate to CL". Teachers' beliefs may differ in the amount of willingness and contribution a student may have during collaborative assignments and interaction.

According to De Hei and colleagues (2015), in a study conducted in higher education, teachers with positive beliefs about their students' willingness for collaboration and motivation for collaboration practiced more CL. However, in the same study, it was found that teachers believed that CL had a positive effect on learning outcomes, but the effort they expected from students for CL was less. In other words, it was found that although the learning beliefs of the lecturers were positive, if they had negative beliefs on student motivation and effort, they would refrain from using a collaborative approach.

Besides, it can be observed that teacher CL beliefs affect the implementation of collaboration in an LMS. Gurer and Akkaya (2021) state that constructivist and traditional teacher beliefs affect teachers' adoption of technology (constructivists are more willing to adopt technology). It was observed that constructivist beliefs positively affected perceived usefulness, perceived ease of use and attitude towards use while traditional teacher beliefs affected the same variables negatively.

All in all, the gaps the author has identified in the literature are as follows: (i) not enough research exists on the use of CL in learning management systems, specifically in the context of

primary and secondary education. Also, (ii) it is not clear how teacher beliefs of CL affect their acceptance of learning management systems, and finally, (iii) research focusing on TAM from the perspective of primary and secondary school teachers is lacking. Especially since the use of LMS and its variants are becoming more popular in the K12 context, it is important to understand how teachers accept them for the use of 21st century methodologies, such as CL. The current study aims to fill in these gaps by exploring K12 teacher acceptance of LMS and the role of CL beliefs in relation to TAM. The following research questions are formulated:

RQ #1: What are the relationships between internal and external TAM predictors of LMS acceptance for CL learning?

RQ #2: What factors predict K-12 teachers' acceptance of LMS for collaborative learning?

RQ #3: How do K-12 teachers' collaborative learning beliefs affect their acceptance of LMS for collaborative learning?

# 3 Methodology

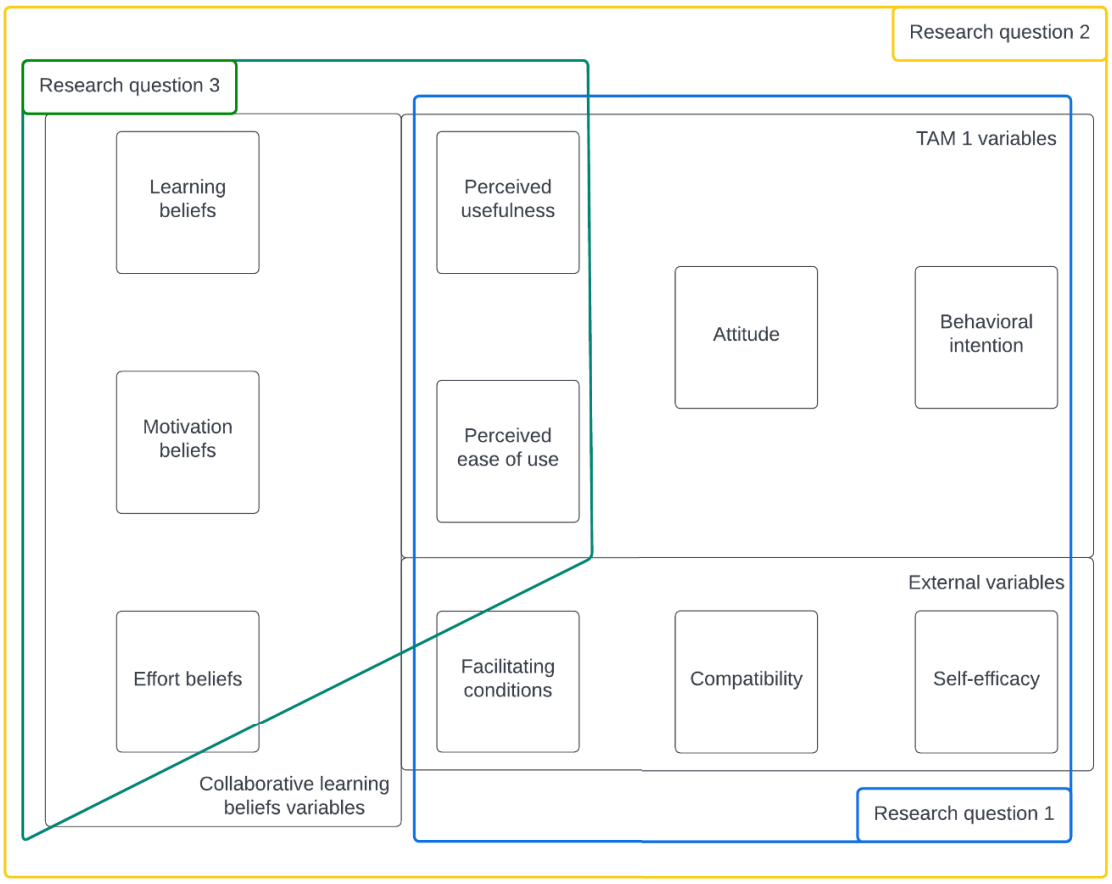
In this section, the design and participants of the study are described, and the instrumentation of study is explained. Information on the approach to the analysis of the study is given, including the preparation of data, normalizing the data, data analysis, and assumptions of regression.

## 3.1 Design of the study

To answer the research questions, the present research employs quantitative methodology. Research question 1 focuses on the relationship between the external variables (compatibility, facilitating conditions, and self-efficacy) and internal TAM1 variables to shed light on the value they bring to the context of the study. To achieve an understanding on the factors that predict acceptance of LMS for CL, research question 2 focuses on the external variables, TAM1, and CL beliefs. Lastly, to explore the relationship between CL beliefs and the acceptance of the LMS, research question 3 pairs CL beliefs with perceived ease of use and perceived usefulness, which is similar to Gurer and Akkaya's (2021) study on pre-service teachers. Figure 4 shows the clustering of the variables analyzed in this study.

**Figure 4**

*Relationship of research questions and variables explored*




### 3.2 Participants

The participants in this study consist of VCloud users in Turkey. VCloud is a Collaboration-based learning management system. The data was collected in cooperation with the product owners of the LMS. All the participants taught in private schools. The participant's consent was taken before they were able to fill out the survey. The questionnaire was opened by 179 teachers, 91 of them started to answer and 60 of them successfully completed the questionnaire. Thirteen (21.7%) of the participating teachers teach at primary school, 18 (30%) at secondary school, and 20 (33.3%) at high school level. 11 of the teachers (18.1%) introduced themselves as male and 49 (81.7%) as female. In addition, 9 (15%) of the participating teachers teach classes of 20 people or less, 40 (66.6%) teach classes between 20 and 30 people, and 8 (13.4%) teach classes between 30 and 40 people. The average teaching experience of the participants was found to be 14.8 years and the average age of the participants was 39 years. Table 1 outlines the sex, weekly course load, and levels taught distribution of the participants.

### 3.3 Instrumentation

In this study, data was collected online through Webropol, a digital query and reporting tool, consisting of three different steps. Firstly, the participants consent was taken, and demographic information was collected, then, their beliefs about CL was measured, and finally, their acceptance based on the TAM was measured.

#### 3.3.1 TAM survey

The variables in the questionnaire are a questionnaire consisting of 12 items with their operational definitions. The internal variables included were perceived ease of use (3 items), perceived usefulness (3 items), attitude (3 items), and behavioral intention (3 items). When external factors are added to the model (compatibility (3 items), self-efficacy (3 items) and facilitating conditions (3 items)), the TAM model consists of 21 items in total. In addition, system usage was also included in the instrument (1 item). These items were adapted to Turkish by Ursavaş and colleagues (2014). In the adaptation study, a 5-point Likert-type scale was rated as 1=totally disagree and 5=totally agree. In this study, Ursavaş and colleagues' (2014) Turkish translations of the TAM items were used as they are in 5-point Likert type (on a scale from 1=totally disagree and 5=totally agree). In the context of the study, through the TAM model, the acceptance of VCloud for CL purposes was questioned.

**Table 1**

*Demographic characteristics of the participants, including sex, weekly course load, and levels taught*

| Variable | *n* | *%* |
|---|---|---|
| Sex | | |
| Male | 11 | 18.3% |
| Female | 49 | 81.7% |
| Weekly course load | | |
| 5 - 10 | 2 | 3,3% |
| 10-15 | 1 | 1,7% |
| 15-20 | 6 | 10,0% |

| | | |
|---|---|---|
| 20-25 | 14 | 23,3% |
| 25-30 | 26 | 43,3% |
| 30-35 | 7 | 11,7% |
| 35-40 | 1 | 1,7% |
| 40+ | 1 | 1,7% |
| Levels taught | | |
| Primary | 13 | 21,7% |
| Secondary | 18 | 30,0% |
| High school | 20 | 33,3% |
| Primary+Secondary | 4 | 6,7% |
| Secondary+High school | 3 | 5,0% |
| Primary+Secondary+High School | 1 | 1,7% |

### 3.3.2 Teacher CL beliefs survey

The CL beliefs questionnaire was developed by (de Hei et al., 2015). The questionnaire includes three different aspects of teachers' CL beliefs: learning beliefs, motivational beliefs, and effort beliefs. The questionnaire was originally composed of 15 items (learning beliefs, n = 7, motivation beliefs, n = 3, effort beliefs, n = 5) and was graded as 1 = totally disagree and 6 = totally agree. In this study, this questionnaire was adapted as it is and translated by 3 different English-Turkish bilingual academic and non-academic individuals without the knowledge of each other, and these translations were reviewed and the most appropriate translation for the context was used. In addition, it was converted to a 5-point Likert type. The reason behind this is to be consistent with the TAM questionnaire scale and provide the option to remain neutral for the participants.

## 3.4 Analysis

### 3.4.1 Preparing and screening the data

Since data was collected through Webropol, the author was able to retrieve the data collected as an Excel sheet which is prelabeled to fit the parameters determined in IBM SPSS 27 software. Transferring quantitative data from Excel is a fast and reliable solution. However, it is important

that the values and measures are aligned properly (Pallant, 2020). The variables were simply copy pasted and the parameters of the excel sheet and SPSS were aligned accordingly as starting point of the data in the Excel spreadsheet varied (0 and 1).

After the data was entered, it was screened for possible errors. Pallant (2020) mentions a two-step process of screening and cleaning the data, namely, checking for errors and finding and correcting the error. Categorical data, such as sex, school type, and levels taught were screened for scores that were out of range. Their minimum and maximum values were checked, the number of valid and missing cases were observed in case the data was not pasted correctly. No out-of-range data were found. A few missing values were present. These values were double checked from their original forms and were seen to be intact. The same process was applied for numerical data, such as the TAM and CL beliefs variables, and yielded similar results.

### 3.4.2 Preliminary analysis

*Descriptive statistics*

Descriptive statistics is used to describe the characteristics of the participants. More importantly, it is needed to check for violation of the assumptions statistical techniques have (Pallant, 2020). These generally include mean, standard deviation, range of scores, and skewness and kurtosis (Pallant, 2020). For categorical variables, their frequencies were measured; and for the continuous variables, the mean, minimum, maximum, standard deviation, skewness, and kurtosis were measured.

*Manipulating the data*

Manipulation of data can be explained as the process of manipulating raw data into a form that is more suitable to conduct intended analyses to answer research questions (Pallant, 2020). This includes:

- Overall scores of multiple variables
- Collapsing a continuous variable into a categorical variable
- Transforming skewed variables for parametric analyses or removing outliers

Since the data collection instruments included several operational definitions for each factor, we needed to combine them to achieve an overall score. This was done through SPSS, and new

variables were created (E.g., PU_1, PU_2, PU_3 -> AvPU). This process was done automatically in SPSS with all the TAM and CL beliefs factors. While applying this process, negatively worded items, or items that had a contrasting meaning compared to other items within the same factor were reversed. The one example is Item 2 of effort beliefs.

New variables were also created for certain demographic factors. For example, data was collected from the participants on the levels they taught in an individual manner (they could choose multiple on a scale from 1st grade to 12th grade). The levels were collapsed into categories such as "primary", "secondary", "high school", "primary + secondary", etc. The process was also applied to the variable weekly-course-load.

The analysis revealed that Motivation belief, Learning Belief, and Self-efficacy variables were negatively or positively skewed. (Tabachnick et al., 2007) mention that skewness is usually not a problem with bigger samples and does not make a "substantive" difference. However, due to our small sample size, the data must be transformed to a lesser degree of skewness to meet the assumptions of future intended analyses. Initially, log transformation was applied to the skewed variables. The results of the transformation were not satisfactory, so, outliers were detected and removed from further analysis. In total, four of the average calculated scores were removed. This made the data sample normal. Table 2 shows the skewness and kurtosis for the variables of the study.

**Table 2**

*Kurtosis and skewness of the variables of the study*

| Variables | Skewness | Kurtosis |
|---|---|---|
| Mean learning beliefs score | -1.454 | 1.084 |
| Mean motivation beliefs score | -1.161 | .897 |
| Mean self-efficacy score | -1.018 | .322 |
| Mean effort belief score | -.563 | .098 |
| Mean perceived usefulness score | -1.291 | .618 |
| Mean perceived ease of use | -1.291 | 1.500 |

| | | |
|---|---|---|
| Mean attitude score | -.959 | .889 |
| Mean behavioral intention score | -.841 | .248 |
| Mean facilitating conditions | -1.060 | .346 |
| Mean compatibility score | -1.024 | .723 |

Another assumption descriptive statistics have is related to the normality. The meaning of normal in data "is used to describe a symmetrical, bell-shaped curve, which has the greatest frequency of scores in the middle with smaller frequencies towards the extremes" (Pallant, 2020). Skewness and kurtosis are one indicator of normality; however, they can also be assessed visually, especially with cases that have larger sample size (>200). However, since the sample size is small, skewness and kurtosis are adequate indications at this moment (Pallant, 2020).

### 3.4.3 Reliability

Reliability of the scales are an important aspect of the study as they determine whether the scales measure the underlying construct (Pallant, 2020). Especially longer scales should ideally have a Cronbach alpha coefficient over .7 (DeVellis, 1991). However, with shorter ones, it is common to find lower Cronbach values (e.g., 5). This study yielded significant reliability in the TAM scale, achieving .834 at the lowest and .908 at the highest. However, CL belief scale yielded mixed results, with learning beliefs at .805, motivational beliefs at .790, and effort beliefs at .524. Yet, all the scales in this study are lowest at acceptable level reliability, with all but one at significant level of reliability.

### 3.4.4 Data analysis

Multiple stepwise regression analysis was selected as the statistical approach to analyze the data in this study. It "allows you to compare the predictive ability of particular independent variables and to find the best set of variables to predict a dependent variable" (Pallant, 2020). It is explained as suitable for dealing with complex real-life related issues, opposed to studies conducted in the laboratory environment (Pallant, 2020). Since this study aims to find which factors best predict the acceptance of an LMS and how CL beliefs factors play a role in the TAM, and since this approach deals with teachers in the field, it seems to be suitable.

However, before an analysis can be completed, the assumptions of regression must be met and confirmed. These assumptions are, namely, sample size, multicollinearity and singularity, outliers, normality, linearity, homoscedasticity, and independence of residuals.

### 3.4.5 Assumptions of regression

Sample size is a problematic aspect of this study. Multiple regression with smaller sample sizes is often not generalizable (Pallant, 2020). The recommended number of participants per predictor is 15 (Brown et al., 1996), however, this study was only able to achieve 6. To overcome this issue, multiple analyses were conducted against different variables based on the literature. Doing this limits the number of predictors in a single analysis, enabling generalizability to a certain degree.

Multicollinearity and singularity refer to the relationship among predictors. The issue with having high correlation (r = .7 and above) among predictors is that it may cause for multiple regression analysis to not be able to detect significant unique contributions (Pallant, 2020). This study attempts to overcome this issue with the same solution for the limited simple size, which is conducting multiple analyses and distributing the predictors based on the literature.

Another assumption that needs to be met is the presence of outliers. They can cause for the model to deviate from what is intended. In this study, outliers were identified by checking skewness and kurtosis of the predictors. Typically, the results should be between +/-2. As mentioned earlier, the three variables that were skewed were normalized with elimination of outliers, meeting the assumption of no outliers.

Normality, linearity, and homoscedasticity can be visually assessed from the residual scatterplot generated by multiple regression analysis. To meet the assumptions, the residuals should be roughly rectangular around the point 0, within the range of +/- 3 (Tabachnick et al., 2007). During the analyses, the scatterplots were visually assessed, and the scatterplots plots produced as a result of the regressions were found to be within the parameters advised in the literature.

# 4 Results

The results are interpreted based on the research questions determined in the previous chapters. The results are given starting with exploring the correlations of the variables, then, stepwise regression results are introduced, finally, standard regression results are given.

## 4.1 Descriptive statistics

Descriptive results were produced to measure the overall acceptance of the LMS of the participant K12 teachers. For each variable, minimum, maximum, mean (*M*), and standard deviation (*SD*) was calculated. Table 3 presents descriptive results including both internal and external factors measured in the present study. Perceived usefulness and perceived ease of use had similar means ($M = 4.02$, $SD = .89$; $M = 4.07$, $SD = .92$). In other words, the participants generally found the LMS useful and easy to use on a similar level. On the other hand, the overall attitude ($M = 3.92$, $SD = .96$) and behavioral intention ($M = 3.95$, $SD = .96$) of the teachers to use the LMS for CL was slightly lower.

When external factors are observed, self-efficacy had the highest score ($M = 4.39$, $SD = .64$) followed by facilitating conditions ($M = 4.00$, $SD = 1.09$), then, compatibility ($M = 3.87$, $SD = .97$). This reveals that teachers believed in their ability to use the LMS for CL purposes, and that necessary support is available on an individual, technical and organizational level. Although compatibility achieved a higher-than-average score, the teacher's perception of the LMS being compatible in reference to their job was lower compared to the other external variables.

Albeit the lowest mean score can be found for system usage ($M = 3.50$, $SD = 1.34$). It can be understood that although predicting factors may have high scores, it does not always result in acceptance of LMS for CL.

**Table 3**

*Descriptive statistics related to internal and external TAM variable mean scores*

| Variable | *N* | *Minimum* | *Maximum* | *M* | *SD* |
|---|---|---|---|---|---|
| Mean PU score | 58 | 1.00 | 5.00 | 4.0287 | .89024 |
| Mean PEU score | 58 | 1.00 | 5.00 | 4.0747 | .92989 |
| Mean ATT score | 58 | 1.00 | 5.00 | 3.9224 | .96438 |
| Mean BI score | 58 | 1.00 | 5.00 | 3.9540 | .96820 |
| Mean FC score | 58 | 1.00 | 5.00 | 4.0086 | 1.0977 |
| Mean COMP score | 58 | 1.00 | 5.00 | 3.8707 | .97585 |
| Mean SE score | 56 | 2.67 | 5.00 | 4.3929 | .64778 |
| System usage | 55 | 1.00 | 5.00 | 3.5090 | 1.3453 |

Descriptive results were produced to measure the overall CL beliefs of the teachers (see table 4). For each variable, minimum, maximum, mean (*M*), and standard deviation (*SD*) was calculated. The teacher learning beliefs were highest among all three variables ($M = 4.77$, $SD = .29$). This is followed by the teacher's motivation beliefs ($M = 4.61$, $SD = .47$), which is also high. In contrast, the participant teacher's beliefs about the amount of effort their students would put into CL was lower compared to the other CL beliefs variables ($M = 3.83$, $SD = .67$).

**Table 4**

*Descriptive statistics related to internal and external TAM variable mean scores*

| Variables | *N* | *Minimum* | *Maximum* | *M* | *SD* |
|---|---|---|---|---|---|
| Mean effort belief Score | 60 | 2.00 | 5.00 | 3.8344 | 0.67447 |
| Mean learning belief score | 58 | 4.00 | 5.00 | 4.7774 | 0.29255 |
| Mean motivation belief score | 59 | 3.00 | 5.00 | 4.6102 | 0.47607 |

### 4.2 Exploring the relationship between external and internal predictors (RQ #1)

A Pearson correlation matrix was produced to identify which variables have a linear relationship amongst each other and their significance. As it can be seen in table 3, behavioral intention significantly positively correlates with perceived usefulness, perceived ease of use, effort belief, learning belief, attitude, facilitating conditions, compatibility, and self-efficacy and positively moderately with motivation belief. However, especially with smaller samples, the coefficient of determination must be considered, as correlation tables only indicate the confidence in obtained results (Pallant, 2020). Shared variance can be calculated by squaring the r value and multiplying it by 100 to obtain a percentage ($r^2$ x 100). In that case, the most notable correlations with behavioral intention are perceived usefulness (84%), perceived ease of use (79%), attitude (88%), compatibility (77%), and self-efficacy (52%) with coefficient of determination over 50 per cent, indicating high levels of shared variance. The lowest correlation of behavioral intention is with motivation beliefs, with a shared variance of only 9 per cent.

Self-efficacy can be seen to have significant positive correlation with internal TAM variables, with lowest shared variance with attitude (45%) and highest shared variance (59%) with perceived ease of use. Facilitating conditions, although positively significantly correlating with all internal TAM variables, has the lowest percentage in shared variance, highest with perceived usefulness (23%). Compatibility has the highest significantly positive correlation with internal TAM factors with 76 per cent shared variance with perceived usefulness, 50 per cent shared variance with perceived ease of use, and 74 per cent shared variance with attitude variables.

**Table 5**

*Correlation Table of all TAM and CL beliefs variables*

| Variable | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. BI | 58 | - | | | | | | | | |
| 2. PU | 58 | .924** | - | | | | | | | |
| 3. PEU | 58 | .899** | .866** | - | | | | | | |
| 4. EB | 60 | .360** | .304* | .291* | - | | | | | |
| 5. LB | 58 | .355** | .282* | .434** | .431** | - | | | | |
| 6. MB | 59 | .316* | .286* | .446** | .363** | .528** | - | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 7. ATT | 58 | .944** | .929** | .903** | .330* | .313* | .342** | - | | |
| 8. FC | 58 | .441** | .486** | .461** | .060 | .001 | -.206 | .468** | - | |
| 9. COMP | 58 | .882** | .872** | .766** | .285* | .177 | .186 | .863** | .405** | - |
| 10. SE | 56 | .726** | .709** | .772** | .126 | .416** | .169 | .673** | .415** | .670** |

Note. BI = behavioral intention; PU = perceived usefulness; PEU = perceived ease of use; EB = effort belief; LB = learning belief; MB = motivation belief; ATT = Attitude towards use; FC = facilitating conditions; COMP = compatibility; SE = self-efficacy

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

### 4.3 Exploring K12 teacher acceptance of LMS for CL (RQ#2)

Stepwise regression analyses were conducted to produce 3 different models with behavioral intention, attitude, and system usage as dependent variables to explore significant predictors within the model. In other words, the aim is to understand which of the predictors have a significant effect on the acceptance of a learning management system for CL by k12 teachers.

As it can be seen in table 5, with behavioral intention as the dependent variable, attitude alone significantly explained 89 per cent of the variance ($R^2 = .89$, $F_{(1,53)} = 433.202$, $p = < .001$), when added compatibility, 90 per cent of the variance ($R^2 = .90$, $F_{(2,52)} = 258.397$, $p = < .001$), and when added perceived ease of use, 92% of the variance ($R^2 = .91$, $F_{(3,51)} = 202.23$, $p = < .001$). This shows that in terms of predicting a teacher's behavioral intention to use a learning management system for CL, attitude ($\beta = .457$, $p = <.000$), compatibility ($\beta = .277$, $p = .001$), and perceived ease of use ($\beta = .274$, $p = .004$) are significant predictors. The variables excluded from the model at the end were effort belief ($\beta = .056$, $p = .174$), learning belief ($\beta = .059$, $p = .192$), motivation belief ($\beta = -.019$, $p = .671$), perceived usefulness ($\beta = .182$, $p = .118$), facilitating conditions ($\beta = -.016$, $p = .730$), and self-efficacy ($\beta = .059$, $p = .368$).

**Table 6**

*Stepwise regression model with behavioral intention as dependent variable*

Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change |
|---|---|---|---|---|---|
| 1 | .944[a] | .891 | .889 | .32267 | .891 |
| 2 | .953[b] | .909 | .905 | .29832 | .018 |
| 3 | .960[c] | .922 | .918 | .27743 | .014 |

a. Predictors: (Constant), Mean attitude score

b. Predictors: (Constant), Mean attitude score, Mean compatibility score

c. Predictors: (Constant), Mean attitude score, Mean compatibility score, Mean perceived ease of use score

d. Dependent Variable: Mean behavioral intention score

The model with attitude as a dependent variable (see table 7) yielded similar results to behavioral intention. Perceived usefulness accounted for 86% of the variance ($R^2$ = .86, $F_{(1,53)}$ = 334.046, p = < .001), when perceived ease of use added, 89.7% of the variance ($R^2$ = .90, $F_{(2,52)}$ = 237.916, p = < .000), with compatibility, 90% ($R^2$ = .91, $F_{(3,51)}$ = 175.310, p = < .001), and with self-efficacy, 91% of the variance ($R^2$ = .92, $F_{(4,50)}$ = 143.285, p = < .001). The predictors removed from the model were effort belief (β = .019, p = .656), learning belief (β = .012, p = .806), motivation belief (β = -.011, p = .825), and facilitating conditions (β = .016, p = .739). ANOVA test labels all the steps of the model to be statistically significant (p<.0005). This means that in terms of predicting the attitude of a K12 teacher's acceptance of a learning management system for CL, perceived ease of use, perceived usefulness, compatibility, and self-efficacy are significant predictors.

**Table 7**

*Stepwise regression model with attitude as dependent variable*

Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change |
|---|---|---|---|---|---|
| 1 | .929[a] | .863 | .860 | .36022 | .863 |
| 2 | .949[b] | .901 | .897 | .30846 | .038 |
| 3 | .955[c] | .912 | .906 | .29504 | .010 |
| 4 | .959[d] | .920 | .913 | .28389 | .008 |

a. Predictors: (Constant), Mean perceived usefulness score

b. Predictors: (Constant), Mean perceived usefulness score, Mean perceived ease of use score

c. Predictors: (Constant), Mean perceived usefulness score, Mean perceived ease of use score, Mean compatibility score

d. Predictors: (Constant), Mean perceived usefulness score, mean perceived ease of use score, Mean compatibility score, Mean self-efficacy score

e. Dependent Variable: Mean attitude score

However, when system usage is tested as a dependent variable, differences can be observed. As it can be seen in table 7, only one predictor was deemed statistically significant. Attitude significantly predicted system usage ($R^2 = .60$, $F_{(1,51)} = 77.7$), $p = .000$) and accounted for 59.5% of the variance. All other predictors were removed from the model (perceived ease of use ($\beta = .320$, $p = .119$), perceived usefulness ($\beta = .282$, $p = .240$), behavioral intention ($\beta = .011$, $p = .967$), compatibility ($\beta = .000$, $p = .998$), facilitating conditions ($\beta = .054$, $p = .593$), self-efficacy ($\beta = .064$, $p = .597$), learning beliefs ($\beta = -.128$, $p = .170$), motivation beliefs ($\beta = -.015$, $p = .877$), and effort beliefs ($\beta = .-155$, $p = .098$)). ANOVA test deemed this model as statistically significant as well ($p<.0005$). This means that, in terms of predicting a k12 teacher's system acceptance of an LMS for CL, attitude plays a significant role.

**Table 8**

*Stepwise regression model with system usage as dependent variable*

Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change |
|---|---|---|---|---|---|
| 1 | .777[a] | .603 | .595 | .855186 | .603 |

a. Predictors: (Constant), Mean attitude score

b. Dependent Variable: System usage 1

### 4.4 Exploring the role of CL beliefs in K12 teacher acceptance of LMS for CL (RQ#3)

To explore the effect of CL beliefs (Learning beliefs, Motivation beliefs, and Effort beliefs) on K-12 teachers' learning management system acceptance, standard multiple regression analysis

was conducted with PEU and PU as dependent variables. As it can be seen in table 9, the model produced with perceived usefulness as dependent variable predicted only 13% of the variance, with no predictor having significant impact ($R^2 = .13, F_{(3,52)} = 2.745, p = .052$). This means that in terms of determining teacher perceptions of the usefulness of the learning management system, CL beliefs predict 13% of the variance, with no specific variable holding a significant effect.

**Table 9**

*Standard regression of CL beliefs predictors with perceived usefulness and perceived ease of use as dependent variable*

Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .370[a] | .137 | .087 | .85067 |
| 2 | .508[b] | .259 | .216 | .82350 |

a. Predictors: (Constant), Mean motivation belief score, Mean effort belief Score, Mean learning belief score. Dependent Variable: Mean perceived usefulness score

b. Predictors: (Constant), Mean motivation belief score, Mean effort belief Score, Mean learning belief score. Dependent Variable: Mean perceived ease of use score

On the other hand, the model with perceived ease of use as the dependent variable moderately significantly predicted 25% of the variance ($R^2 = .25, F_{(3,52)} = 6.04, p = .001$). Amongst the three predictors, motivation belief was a more significant predictor ($p = .051$) compared to the other predictors. This means that, in terms of predicting teacher perception of the ease of use to use an LMS for CL, CL beliefs explain 25 per cent of the variation, with motivation beliefs particularly more dominant.

# 5 Discussion

In this study, the aim was to understand teacher acceptance of learning managements systems through the technology acceptance framework, adding relevant external predictors and exploring the effect of CL beliefs in relation to the model. The results are discussed based on the research questions of this study, tying them to existing literature.

## 5.1 What are the relationships between internal and external predictors of K12 teacher LMS acceptance for CL learning?

When we look at the correlations table (see table 3), we can see that behavioral intention has the highest shared variances with PEU, PU, ATT, COMP, and SE. This can also be observed by the explanatory power of the model in stepwise regression with behavioral intention as the dependent variable. To further contextualize this study, external predictors are necessary (Hong et al., 2015; Ngai et al., 2007; Teo, 2008; Teo & Noyes, 2011; Tsai et al., 2010). Based on the literature, compatibility, self-efficacy, and facilitating conditions were found to be suitable to contextualize the present study. Compatibility has the highest amount of shared variance with the internal variables of TAM, followed by self-efficacy, then facilitating conditions.

The present study found that self-efficacy predicted perceived ease of use, followed by behavioral intention, perceived usefulness, and attitude. Compatibility predicted behavioral intention the most, then perceived usefulness, attitude, then perceived ease of use. The results are parallel with the literature. In the study by Mokhtar and colleagues (2018), both compatibility and self-efficacy had significant impact on perceived usefulness. They found that the higher university instructors found a LMS fit and compatible to desired teaching styles, the more they will have positive intentions to use the LMS for teaching. Similarly, the more the teachers believed in their abilities to perform successfully on an LMS, the more they intended to use it. On a different note, a different study assessing acceptance of e-learning by pre-service teachers found that self-efficacy positively significantly predicted perceived ease of use (Sánchez-Prieto et al., 2017). Similarly, Siyam (2019) in a study with special education teachers on the acceptance of technology also found that self-efficacy significantly predicted perceived ease of use. In the study by Hong and colleagues (2021), it was found that self-efficacy significantly predicted perceived ease of use as well, indicating that preschool teachers found technology easy to use when they believed in their ability to use them. Şahin and colleagues (2021) found that in the acceptance information technologies by university instructors, compatibility and self-efficacy

were the most influential predictors. As a result, it can be said that in the measurement of the acceptance of K-12 teacher of LMS for CL, self-efficacy and compatibility are significant predictors.

In the present study, facilitating conditions predicted perceived usefulness the most, followed by attitude, perceived ease of use, then behavioral intention. The relationship between facilitating conditions and internal predictors have been stated to be of mixed relationship. In the study by Buabeng-Andoh and Baah (2020), facilitating conditions did not significantly predict attitude. They found that facilitating conditions only predicted attitude through effort expectancy. Similarly, Maican and colleagues' (2019) study's model found facilitating conditions to solely significantly predict effort expectancy. However, as stated in the literature, the impact of facilitating conditions is lessened when effort expectancy is available in the model. A different study hypothesized that facilitating conditions would have a positive relation with perceived ease of use, however, did not statistically validate their model (Sánchez-Prieto et al., 2016). A meta-analysis on teacher adoption of technologies found that facilitating conditions were positively related to perceived usefulness and perceived ease of use. On a similar note, the study by Şahin and colleagues (2021) found that facilitating conditions significantly predicted perceived ease of use, and in addition, behavioral intention. There is no consensus on why the results of facilitating conditions differ between different contexts. Lee and colleagues (2015) relate the impact of facilitating conditions to expectations towards the classroom and the teaching environment. However, in the case of the present study, it could be inferred that since private school teachers usually have access to better educational and technical support (Akgül, 2021), it is possible that their availability of support does not have an impact towards the acceptance of the LMS for CL, resulting in the variable not having a significant impact on the overall model.

### 5.2 What factors predict K12 teachers' acceptance of LMS for collaborative learning?

The technology acceptance model measures the behavior of a user within a system. It aims to understand the extent a user finds a technology to be appropriate for their use (Davis, 1989). To measure acceptance, at its core, it includes variables such as perceived usefulness, perceived ease of use, attitude, and behavioral intention.

Unsurprisingly, stepwise regression with behavioral intention as the dependent variable showed the highest percentage of explaining the variance when compared to attitude and system usage as dependent variables. Significant predictors were attitude, compatibility, and perceived ease

of use. However, stepwise regression with attitude as the dependent variable flagged a higher number of significant predictors, adding perceived usefulness and self-efficacy in addition to the existing predictors of behavioral intention. On the other hand, system usage, being the model having the lowest predicting power, only found attitude as a significant predictor. In other words, in the context of this study, the more K12 teachers i) hold positive emotions towards LMS for CL, ii) found the LMS easy to use for CL, iii) found the LMS useful to use for CL, iv) found the LMS compatible with their teaching style for CL, and v) believed in their own ability to use the LMS for CL, the more they are willing to use the LMS for CL.

The results are mostly in line with the literature. For example, in the study on secondary school teachers' acceptance of learning management systems by Stockless (2018), it was found that perceived ease of use predicted behavioral intention through perceived usefulness. In the same study, attitude was also a significant determiner of behavioral intention. They concluded that through the TAM model, LMSs were useful for secondary school teachers.

The current study found that self-efficacy is a significant predictor of attitude, which is a significant predictor of behavioral intention. Similar support from the literature can be found on the effect of self-efficacy on the acceptance of learning management system (Anderson et al., 2011; Baker-Eveleth & Stone, 2008; Banas & York, 2014; Joo et al., 2018; Siyam, 2019; Zheng et al., 2018). The study by Siyam (2019) had found that self-efficacy is a significant predictor on the acceptance of use of technology, stating that teachers should be provided with not only technical training related to the implementation, but also training session on understanding the impact technology would have on supporting their teaching. Similar findings are presented by Zheng and colleagues (2018), in which their study with university instructors on the acceptance of learning management systems, organizational support and self-efficacy explained perceived benefits. On a similar note, Ju and colleagues' (2018) study on pre-service teacher acceptance of learning technologies found that TPACK, only through teacher self-efficacy explained behavioral intention. They conclude that through support is that self-efficacy can be raised, which directly affects intention to use technology for teaching. All in all, as per previous literature, it can be said that to support K12 teacher acceptance of learning management systems for CL, meaningful training and support must be provided to the teachers to achieve higher levels of self-efficacy, which impact intention to use said technologies.

Compatibility was another major predictor in the behavioral intention and attitude regression models. This finding fits into existing literature. For example, a study on university instructor

acceptance of information technologies found that compatibility and self-efficacy were the most influential predictors (citation). Authors state that teachers have higher intentions of using technologies for teaching if they "meet expectations" and have "necessary knowledge" to use them(source). Another study on higher education instructors found that compatibility had an indirect impact on the acceptance of learning management systems through perceived usefulness and perceived ease of use (Mokhtar et al., 2018). The authors emphasized the need for focusing on "providing adequate features" within LMS to accommodate for a range of teaching styles. The results of this study are also in accordance with the results by Lai and colleagues (2012). They found that educational compatibility had a direct effect on attitude on the acceptance of technology for learning by university students. Similar results can be found by Chen (2011), who also found educational compatibility to have an impact on behavioral intention. In the case of the present study, compatibility of the learning management system with the teacher's way of teaching is an important aspect to put into consideration as it affects behavioral intention to use.

Surprisingly, facilitating conditions was not deemed a significant predictor in the models created. Based on previous literature, it was expected that facilitating conditions would directly affect behavioral intention. In the literature, although a good number of studies exist finding facilitating to not affect behavioral intention (Buabeng-Andoh & Baah, 2020; Dindar et al. 2021; Scherer & Teo, 2019; Teo, 2008, 2010, 2012; Teo & Noyes, 2011), some found for facilitating conditions to have a direct impact (Gurer, 2021; Teo, 2011). When closely examined, it was found that the main difference between studies on the impact of facilitating conditions was the participants. Studies that did not have an impact were done with pre-service teachers, while studies in which facilitating conditions had an impact were done with schoolteachers or senior pre-service teachers (3$^{rd}$, 4$^{th}$, or 5$^{th}$ year). In this sense, although the participants of the present study are k12 teachers, facilitating conditions was not supported. This means that, the perceived availability of adequate and timely support is not enough to foster positive intentions towards the use of LMS for CL in the K12 context. This is further explored in the following section.

## 5.3 How do K12 teacher collaborative learning beliefs affect their acceptance of LMS for collaborative learning?

CL beliefs can be categorized as learning beliefs, motivation beliefs, and effort beliefs (De Hei et al., 2015). The present study looked for possible relationships between CL beliefs and acceptance of learning management systems for CL purposes. With perceived usefulness and perceived ease of use as dependent variables, CL beliefs were examined, however, little to no significant relationship was found. De Hei and colleagues had found that university lecturers, despite having high learning beliefs related to CL, that they would opt to not practice CL due to having low effort and motivation beliefs. Although descriptive results in the present study indicate that participant teachers have high learning belief (m=4.77) and motivation belief (m=4.61) mean scores compared to their effort beliefs (m=3.83) mean score, no significant effect was found by them towards the acceptance of learning management systems for CL. Standard multiple regression results with perceived ease of use as dependent variable found that only motivation belief to holds a low significant effect. This is contrary to previous findings. Gurer and Akkaya (2021) in their study had found that pre-service teachers with constructivist pedagogical beliefs predicted their attitudes and intentions towards technology. On the other hand, they found that pre-service teachers with traditional pedagogical beliefs did not see technology to be a useful part of teaching.

On another note, however, when the correlation table (see table 3) is observed, effort belief significantly correlates with behavioral intention, although shared variance is low. Also, effort belief seems to have the highest correlation with behavioral intention amongst the CL beliefs measured in the present study. As mentioned previously, De Hei and colleagues (2015) had found effort belief and motivation belief to have an impact on whether the lecturer decided to use CL or not. Although the models did not yield significant results, we can understand from the correlation table that the higher a teacher's beliefs related to the effort their students will put towards CL, the more willing they are to use an LMS for CL.

# 6 Conclusion

The use of technology in the classroom for educational and administrative purposes has increased as technologies are becoming more affordable and familiar. Especially with the recent COVID-19 pandemic, there has been an increased adoption of learning management systems in K12 schools. However, studies have found that teachers usually use learning management systems for administrative purposes, disregarding proven capabilities of LMSs to support innovative teaching practices, such as CL. In addition, research on the acceptance of LMSs have generally focused on higher education.

As a result, the present study aimed to (i) explore K12 teacher acceptance of learning management systems for CL, (ii) the relationship between internal and external variables of the TAM model, (iii) and the impact CL may have on their acceptance. To achieve an understanding on the generated research questions, a quantitative approach with a self-report questionnaire was found suitable. Descriptive findings suggest that the teachers hold a positive attitude towards accepting LMS for CL and are willing to use them later in their careers. It was found that they found the LMS they used easy to use and useful, and they believed in their own capability to use the LMS for CL, thought that support to use the LMS for CL was in reach. On another note, it was found that the participant teachers had high beliefs that students learn from CL, but also thought that the students would not put in adequate effort for CL. Although overall acceptance is high, when gone into depth, it was found that the impact of having support in reach, when necessary, both on a personal and technical level did not have a significant impact on the K12 teacher's acceptance of LMS for CL. Although facilitating conditions significantly correlates with the teacher intention to the use the LMS for CL, it shares low variance, meaning that it is a small piece of the overall picture. Moreover, the TAM model predicts with a high percentage the future willingness of K12 teachers in the context of using the LMS for CL, measuring how easy it is to use, how useful it is, the emotional response, how it is compatible to their task achievement, and finally, their self-efficacy in using it. Also, CL beliefs, overall, do not have a significant impact on teacher acceptance of LMS for CL. Only the K12 teacher's CL beliefs related to their student's motivation during CL was found to have a moderate effect on how the teachers found the LMS easy to use for CL. The higher the teacher believes that their students would be motivated, the more they found the LMS easy to use for CL.

The applicability of the TAM model to a wide variety of contexts has been found successful, and the findings of this research add on to the literature in that it confirms the usability of TAM to assess K12 teacher acceptance of LMS for CL. The effect of all internal TAM variables and two of three external variables were supported. It is in line with previous research which demonstrate the necessity for adequate training to improve teacher self-efficacy, and LMS compatibility with teachers teaching (Chen, 2011; Findik Coşkunçay & Özkan, 2013; Mokhtar et al., 2018; Şahin et al., 2021; Sánchez-Prieto et al., 2017). Contrary to the literature, the availability of help on a personal and technical level did not have a significant impact on the model towards predicting k12 teacher acceptance of LMS for CL, which found that especially in authentic environments, having a significant impact (Lee et al., 2015; Teo, 2008, 2010, 2011; Teo & Noyes, 2011)

**Practical implications and future directions**

The present study provides the reader an understanding on the relationship between the classroom teacher and a learning management system for educational purposes. As per the conclusion, it may be beneficial to provide adequate support and training to teachers in the use of the LMS for CL, both technically and pedagogically. It would be in the interest of school managements to consider and predict how the teachers will use the LMS.

The effective acceptance of an LMS is multifaceted. In may be in the interest of organizations and LMS developers to consider various variables that may come into play. In the present study, predicting variables achieved higher scores compared to actual system usage. The context in which LMSs will be deployed should be thoroughly considered, and the sustainability of the LMS should be put into consideration if one wishes to enable teachers through technology.

For future research, the present study should be replicated with higher number of participants to achieve a deeper understanding of the relationship between the variables. Also, various external predictors that might be related to the CL and learning management system use should be considered to contextualize further K12 teacher acceptance. In this context, a framework of CSCL or CL could be considered. Since certain features within LMSs are what facilitate the implementation of pedagogical approaches, measuring teacher acceptance for educational purposes on a holistic level may not provide critical information on the impact of features. On this note, future research may also focus on the comparison of perceived CL beliefs and actual implementation of collaborative practices within LMSs to mitigate bias, as self-report studies could result in bias, making it difficult to unearth some aspects that may have a significant

impact. Furthermore, the relationship of facilitating conditions should be examined further as its impact has been of mixed result in the literature.

# 7 Evaluation

## 7.1 Limitations

The most apparent limitation of the present study is the number of participants who agreed to participate. Initially, the author sought to apply structural equational modelling to achieve a more in-depth understanding, however, due to lack of opportunity to reach a wider range of participants, it was not possible. As a result, the direction of the study shifted to becoming more exploratory research. Nonetheless, the results achieved provide significant contribution to the literature and sheds light onto an often-underrepresented aspect of LMS acceptance.

All the participants were from private schools in Turkey, where the agenda, infrastructure, and organizational and peer support may be different from state schools. Thus, the results of this study are only valid to a specific group, which are private school K12 teachers. Yet, the results of the present study paint a picture on how K12 teachers view LMSs for CL, which has valuable implications.

Moreover, during the design process of the study, a CL framework was not taken into consideration when selecting the external variables to contextualize the study. The variables were selected based on precedent in the literature after it was extensively reviewed. As a result, some aspects of the CL in relation to the study may have been overlooked. Despite that, since the variables selected contain precedent in the literature, they provide significant contributions to the study.

## 7.2 Validity and Reliability

To ensure the validity and reliability of the present study, the author followed strict guidelines into quantitative research by Pallant (2020). In the methodology section, a detailed description of the analysis process can be found. Necessary actions were taken to ensure that the data collected fit the type of analysis intended.

The TAM model is an often-researched scale. Its effectiveness in measuring the underlying construct of technology acceptance has been confirmed several times in different contexts by previous literature. A meta-analysis by (Scherer et al., 2019) found that the overall reliability scores were around the .850 mark, concluding the TAM variables to be reliable. The CL beliefs scale used in the study was also adapted from previous literature. The scales were adapted to fit

the native language of the participants, and necessary translations for the TAM scale and external variables were adapted from Ursavas (2014). Expert judgment method was used to validate the translation by the author and three other individuals, who participated in the translation of the CL beliefs scale (Fraenkel & Wallen, 2012).

While presenting results, discussion, and conclusion, a structure based on the research questions were followed to present the study in a clear, concise, and effective manner.

### 7.3 Ethical issues

To ensure compliance with the ethical aspect of the study, participant teachers were informed in detail about the study. The information included the context of study, aim of the study, and data privacy. Their rights in line with GDPR regulations were stated, and the participants were informed that they could stop the survey entirely whenever they wanted. Participants who did not consent were automatically sent to the end screen of the survey. The data collected was automatically stored in a secure digital account on Webropol.

No identifiable information was collected from the participants, including names, emails, and school names, etc. Furthermore, the author did not change any values of the data collected in the study, conducting analysis on the data collected. After the study is completed, the data will be continued to be stored on the university servers and will be deleted within 6 months. The results of the present study are of ethical conduct.

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# Appendix

Consent Form
Dear Teacher,

In collaboration with University of Oulu and SEBIT, we are studying the impacts of collaborative learning beliefs and the acceptance of technology through a questionnaire. Collaborative learning shortly can be defined as the process of realizing learning as students work in small groups and help each other learn (Acikgoz, 2003:336). In this context, the answers you give would be used towards improving VCloud and as data for thesis work and the University of Oulu. It will not be used for anything else.

Your participation is voluntary. You can leave any question unanswered. You can disconnect from the survey at any time and stop. It takes around 5 to 10 minutes to fill out the survey.

Data collected will be stored in the servers of University of Oulu and SEBIT and will only be used for the present study. You can read more on the European Union's General Data Protection Regulation (GDPR) here: https://gdpr-info.eu/

Thank you for your participation!

Ridwan Whitehead / ridwan.whitehead@sebit.com.tr, ridwan.whitehead@student.oulu.fi

**I have read and understood the above information and agree to participate in the study.**
**Yes** **No**

| **Demographic variables** | **Options** |
|---|---|
| **Sex** | Male |
| | Female |
| **School type** | Private |
| | State |
| **Class groups taught** | 1st – 12th grade |
| **Teaching experience** | 1 – 40 |
| **Class size** | 1 – 5 |
| (You can choose more than one) | 5 – 10 |

| | |
|---|---|
| | 10 – 15 |
| | 15 – 20 |
| | 20 – 25 |
| | 25 – 30 |
| | 30 – 35 |
| | 35 + |
| **Weekly number of classes** | 5 – 10 |
| (Options are in hours) | 10 – 15 |
| | 15 – 20 |
| | 20 – 25 |
| | 25 – 30 |
| | 30 – 35 |
| | 35 – 40 |
| | 40+ |
| **Age** | 21 – 80 |

| **Constructs** | **Operational Definitions** |
|---|---|
| Perceived use-fulness | a. VCLOUD is of benefit to me for CL activities<br>b. The advantages of VCLOUD outweighs its disadvantages for CL activities<br>c. Overall, VCLOUD is advantageous for collaborative activities |
| *(Algılanan Kullanışlılık)* | *I) Derslerimde İşbirliğine dayalı öğrenme için VCLOUD kullanmak performansımı artırır*<br>*II) Derslerimde İşbirliğine dayalı öğrenme için VCLOUD kullanmak işlerimi kolaylaştırır*<br>III) *Derslerimde İşbirliğine dayalı öğrenme için VCLOUD kullanmayı yararlı buluyorum* |
| Perceived ease of use | a. Learning to operate VCLOUD for CL activities is easy for me<br>b. It is easy for me to become skilful at using VCLOUD for CL activities<br>c. Overall, VCLOUD is easy to use for CL activities |
| *(Algılanan Kullanım Ko-laylığı)* | *I) Derslerimde VCLOUD'I İşbirliğine dayalı öğrenme için kullanmak benim için kolaydır*<br>*II) İşbirliğine dayalı öğrenme için VCLOUD kullanımı, benim için kolaydır*<br>III) *Derslerimde İşbirliğine dayalı öğrenme için VCLOUD kullanabilecek beceriye sahip olmak benim için kolaydır* |
| Attitude | a. Using VCLOUD for CL activities is a good idea<br>b. Using VCLOUD for CL activities is a wise idea<br>c. I like the idea of using VCLOUD for CL activities |

| | | |
|---|---|---|
| *(Kullanıma Yönelik Tutum)* | *I)* | *Derslerimde İşbirliğine dayalı öğrenme için VCLOUD kullanmak oldukça iyi bir fikirdir* |
| | *II)* | *Mesleğimde İşbirliğine dayalı öğrenme için VCLOUD kullanmak beni mutlu ediyor* |
| | III) | *Derslerimde İşbirliğine dayalı öğrenme için VCLOUD kullanmak dersi daha eğlenceli ve ilginç yapıyor* |
| Behavioural intention | | a. All things considered; I expect to continue to use VCLOUD for CL activities.<br>b. If I could, I would like to continue my use of VCLOUD for CL activities.<br>c. All thing considered, it is likely that I will continue to use VCLOUD for CL activities. |
| *(Davranışsal Niyet)* | *I)* | *İşbirliğine dayalı öğrenme için VCLOUD'I sıklıkla kullanacağımı düşünüyorum* |
| | *II)* | *Gelecekteki derslerimde İşbirliğine dayalı öğrenme VCLOUD kullanmayı planlıyorum* |
| | III) | *Bundan sonra da mesleğimde İşbirliğine dayalı öğrenme için VCLOUD kullanmaya gayret edeceğim* |
| Facilitating conditions | | a. When I need help to use VCloud, guidance is available to me.<br>b. When I need help to use the computer, specialized instruction is available to help me.<br>c. When I need help to use VCloud, a specific person is available to provide assistance. |
| *(kolaylaştırıcı Durumlar)* | I) | Derslerimde İşbirliğine dayalı öğrenme için VCLOUD kullanırken zorlandığımda okulda rehberlik ve yardım alacağım kişiler vardır |
| | II) | İşbirliğine dayalı öğrenme için VCLOUD kullanırken bir sorunla karşılaştığım anda kimden yardım alacağımı bilirim. |
| | III) | İşbirliğine dayalı öğrenme için VCLOUD kullanırken sorunla karşılaştığım anda kimden yardım alacağımı bilirim |
| Compatibility | | a. Using VCLOUD fits well with the way I normally facilitate CL activities.<br>b. The setup of VCLOUD is compatible with the way I facilitate CL activities.<br>c. Using VCLOUD fits into the way I facilitate CL activities. |
| *(Uygunluk)* | I) | İşbirliğine dayalı öğrenme için VCLOUD'in mesleğim ile ilgili olduğunu düşünüyorum |
| | II) | Mesleğimde İşbirliğine dayalı öğrenme için VCLOUD'e ihtiyacım olduğunu düşünüyorum |
| | III) | İşbirliğine dayalı öğrenme için VCLOUD'in mesleğim için önemli olduğunu düşünüyorum |
| Self-efficacy | | a. I would feel comfortable using VCLOUD for CL activities on my own.<br>b. If I want to, I can use VCLOUD for CL activities easily. |

| | | |
|---|---|---|
| | | c. I would be able to use VCLOUD for CL activities even if there is no one around to show me how to use it. |
| *(Öz-yeterlilik)* | I) | İşbirliğine dayalı öğrenme için VCLOUD'I kullanabilecek bilgi ve beceriye sahibim |
| | II) | Bir kişi, bir kere bana nasıl yapıldığını gösterse, derslerimde İşbirliğine dayalı öğrenme için VCLOUD'i kullanabilirim |
| | III) | İşbirliğine dayalı öğrenme için VCLOUD kullanımı konusunda kendime güveniyorum |
| System usage | | a. I frequently use VCLOUD for CL activities |
| *(Sistem Kullanimi)* | I) | İş birliğine dayalı öğrenme için VCloud'u sıkça kullanıyorum. |

| | | |
|---|---|---|
| | TR | **Çaba inancı** |
| | ENG | **Effort Belief (EB)** |
| 1 | TR | İşbirlikli öğrenme sırasında öğrenciler grup ürününe eşit katkıda bulunurlar. |
| | ENG | During collaborative learning, students make an equal contribution to a group product. |
| 2 | TR | Gruplar halinde çalışmak öğrenciler için zorlayıcıdır. |
| | ENG | Working in groups is challenging for students. |
| 3 | TR | Öğrenciler ödevleri birlikte yaptıklarında tek başına yaptıklarından daha fazla çaba gösterirler. |
| | ENG | Students show more effort when they complete assignments together than when they do it individually. |
| 4 | TR | Öğrenciler grup çalışması yapmalarına izin verildiğinde derse daha hevesli olurlar. |
| | ENG | Students are enthusiastic when they are allowed to work on a group assignment. |
| 5 | TR | Öğrencilerin birlikte çalışmaya ayırdığı vakit öğrenim kazanımlarına olumlu etki eder. |
| | ENG | Time that students invest in working together is positively expressed in the learning outcome. |

TR **Öğrenme İnancı**

ENG **Learning Belief (LB)**

1 TR İşbirlikli öğrenme karmaşık problemlerin üstesinden gelmek için uygundur.

ENG Collaborative learning is suitable for tackling complex problems.

2 TR Öğrencilerin dersler sırasında işbirliği yapması, onların gelecek profesyonel yaşamlarında işbirlikli olmaları için bir hazırlıktır.

ENG Collaborating during lessons is a relevant preparation for collaboration in future professional practice.

3 TR İşbirlikli öğrenme öğrencilerin kendi öğrenme süreçleri için sorumluluk almayı öğrenmelerini sağlar.

ENG Collaborative learning ensures that students learn to take responsibility for their learning process.

4 TR İşbirlikli öğrenme ilk ve orta öğretim için etkili bir öğretim metodur.

ENG Collaborative learning is an efficient teaching method in K12 schools.

5 TR Grup ödevleri öğrencilerin öğretilen konuya katılımlarını teşvik eder.

ENG Group assignments stimulate the involvement of students with subject matter.

6 TR Öğrenciler konuyu birbirleriyle tartıştıklarında etkili öğrenirler.

ENG Students learn effectively when they discuss the subject matter with each other.

7 TR İşbirlikli öğrenme öğrencinin işbirliği yapabilme kapasitesini artırır.

ENG Collaborative learning contributes to a students' capacity for collaboration.

8 TR Öğrencilerin karmaşık görevler üzerinde birlikte çalışmaları öğrenmelerini artırır.

ENG Working together on complex tasks increases the learning outcome.

9 TR İşbirlikli öğrenme bilgi inşasına katkıda bulunur.

ENG Collaborative learning contributes to knowledge construction.

10 TR İşbirlikli öğrenme öğrencinin profesyonel gelişimine katkıda bulunur.

ENG Collaborative learning contributes to a student's professional development.

| | | |
|---|---|---|
| | TR | **Motivasyon inanci** |
| | ENG | **Motivational Belief (EB)** |
| 1 | TR | İşbirlikli öğrenme öğrenme deneyiminin özgünlüğüne katkı sağlar. |
| | ENG | Collaborative learning contributes to the authenticity of the learning experience. |
| 2 | TR | Öğrencilerin konuyu birbirbirleriyle tartışabilmeleri derse katılmalarını motive eder. |
| | ENG | Students are motivated to participate in the lesson when they can discuss the subject matter with each other. |
| 3 | TR | İşbirlikli öğrenme öğrencilerin öğrenme motivasyonunu olumlu yönde etkiler. |
| | ENG | Collaborative learning influences the learning motivation of students in a positive manner. |