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# EXAMINING THE ROLE OF ENGAGEMENT IN BLENDED LEARNING AND ITS EFFECTS ON LEARNING OUTCOMES AND SATISFACTION IN CAMEROON HIGHER EDUCATION

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**Abstract:**
In the context of higher education student learning outcome, and satisfaction was examined using blended learning by analyzing how it influences the underlying learning process, focusing on the role of learning engagement. A structural model was used to explain students' learning outcomes and satisfaction with an experiment involving 210 university students learning using Google Workspace. The experimental data show that the effects of using blended learning are mediated by learning engagement. In particular, interactions using learning management systems positively affect learners' engagement, increasing perceived learning outcomes and satisfaction. Hence, blended learning appears to have significant direct and moderating effects on learning outcomes and satisfaction. These findings have several important implications for blended learning research and practice.

**Keywords:** blended learning, learning outcomes, learning satisfaction, learning engagement

## 1. Introduction

With the increase in the use of learning management systems today, blended learning has gained a reputation in numerous research fields, such as higher education (Shim & Lee, 2020), educational technology (Evans, 2008), and educational psychology (Leutner, 2014). Blended learning combines face-to-face and online instruction with reduced class time, as some learning components are provided online (Bower *et al.*, 2015; Castro, 2019; Graham *et al.*, 2013). Hence, blended learning combines two separate modes of teaching and learning: classroom-based face-to-face and distance online learning (Graham, 2006). Blended learning supports active knowledge construction by the learners by enhancing the learner's control of the learning process and collaboration (Arbaugh, 2014; Butz, 2014;

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Li *et al.*, 2020). Blended learning offers learners greater flexibility and encourages personal interaction with peers and the instructor (Chou & Chou, 2011). In this study, blended learning environments focus on; video lectures, research articles, and other content widely supported by the Google Classroom platforms.

Research in blended learning has primarily focused on examining the impact of blended learning on cognitive learning outcomes, self-assessments of knowledge, and learner satisfaction. However, these researches offer inconsistent results. For example, Webb *et al.* (2005) observed significantly improved exam and assignment results in blended learning compared to face-to-face lectures. In contrast, Chen and Jones (2007) and Cosgrove and Olitsky (2015) find no significant effect of the teaching format on students' performance, while Bryant *et al.* (2003) see better exam results for face-to-face lectures. These inconsistent findings suggest indirect effects might influence learning outcomes and satisfaction in blended learning environments. This paper highlights the vital role of indirect effects of engagement on learning outcomes and satisfaction in the blended learning environment. As such, it explains the inconsistent findings of the existing research.

## 2. Literature review

Blended learning combines face-to-face and online instruction with reduced time spent in the traditional lecture hall (Graham *et al.*, 2013). Although the balance between online and face-to-face activities differs for each course, blended learning seeks to maximize the benefits of face-to-face and online methods using learning management systems and class time (Osguthorpe & Graham, 2003). Chou and Chou (2011) conclude that although the online learning part of blended learning offers learners greater flexibility in the process, the face-to-face part encourages personal interactions with peers and the instructor. As such, course flexibility and interaction are generally viewed as the central characteristics of blended learning (Arbaugh, 2014).

Course flexibility refers to a pedagogical method that allows learners to study anytime and anywhere (Alavi & Gallupe, 2003). It enables learners to balance their studies of predefined content with personal commitments, such as work, family, and other activities (Garrison & Kanuka, 2004). Course interaction refers to communication and collaboration with other learners and the instructor. It has been identified as a significant predictor of learning outcomes, especially at the graduate level (Arbaugh, 2014). Interaction encourages engagement with different views and opinions (Alavi, 1994). For example, Kintu *et al.* (2017) find that course interaction positively affects intrinsic motivation and knowledge construction. Napier *et al.* (2011) point out that blended learners report more interactions and higher-quality interactions with their instructors and peers than traditional learners. Interaction occurs in synchronous and asynchronous forms (Alavi & Gallupe, 2003). Thus, interaction is not limited to face-to-face encounters in blended learning environments but can also be integrated into online learning.

Different taxonomies have been developed to differentiate between learning outcomes. For example, Kraiger *et al.* (1993) propose a taxonomy that distinguishes cognitive, skill-based, and affective learning outcomes. Cognitive learning outcomes include verbal knowledge, knowledge organization, and cognitive strategies. Cognitive learning outcomes are generally assessed through tests (i.e., recognition, recall, power, speed) and particularly for cognitive processes via self-assessments of knowledge (Kraiger *et al.*, 1993). Skill-based learning outcomes refer to skill compilation and automaticity. Finally, affective learning outcomes include learning efforts' attitudinal and motivational effects. While attitudinal outcomes refer to changes in the direction and strength of attitudes, motivational outcomes comprise motivational disposition, self-efficacy, and goal setting. Affective learning outcomes are typically investigated using self-reported measures (Kraiger *et al.*, 1993).

Empirical research on the relationship between blended learning and learning outcomes is mainly grounded in a constructivist perspective on teaching and learning (Wieckowski & Washburn, 2014). The constructivist perspective stands in contrast to the objectivist perspective, which has been the dominant perspective on learning in the past (Müller & Wulf, 2020). The objectivist perspective assumes that traditional lectures can best transfer an objective reality to the learner (Ertmer & Newby, 2013). The constructivist perspective, in contrast, proposes that better learning outcomes result if learners construct knowledge themselves, either individually or in collaboration with others, based on active engagement with and sensemaking of existing information (Al-Huneidi & Schreurs, 2012). From a constructivist perspective, learners occupy a central role in the learning environment, while instructors become facilitators.

In line with its constructivist grounding, empirical research on blended learning environments has focused on comparing learning outcomes between blended courses and other instruction formats, such as traditional lectures or purely online courses. This research mainly examines cognitive learning outcomes, such as course grades (Alonso *et al.*, 2011; McKenzie *et al.*, 2013) and learner satisfaction (McDonough *et al.*, 2014) or affective learning outcomes, such as confidence (Chen & Jones, 2007) or motivation (Kintu *et al.*, 2017).

Research on the learning outcomes in blended learning yields inconclusive results. One group of studies that compares blended learning environments with other instruction formats does not find significant differences regarding learning outcomes. For example, in an experiment involving undergraduate biology students, Bergstrom (2011) finds that blended learning environments do not affect cognitive learning outcomes (i.e., recall and retention performance). Similarly, in a blended undergraduate computing module with two instead of three meetings per week, Napier *et al.* (2011) find that course grades in traditional and blended courses are comparable, although blended learners report higher levels of interaction. Chen and Jones (2007) examine traditional lectures and blended learning in an MBA accounting course and conclude that students' grades are comparable. However, in terms of learners' reactions, the students in traditional lectures are more satisfied with the clarity of instruction, while the blended learners express

greater appreciation of the learned concepts and experience an improvement in their analytical skills. Cosgrove and Olitsky (2015) compare traditional and blended formats in an undergraduate economics course and do not find significant differences in cognitive learning outcomes measured in exam performance.

Terry (2007) examines three instruction formats, traditional, blended, and online, and finds that cognitive learning outcomes measured based on continuous assessments are similar for all three formats, while the purely online format leads to significantly worse results on the final exam. Wieckowski and Washburn (2014) find no differences in the effects of the three modes of instruction on exam performance, although blended (and online) courses lead to higher learner satisfaction. Nevertheless, students in the traditional class retain the material better based on comparing pre-test and post-test results.

The second group of studies comparing blended learning environments with other instruction formats finds blended learning significantly more effective than traditional lectures. For example, Baepler *et al.* (2014) show that cognitive learning outcomes (i.e., course grades) in a blended course in chemistry are at least as good as in traditional lectures or significantly better. In addition, they find that blended learning improves affective learning outcomes (i.e., confidence and enrichment). Similarly, Lovett *et al.* (2008) show that students in a blended statistics course with 16 instead of 60 meetings per term learn twice as fast as students in the traditional lecture format and perform equally well or better on cognitive assessments. Furthermore, Riffell and Sibley (2005) find that blended learners in a biology course with a two-thirds reduction in face-to-face time not only achieve higher cognitive performance than learners in a traditional course but also report higher levels of interaction with content, instructor, and peers. McFarlin (2008) demonstrates that transitioning from traditional lectures to a blended format enhances course grades by almost 10 percent among physiology students, presumably due to greater exposure to course content through online materials. Melton *et al.* (2009) find that both course grades and learner satisfaction are significantly higher in an undergraduate health course using a blended format.

In contrast, Pereira *et al.* (2007) observe better test results in a blended learning environment but no difference in learner satisfaction for anatomy students. Webb *et al.* (2005) examine different instruction formats in an MBA course on information systems. They find better assignment results for students in blended and online environments than for those in traditional formats. Dowling *et al.* (2003) investigate different course formats for undergraduate accounting students and conclude that midterm and final exam results are higher among students in a blended course. Deschacht and Goeman (2015) show that the use of a blended format for various management subjects leads not only to better exam performance but also to higher dropout rates. In a study of undergraduate students who demonstrate a higher degree of active learning practices in a blended business communication course, Sauers and Walker (2004) find that blended learners achieve significantly higher test results than students in traditional lectures.

Learning engagement is essential for determining learning outcomes in a blended learning environment. Learning engagement positively affects learning outcomes and satisfaction (Carini, Kuh, & Klein, 2006). Learning engagement also offers a logical means to explain the inconsistent results in previous research; for example, whether a particular learning medium improves or hinders students' learning outcomes and satisfaction may depend on how that medium engages students in learning activities. Although prior research confirms the significance of learning engagement (Hu, Kuh, & Li, 2008), its role in blended learning and influences on learning outcomes and satisfaction remain uncertain and warrant research attention. Building on activity theory, Liaw *et al.* (2007) examine the relationship between learning engagement and outcomes without any benchmarks and report that increased attention can improve students' learning outcomes.

## 3. Purpose of the study

The study aimed to examine how blended learning environments influence students' learning outcomes and satisfaction through the lens of learning engagement. A structural model was proposed that centres on the role of learning engagement in mediating and moderating the influences of blended learning environments on students' learning outcomes and satisfaction.

## 4. Research model and hypotheses

Our model explains students' learning outcomes and satisfaction in blended learning environments, compared with face-to-face learning, with a particular focus on learning engagement, which mediates the effects of the learning medium. Our dependent variables, learning outcomes, and satisfaction, are critical indicators of students' learning and achievement. Learning outcomes and satisfaction represent a manifestation of students' learning experiences. According to Zhang *et al.* (2007), students who perceive effective knowledge transfer tend to have positive attitudes toward the learning results and thus exhibit higher satisfaction. Both learning outcomes and satisfaction can be influenced by environmental factors, such as instructions and learning systems (Liaw, Huang, Chen, 2007); when the learning environment facilitates effective knowledge delivery, students are likely to perceive their learning as effective and positive and thus gain satisfaction with their learning. Learning outcomes and satisfaction measures have been studied in previous research (Arbaugh, 2000; Wang, 2003); therefore, our dependent variable choices enable us to offer insights into the inconsistent findings in blended learning environments literature. Although blended learning environments increase students' control over the timing, pacing, and sequencing of their learning and presentation methods (Garrison & Anderson, 2003), they also demand greater student responsibilities to manage the learning tasks and processes (Allen, & Seaman, 2009). In addition, students take more time to provide input (e.g., posting questions, responding

to questions, offering explanations, and sharing ideas) and must accept delayed responses, often constrained by no and poor internet quality. The use of blended learning environments provides unlimited support for interactive content; thus, we anticipate more learning engagement in blended learning environments than in face-to-face learning:

**H1:** The learning medium affects learning engagement; specifically, learning engagement is higher with blended learning environments that offer unlimited interactive support than face-to-face learning.

Effective learning requires students to engage proactively in learning activities. According to the experiential learning theory (Kolb, Rubin, & Osland, 1990), people learn by doing; by engaging in learning activities, students internalise what they learn and can absorb and reflect on the learning experience. Hiltz and Shea (2005) report that students engage more in learning activities when they are active learners and take charge of their learning, which leads to favourable learning outcomes. By profoundly engaging in learning, students undertake more effort to meet the learning requirements and accomplish the learning goal by acquiring focal knowledge or skills (Robinson, & Hullinger, 2008). Hence, we postulate a positive effect of learning engagement on learning outcomes in both blended learning and face-to-face learning; accordingly, we test:

**H2:** Learning engagement positively affects learning outcomes, regardless of the medium of learning (i.e., blended learning or face-to-face learning).

Effective learning can lead to learning satisfaction (Keller, 1983). Both learning outcomes and satisfaction represent crucial measures of learning (Chou & Liu, 2005; Piccoli, Ahmad, & Ives, 2001). According to Zhang *et al.* (2006), students who perceive their acquisition of the focal knowledge to be effective likely will exhibit positive attitudes and high satisfaction. We expect students who perceive that they have successfully achieved the learning goal to have greater learning satisfaction than their counterparts who fail to achieve it, regardless of the learning medium. Thus, we hypothesise a positive relationship and test the following:

**H3:** Perceived learning outcomes are positively associated with learning satisfaction, regardless of the medium of learning (i.e. blended learning or face-to-face learning).

## 5. Methods

### 5.1 Design and data collection

We performed an experiment to examine students' learning outcomes and satisfaction in the blended learning environment and face-to-face learning. This section details our experimental design, measurements, subjects, tasks, experimental flow, and data collection.

### 5.2 Experimental design

We recognised that the use of learning management systems by lecturers could enhance social presence online, just like in face-to-face classes. Social presence online promotes immediate feedback and interactive support. A learning platform like Google Classroom allows instructors to post and deliver prepared lessons (PowerPoint presentations, documents, video clips) to students. We adopted a one-variable randomised design: half the experimental sessions used blended learning, and the remainder used classroom-based face-to-face learning. We allowed students to choose the particular experimental session to join according to their schedule or availability. However, the learning medium used in each experimental session was random and not revealed to students when they signed up to participate.

We adapted measurement scales developed in previous research, with appropriate wording changes to fit our context. We assessed learning outcomes using students' perceptions, congruent with Rovai *et al.* (2003) and Hu *et al.* (2008). Items to measure students' learning satisfaction were adapted from Wang (2003). All question items used a four-point Likert scale, with 1 as "strongly disagree" and 4 as "strongly agree." We randomly sequenced the questionnaire items to reduce a potential anchoring effect that may induce monotonous responses. In addition, we measured learning engagement as the number of optional learning tasks a student completed in the experiment in addition to the experimental tasks.

### 5.3 Experimental tasks

We searched the resources online to locate video content appropriate for our study. By aggregating the selected contents, we created a video clip, approximately 20 minutes in length, which supported the learning tasks by the participants in the blended learning group. For the participants in the face-to-face learning group, an instructor delivered the same learning materials through a classroom-based lecture, also approximately 20 minutes in length, without using the video contents. In the blended learning or face-to-face learning group, we provided the participants with step-by-step instructions for completing each task by applying the knowledge and skills acquired in the experiment and some optional tasks that required focal knowledge and skill. Both the experimental and optional tasks were designed according to the specific lessons we targeted, delivered through blended learning or face-to-face learning. Each participant had the same time to complete the optional tasks after receiving the lecture or video content. The instructions, demonstrations, and exercises were identical between the two groups. An investigator conducted all the experimental sessions.

### 5.4 Experimental flow and data collection

A total of four experimental sessions were conducted in the second semester of 2022, all using the same designated facility. Half of the sessions were face-to-face learning, and the remainder were blended learning. The face-to-face sessions were conducted on June 3 and 4, and the blended learning sessions took place on June 2 and 4. At the beginning

of each session, we explicitly informed students of the study's objectives and addressed any privacy-related concerns. We clearly communicated our intent and promised to perform data analyses at an aggregate level, not in any personally identifiable manner. We also provided each student with convenient access to his or her data. In the face-to-face learning settings, students received the learning materials through classroom-based, instructor-centric lecturing, explanations, and demonstrations. In the blended learning group, they learned using both online and face-to-face, with an instructor to answer questions and address technical problems. For our experimental design, students in the blended learning group received no instructor-provided lectures; they received the learning contents through Google Classroom and learned at their own pace. During the experiment, additional tasks beyond the experimental tasks were available so that students could attempt those tasks at their discretion. After completing the experiment, students completed a questionnaire that collected their perceived learning outcomes and satisfaction.

### 5.5 Data analyses and results

#### 5.5.1 Summary statistics

A total of 210 volunteers participated in the experiment and enrolled in the research methodology course. We randomly assigned each group session to face-to-face and blended learning conditions.

#### 5.5.2 Measurement model

A confirmatory factor analysis was performed for each experimental group and used Tucker's coefficient of congruence to test the factor invariance between the two groups. In the factor analysis, we removed items that did not load well on their corresponding latent construct and those suggesting factor invariance between groups.

The analysis of the final measurement model suggests that the items exhibit satisfactory reliability and validity in both face-to-face and blended learning groups. Tucker's coefficient of congruence can be calculated as the coefficients of congruence between the face-to-face and blended learning groups are 0.96 and .99 for learning satisfaction (LS) and learning outcomes (LO), respectively. Because all these coefficients exceed 0.80, the threshold that Harman (1976) suggested, we can conclude that our instruments show sufficient factor invariance between the two experimental groups.

In the structural model analysis, we tested whether differences in learning outcomes and learning satisfaction could be attributed to the medium of learning alone and whether the effects of the medium of learning were mediated by learning engagement. In Table 1, we present some summary statistics of the key variables for each group. Participants in the blended learning group scored significantly higher than their counterparts in the face-to-face group.

### 5.5.3 Structural model and hypothesis testing

Factor invariance suggests that the data from the two groups have similar factor structures, such that we can combine them for our further structural analysis. We analysed the data using partial least squares (PLS) primarily because it maximises the variance explained in the dependent variables and has less stringent sample size requirements (Chin, 2009).

**Table 1:** Descriptive statistics of key variables from each group

| | Face-to-face group | | Blended learning group | | t-Test | |
|---|---|---|---|---|---|---|
| | **Mean** | **Standard deviation** | **Mean** | **Standard deviation** | **t-Statistic** | **p-Value** |
| LM | 2.83 | 0.63 | 3.34 | 0.53 | 1.66 | 0.01 |
| LS | 2.88 | 0.54 | 3.12 | 0.58 | 2.38 | 0.00 |
| LO | 2.98 | 0.42 | 3.23 | 0.48 | 4.66 | 0.00 |
| LE | 2.75 | 0.34 | 3.42 | 0.44 | 8.63 | 0.00 |

We started with a comprehensive model that included paths not directly associated with our hypotheses to test for any potential moderation effects of blended learning and assess the degree of mediation of learning engagement. We took a product indicator approach to account for the moderating effects of the learning medium; that is, we created interaction terms by multiplying the indicators of each predictor: learning engagement (LE) and learning outcomes (LO). As we illustrate, the effects of blended learning seem fully mediated by learning engagement; furthermore, it significantly moderates the relationships between learning engagement and learning outcomes or between learning outcomes and learning satisfaction.

Table 2 summarises the final model's standardised path coefficients, t-statistics, and p-values. In the final model, LE is significantly explained by the medium of learning ($\beta$= .91, p=0.02) with $R^2$=0.47; LE is significantly explained by learning outcomes by ($\beta$=0.50, p=0.01) with $R^2$=0.32; and LS is significantly explained by LE ($\beta$=0.67, p=0.03) with $R^2$=0.41. Our data thus support all our three hypotheses. Students in the blended learning group engage in learning activities more than their counterparts, who rely only on face-to-face learning. Furthermore, learning engagement is a significant determinant of learning outcomes, which is positively associated with learning satisfaction. Also, learning outcomes are higher for blended learning; the influence of the learning medium appears fully mediated by learning engagement. Results also show that the relationship between blended learning and learning outcomes becomes statistically significant when we control for learning engagement. Similarly, though students supported by blended learning exhibit higher learning satisfaction, the influences of learning medium seem mediated by learning engagement and learning outcomes. The direct impact of blended learning on learning satisfaction is statistically significant.

**Table 2:** Summary of path coefficients and statistical significance for the final model

| Path | Standardised path coefficient | t Statistics | p-Value |
|---|---|---|---|
| LM→LE (H1) | 0.91* | 3.71 | 0.02 |
| LE→LO (H2) | 0.50* | 2.37 | 0.01 |
| LO→LS (H3) | 0.41* | 11.60 | 0.03 |

## 6. Discussion

The results revealed that learning engagement helps determine students' learning outcomes and satisfaction; it deserves more research attention. As shown in Table 2, learning engagement, outcomes, and satisfaction are significantly higher in blended learning than in face-to-face learning. Learning satisfaction analysis further indicates that blended learning has a significant, direct effect on learning engagement; its influences on learning outcomes seem mediated by learning engagement, and its effects on learning satisfaction appear mediated by both learning engagement and learning outcomes. That is, the learning medium by itself does not directly increase or decrease learning outcomes or satisfaction, a finding consistent with Clark's (1994) and Hu and Hui's (2012) argument.

This finding highlights the importance of the learning process on learning outcomes. If instruction fails to engage students in the learning process, learning may not be effective or satisfactory, despite the advantages associated with face-to-face learning, such as live interactions between the instructor and students. Moreover, instructors might improve learning outcomes and satisfaction by using blended learning. As indicated, blended learning significantly changes the nature of the relationships between student engagement and learning outcomes or those between student engagement and learning satisfaction. Our results also suggest strong moderating effects of blended learning, which is supported by the work of Hu and Hui (2012).

**Table 3:** Summary of hypothesis testing results

| Hypothesis | Results |
|---|---|
| **H1:** The learning medium affects learning engagement; learning engagement is higher in blended learning than in face-to-face learning. | Supported |
| **H2:** Learning engagement positively affects learning outcomes, regardless of the medium of learning (i.e., blended learning or face-to-face learning). | Supported |
| **H3:** Perceived learning outcomes are positively associated with learning satisfaction, regardless of the medium of learning (i.e., blended learning or face-to-face learning). | Supported |

## 7. Conclusion

This study uses previously validated instruments and learning satisfaction modelling to examine students' learning using data collected from an experiment. We test the influences of blended learning on students' learning outcomes and satisfaction. According to our results, blended learning significantly affects students' engagement in learning activities; its impact on learning outcomes seems fully mediated by learning

engagement, and its influence on learning satisfaction appears fully mediated by both learning engagement and learning outcomes.

From a research perspective, it is essential to understand how blended learning might enhance students' learning outcomes. We contribute to existing blended learning literature by analysing and empirically testing the nature of its influences on learning outcomes and satisfaction. Our experimental results help explain the contradictory results in prior literature and suggest that learning engagement is a key determinant of learning outcomes that deserves future research attention. Our results suggest that educators might improve students' learning outcomes and satisfaction with blended learning by designing systems and using teaching strategies that encourage, facilitate, and reward their active engagement.

**Conflict of Interest Statement**

The authors declare no conflicts of interest.

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