

## **Learner attitudes, student characteristics, and design feature as factors in blended learning effectiveness**

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### **Abstract**

Specialists in the field of education have shown more and more interest in issues related to the learning process. Most of the studies produced by both psychologists and teachers have attempted to identify the factors that determine the learning process and to highlight possible relations among elements related to the quality of education, the teaching strategies used in the classroom and the quality of students performance. This paper investigates the effectiveness of a blended learning environment through analyzing the relationship between learner attitudes, student characteristics, and design features. This paper explores the attitudes of learners towards blended learning and seeks to establish whether there are attitudinal differences with regard to gender and learner attitudes in different schools. Our results show that blended learning is a venture worth undertaking by educational institutions but the attitude factor predicting learning performance needs to be established and therefore remains the focus of future work.

**Keywords:** Learning attitudes, behavioral learning, design feature, blended learner

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### **Introduction**

The teaching and learning environment is embracing a number of innovations and some of these involve the use of technology through blended learning. This innovative pedagogical approach has been embraced rapidly though it goes through a process. The introduction of blended learning (combination of face-to-face and online teaching and learning) initiatives is part of these innovations but its uptake, especially in the developing world faces challenges for it to be an effective innovation in teaching and learning. Blended learning effectiveness has quite a number of underlying factors that pose challenges. One big challenge is about how users can successfully use the technology and ensuring participants' commitment given the individual learner characteristics and encounters with technology (Hofmann, 2014). Hofmann adds that users getting into difficulties with technology may result into abandoning the learning and eventual failure of technological applications. In a report by Oxford Group (2013), some learners (16%) had negative attitudes to blended learning while 26% were concerned that learners would not complete study in blended learning. Learners are important partners in any learning process and therefore, their backgrounds and characteristics affect their ability to effectively carry on with learning and being in blended learning, the design tools to be used may impinge on the effectiveness in their learning.

Garrison and Kanuka (2004) examined the transformative potential of blended learning and reported an increase in course completion rates, improved retention and increased student satisfaction. Comparisons between blended learning environments have been done to establish the disparity between

academic achievement, grade dispersions and gender performance differences and no significant differences were found between the groups (Demirkol & Kazu, 2014).

However, blended learning effectiveness may be dependent on many other factors and among them student characteristics, design features and learning outcomes. Re- search shows that the failure of learners to continue their online education in some cases has been due to family support or increased workload leading to learner dropout (Park & Choi, 2009) as well as little time for study. Additionally, it is dependent on learner interactions with instructors since failure to continue with online learning is attributed to this.

## Literature Review

### Blended Learner

The definition of blended learning is a formal education program in which a student learns:

1. At least in part through online learning, with some element of student control over time, place, path, and/or pace;
2. At least in part in a supervised brick-and-mortar location away from home;
3. The modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience.

The majority of blended-learning programs resemble one of four models: Rotation, Flex, A La Carte, and Enriched Virtual. The Rotation model includes four sub-models: Station Rotation, Lab Rotation, Flipped Classroom, and Individual Rotation.

Rotation model is a course or subject in which students rotate on a fixed schedule or at the teacher's discretion between learning modalities, at least one of which is online learning. Other modalities might include activities such as small-group or full-class instruction, group projects, individual tutoring, and pencil-and-paper assignments. The students learn mostly on the brick-and-mortar campus, except for any homework assignments.

1. Station Rotation is a course or subject in which students experience the Rotation model within a contained classroom or group of classrooms. The Station Rotation model differs from the Individual Rotation model because students rotate through all of the stations, not only those on their custom schedules.
2. Lab Rotation is a course or subject in which students rotate to a computer lab for the online-learning station.
3. Flipped Classroom is a course or subject in which students participate in online learning off-site in place of traditional homework and then attend the brick-and-mortar school for face-to-face, teacher-guided practice or projects. The primary delivery of content and instruction is online, which differentiates a Flipped Classroom from students who are merely doing homework practice online at night.
4. Individual Rotation is a course or subject in which each student has an individualized playlist and does not necessarily rotate to each available station or modality. An algorithm or teacher(s) sets individual student schedules.

Flex model is a course or subject in which online learning is the backbone of student learning, even if it directs students to offline activities at times. Students move on an individually customized, fluid schedule among learning modalities. The teacher of record is on-site, and students learn mostly on the brick-and-mortar campus, except for any homework assignments. The teacher of record or other adults provide face-to-face support on a flexible and adaptive as-needed basis through activities such as small-group instruction, group projects, and individual tutoring. Some implementations have substantial face-to-face support, whereas others have minimal support.

A La Carte model is a course that a student takes entirely online to accompany other experiences that the student is having at a brick-and-mortar school or learning center. The teacher of record for the A La Carte course is the online teacher. Students may take the A La Carte course either on the brick-and-mortar campus or off-site. This differs from full-time online learning because it is not a whole-school experience. Students take some courses A La Carte and others face-to-face at a brick-and-mortar campus.

Enriched Virtual model is a course or subject in which students have required face-to-face learning sessions with their teacher of record and then are free to complete their remaining coursework remote from the face-to-face teacher. Online learning is the backbone of student learning when the students are located remotely. The same person generally serves as both the online and face-to-face teacher. Many Enriched Virtual programs began as full-time online schools and then developed blended programs to provide students with brick-and-mortar school experiences. The Enriched Virtual model differs from the Flipped Classroom because in Enriched Virtual programs, students seldom meet face-to-face with their teachers every weekday. It differs from a fully online course because face-to-face learning sessions are more than optional office hours or social events; they are required.

### **Learner Characteristics and Blended Learning Effectiveness**

Rovai, (2003) noted that learners' computer literacy and time management are crucial in distance learning contexts and concluded that such factors are meaningful in online classes. This is supported by Selim (2007) that learners need to possess time management skills and computer skills necessary for effectiveness in e-learning and blended learning. Self-regulatory skills of time management lead to better performance and learners' ability to structure the physical learning environment leads to efficiency in e-learning and blended learning environments. Learners need to seek helpful assistance from peers and teachers through chats, email and face-to-face meetings for effectiveness (Lynch & Dembo, 2004). Factors such as learners' hours of employment and family responsibilities are known to impede learners' process of learning, blended learning inclusive (Cohen, Stage, Hammack, & Marcus, 2012). It was also noted that a common factor in failure and learner drop-out is the time conflict which is compounded by issues of family, employment status as well as management support (Packham, Jones, Miller, & Thomas, 2004). A study by Thompson (2004) shows that work, family, insufficient time and study load made learners withdraw from online courses.

Learner attitudes to blended learning can result in its effectiveness and these shape behavioral intentions which usually lead to persistence in a learning environment, blended inclusive. Selim, (2007) noted that the learners' attitude towards e-learning and blended learning are success factors for these learning environments. Learner performance by age and gender in e-learning and blended learning has been found to indicate no significant differences between male and female learners and different age groups (i.e. young, middle-aged and old above 45 years) (Coldwell, Craig, Paterson, & Mustard, 2008). This implies that the potential for blended learning to be effective exists and is unhampered by gender or age differences.

### **Learner Attitude as a Predictor**

From a general point of view, a study by Nyamubi (2016) showed that learner attitudes towards the learning of English language were positively related to their performance in the subject. Therefore, attitudes can predict whether learner satisfaction and outcomes are achieved or not.

Janssen and O'Brien (2014) dealt with student opinions and experiences with online homework systems and noted that learner positive attitudes about homework had the strongest effects on homework score (performance). The study was concerned with measurement of learner attitudes about the online homework system not blended learning as the case in our study. Eom, Wen and Ashill (2006) found out in their study about determinants of student satisfaction and learning outcomes in University online courses that instructor feedback and learning style significantly affected learning outcomes while course structure, instructor feedback, self-motivation, learning style, interaction and instructor facilitation significantly affected learner satisfaction in online learning. Our interest here are the factors such as interaction, course structure and instructor feedback which are part of learner-instructor interaction predicting learner satisfaction though not in a blended learning environment. The attitude measure for our study comprises learner autonomy, quality of instructional methods and course interface as additional to the factors tackled by Eom, Wen and Ashill (2006). They went ahead to indicate that course structure was crucial and affects the success of distance education. They noted that under course structure, the course materials being logically organised and course objectives clearly communicated, lead to high levels of student satisfaction and perceived learning outcomes. Swan (2001) found that learners who reported high levels of interaction with instructors and peers had high levels of satisfaction. Additionally, high levels of learner-to-instructor interaction were strongly associated with high levels of online user satisfaction as well as learning outcomes (Arbaugh, 2000; Swan, 2001). However, there is little or no study that has specifically dealt with learner attitudes predicting learning outcomes and satisfaction in a blended learning environment context.

### Learner Outcomes

The outcomes under scrutiny in this study include performance, motivation, satisfaction and knowledge construction. Motivation is seen here as an outcome because, much as cognitive factors such as course grades are used in measuring learning outcomes, affective factors like intrinsic motivation may also be used to indicate outcomes of learning (Kuo, Walker, Belland, & Schroder, 2013). Research shows that high motivation among online learners leads to persistence in their courses (Menager-Beeley, 2004). Sankaran and Bui (2001) indicated that less motivated learners performed poorly in knowledge tests while those with high learning motivation demonstrate high performance in academics (Green, Nelson, Martin, & Marsh, 2006). Lim and Kim, (2003) indicated that learner interest as a motivation factor promotes learner involvement in learning and this could lead to learning effectiveness in blended learning.

Learner satisfaction was noted as a strong factor for effectiveness of blended and online courses (Wilging & Johnson, 2009) and dissatisfaction may result from learners' incompetence in the use of the learning management system as an effective learning tool since, as Islam (2014) puts it, users may be dissatisfied with an information system due to ease of use. A lack of prompt feedback for learners from course instructors was found to cause dissatisfaction in an online graduate course. In addition, dissatisfaction resulted from technical difficulties as well as ambiguous course instruction Hara and Kling (2001).

These factors, once addressed, can lead to learner satisfaction in e-learning and blended learning and eventual effectiveness. A study by Blocker and Tucker (2001) also showed that learners had difficulties with technology and inadequate group participation by peers leading to dissatisfaction within these design features. Student-teacher interactions are known to bring satisfaction within online courses. Study results by Swan (2001) indicated that student-teacher interaction strongly related with student satisfaction and high learner-learner interaction resulted in higher levels of course satisfaction. Descriptive results by Naaj, Nachouki, and Ankit (2012) showed that learners were satisfied with technology which was a video-conferencing component of blended learning with a mean of 3.7. The same study indicated student satisfaction with instructors at a mean of 3.8. Askar and Altun, (2008) found that learners were satisfied with face-to-face sessions of the blend with t-tests and ANOVA results indicating female scores as higher than for males in the satisfaction with face-to-face environment of the blended learning.

Studies comparing blended learning with traditional face-to-face have indicated that learners perform equally well in blended learning and their performance is unaffected by the delivery method (Kwak, Menezes, & Sherwood, 2013). In another study, learning experience and performance are known to improve when traditional course delivery is integrated with online learning (Stacey & Gerbic, 2007). Such improvement as noted may be an indicator of blended learning effectiveness. Our study however, delves into improved performance but seeks to establish the potential of blended learning effectiveness by considering grades obtained in a blended learning experiment. Score 50 and above is considered a pass in this study's setting and learners scoring this and above will be considered to have passed. This will make our conclusions about the potential of blended learning effectiveness.

Regarding knowledge construction, it has been noted that effective learning occurs where learners are actively involved (Nurmela, Palonen, Lehtinen & Hakkarainen, 2003, cited in Zhu, 2012) and this may be an indicator of learning environment effectiveness. Effective blended learning would require that learners are able to initiate, discover and accomplish the processes of knowledge construction as antecedents of blended learning effectiveness. A study by Rahman, Yasin and Jusoff (2011) indicated that learners were able to use some steps to construct meaning through an online discussion process through assignments given. In the process of giving and receiving among themselves, the authors noted that learners learned by writing what they understood. From our perspective, this can be considered to be accomplishment in the knowledge construction process. Their study further shows that learners construct meaning individually from assignments and this stage is referred to as pre-construction which for our study, is an aspect of discovery in the knowledge construction process.

### Predictors of Blended Learning Effectiveness

Researchers have dealt with success factors for online learning or those for traditional face-to-face learning but little is known about factors that predict blended learning effectiveness in view of learner characteristics and blended learning design features. This part of our study seeks to establish the learner characteristics/backgrounds and design features that predict blended learning effectiveness with regard to

satisfaction, outcomes, motivation and knowledge construction. Song, Singleton, Hill, and Koh (2004) examined online learning effectiveness factors and found out that time management (a self-regulatory factor) was crucial for successful online learning. Eom, Wen, and Ashill (2006) using a survey found out that interaction, among other factors, was significant for learner satisfaction. Technical problems with regard to instructional design were a challenge to online learners thus not indicating effectiveness (Song et al., 2004), though the authors also indicated that descriptive statistics to a tune of 75% and time management (62%) impact on success of online learning. Arbaugh (2000) and Swan (2001) indicated that high levels of learner-instructor interaction are associated with high levels of user satisfaction and learning outcomes. A study by Naaj et al. (2012) indicated that technology and learner interactions, among other factors, influenced learner satisfaction in blended learning.

### Objective and Research Questions of the Current Study

The objective of the current study is to investigate the effectiveness of blended learning in view of student satisfaction, knowledge construction, performance and intrinsic motivation and how they are related to student characteristics and blended learning design features in a blended learning environment.

## Method

### Research Design

This research applies a quantitative design where descriptive statistics are used for the student characteristics and design features data, t-tests for the age and gender variables to determine if they are significant in blended learning effectiveness and regression for predictors of blended learning effectiveness.

This study is based on an experiment in which learners participated during their study using face-to-face sessions and an on-line session of a blended learning design. A learning management system (Moodle) was used and learner characteristics/background and blended learning design features were measured in relation to learning effectiveness. It is therefore a planning evaluation research design as noted by Guskey (2000) since the outcomes are aimed at blended learning implementation at MMU. The plan under which the various variables were tested involved face-to-face study at the beginning of a 17 week semester which was followed by online teaching and learning in the second half of the semester. The last part of the semester was for another face-to-face to review work done during the online sessions and final semester examinations. A questionnaire with items on student characteristics, design features and learning outcomes was distributed among students from three schools and one direct-orate of postgraduate studies.

### Data Analysis

First, descriptive statistics was conducted. Shapiro-Wilk test was done to test normality of the data for it to qualify for parametric tests. The test results for normality of our data before the t-test resulted into significant levels (Male = .003, female = .000) thereby violating the normality assumption. We therefore used the skewness and curtosis results which were between -1.0 and +1.0 and assumed distribution to be sufficiently normal to qualify the data for a parametric test, (Pallant, 2010). An independent samples t-test was done to find out the differences in male and female performance to explain the gender characteristics in blended learning effectiveness. A one-way ANOVA between subjects was conducted to establish the differences in performance between age groups. Finally, multiple regression analysis was done between student variables and design elements with learning outcomes to determine the significant predictors for blended learning effectiveness.

## Results and Discussions

Student characteristics, blended learning design features and learning outcomes (RQ1) t-test was carried out to establish the performance of male and female learners in the blended learning set up. This was aimed at finding out if male and female learners do perform equally well in blended learning given their different roles and responsibilities in society. It was found that male learners performed slightly better (M = 62.5) than their female counterparts (M = 61.1). An independent t-test revealed that the difference between the performances was not statistically significant ( $t=1.569$ ,  $df=228$ ,  $p=0.05$ , one tailed). The magnitude of the differences in the means is small with effect size ( $d = 0.18$ ). A one way between subjects ANOVA was conducted on the performance of different age groups to establish the performance of

learners of young and middle aged age groups (20–30, young & and 31–39, middle aged). This revealed a significant difference in performance ( $F(1,236 = 8.498, p < .001)$ ).

Average percentages of the items making up the self regulated learning scale are used to report the findings about all the sub-scales in the learner characteristics/background scale. Results show that learner self-regulation was good enough at 72.3% in all the sub-scales of goal setting, environment structuring, task strategies, time management, help-seeking and self-evaluation among learners. The least in the scoring was task strategies at 67.7% and the highest was learner environment structuring at 76.3%. Learner attitude towards blended learning environment is at 76% in the sub-scales of learner autonomy, quality of instructional materials, course structure, course interface and interactions. The least scored here is attitude to course structure at 66% and their attitudes were high on learner autonomy and course interface both at 82%. Results on the learners' computer competences can be seen that learners are skilled in word processing at 91%, email at 63.5%, spreadsheets at 68%, web browsers at 70.2% and html tools at 45.4%. They are therefore good enough in word processing and web browsing. Their computer confidence levels are reported at 75.3% and specifically feel very confident when it comes to working with a computer (85.7%). Levels of family and social support for learners during blended learning experiences are at 60.5 and 75% respectively. There is however a low score on learners being assisted by family members in situations of computer setbacks (33.2%) as 53.4% of the learners reported no assistance in this regard. A higher percent- age (85.3%) is reported on learners getting support from family regarding provision of essentials for learning such as tuition. A big percentage of learners spend two hours on study while at home (35.3%) followed by one hour (28.2%) while only 9.7% spend more than three hours on study at home. Peers showed great care during the blended learning experience (81%) and their experiences were appreciated by the society (66%). Workload management by learners vis-à-vis studying is good at 60%. Learners reported that their workmates stand in for them at workplaces to enable them do their study in blended learning while 61% are encouraged by their bosses to go and improve their skills through further education and training. On the time spent on other activities not related to study, majority of the learners spend three hours (35%) while 19% spend 6 hours. Sixty percent of the learners have to answer to someone when they are not attending to other activities outside study compared to the 39.9% who do not and can therefore do study or those other activities.

### **Blended Learning Design Features**

However, learners became skilled at navigating around the learning management system (79%) and it was easy for them to locate course content, tools and resources needed such as course works, news, discussions and journal materials. They effectively used the communication tools (60%) and to work with peers by making posts (57%). They reported that online resources were well organized, user friendly and easy to access (71%) as well as well structured in a clear and understandable manner (72%). They therefore recommended the use of online resources for other course units in future (78%) because they were satisfied with them (64.3%). On the whole, the online resources were fine for the learners (67.2%) and useful as a learning resource (80%). The learners' perceived usefulness/satisfaction with online system, tools, and resources was at 81% as the LMS tools helped them to communicate, work with peers and reflect on their learning (74%). They reported that using moodle helped them to learn new concepts, information and gaining skills (85.3%) as well as sharing what they knew or learned (76.4%). They enjoyed the course units (78%) and improved their skills with technology (89%).

Learner interactions were seen from three angles of cognitivism, collaborative learning and student-teacher interactions. Collaborative learning was average at 50% with low percentages in learners posting challenges to colleagues' ideas online (34%) and posting ideas for colleagues to read online (37%). They however met oftentimes online (60%) and organized how they would work together in study during the face-to-face meetings (69%). The common form of communication medium frequently used by learners during the blended learning experience was by phone (34.5%) followed by whatsapp (21.8%), face book (21%), discussion board (11.8%) and email (10.9%). At the cognitive level, learners interacted with content at 72% by reading the posted content (81%), exchanging knowledge via the LMS (58.4%), participating in discussions on the forum (62%) and got course objectives and structure introduced during the face-to-face sessions (86%). Student-teacher interaction was reported at 71% through instructors individually working with them online (57.2%) and being well guided towards learning goals (81%). They did receive suggestions from instructors about resources to use in their learning (75.3%) and instructors provided learning input for them to come up with their own answers (71%).

The technology quality during the blended learning intervention was rated at 69% with availability of 72%, quality of the resources was at 68% with learners reporting that discussion boards gave right content necessary for study (71%) and the email exchanges containing relevant and much needed information (63.4%) as well as chats comprising of essential information to aid the learning (69%). Internet reliability was rated at 66% with a speed considered averagely good to facilitate online activities (63%). They however reported that there was intermittent breakdown during online study (67%) though they could complete their internet program during connection (63.4%). Learners eventually found it easy to download necessary materials for study in their blended learning experiences (71%).

Learner extent of use of the learning management system features show that they are very rarely used features include the blog and wiki while very often used ones include the email, forum, chat and calendar. The effectiveness of the LMS was rated at 79% by learners reporting that they found it useful (89%) and using it makes their learning activities much easier (75.2%). Moodle has helped learners to accomplish their learning tasks more quickly (74%) and that as a LMS, it is effective in teaching and learning (88%) with overall satisfaction levels at 68%. However, learners note challenges in the use of the LMS regarding its performance as having been problematic to them (57%) and only 8% of the learners reported navigation while 16% reported access as challenges.

Learner attitudes towards Face-to-Face support were reported at 88% showing that the sessions were enjoyable experiences (89%) with high quality class discussions (86%) and therefore recommended that the sessions should continue in blended learning (89%). The frequency of the face-to-face sessions is shown in the table below as preferred by learners (Table 5). Learners preferred face-to-face sessions after every month in the semester (33.6%) and at the beginning of the blended learning session only (27.7%).

### Learner Outcomes

Learners reported high intrinsic motivation levels with interest and enjoyment of tasks at 83.7%, perceived competence at 70.2%, effort/importance sub-scale at 80%, pressure/ tension reported at 54%. The pressure percentage of 54% arises from learners feeling nervous (39.2%) and a lot of anxiety (53%) while 44% felt a lot of pressure during the blended learning experiences. Learners however reported the value/usefulness of blended learning at 91% with majority believing that studying online and face-to-face had value for them (93.3%) and were therefore willing to take part in blended learning (91.2%). They showed that it is beneficial for them (94%) and that it was an important way of studying (84.3%).

Learner satisfaction was reported at 81% especially with instructors (85%) high percentage reported on encouraging learner participation during the course of study 93%, course content (83%) with the highest being satisfaction with the good relationship between the objectives of the course units and the content (90%), technology (71%) with a high percentage on the fact that the platform was adequate for the online part of the learning (76%), interactions (75%) with participation in class at 79%, and face-to-face sessions (91%) with learner satisfaction high on face-to-face sessions being good enough for interaction and giving an overview of the courses when objectives were introduced at 92%.

Learners' knowledge construction was reported at 78% with initiation and discovery scales scoring 84% with 88% specifically for discovering the learning points in the course units. The accomplishment scale in knowledge construction scored 71% and specifically the fact that learners were able to work together with group members to accomplish learning tasks throughout the study of the course units (79%). Learners developed reports from activities (67%), submitted solutions to discussion questions (68%) and did critique peer arguments (69%). Generally, learners performed well in blended learning in the final examination with an average pass of 62% and standard deviation of 7.5.

Significant predictors of blended learning effectiveness (RQ 2) <sup>11</sup> A standard multiple regression analysis was done taking learner characteristics/ background and design features as predictor variables and learning outcomes as criterion variables. The data was first tested to check if it met the linear regression test assumptions and results showed the correlations between the independent variables and each of the dependent variables (highest 0.62 and lowest 0.22) as not being too high, which indicated that multicollinearity was not a problem in our model. From the coefficients table, the VIF values ranged from 1.0 to 2.4, well below the cut off value of 10 and indicating no possibility of multicollinearity. The normal probability plot was seen to lie as a reasonably straight diagonal from bottom left to top right indicating normality of our data. Linearity was found suitable from the scatter plot of the standardized residuals and was rectangular in distribution. Outliers were no cause for concern in our data since we had

only 1% of all cases falling outside 3.0 thus proving the data as a normally distributed sample. Our R-square values was at 0.525 meaning that the independent variables explained about 53% of the variance in overall satisfaction, motivation and knowledge construction of the learners. All the models explaining the three dependent variables of learner satisfaction, intrinsic motivation and knowledge construction were significant at the 0.000 probability level (Table 6).

From the table above, design features (technology quality and online tools and resources), and learner characteristics (attitudes to blended learning, self-regulation) were significant predictors of learner satisfaction in blended learning. This means that good technology with the features involved and the learner positive attitudes with capacity to do blended learning with self drive led to their satisfaction. The design features (technology quality, interactions) and learner characteristics (self regulation and social support), were found to be significant predictors of learner knowledge construction. This implies that learners' capacity to go on their work by themselves supported by peers and high levels of interaction using the quality technology led them to construct their own ideas in blended learning. Design features (technology quality, online tools and resources as well as learner interactions) and learner characteristics (self regulation), significantly predicted the learners' intrinsic motivation in blended learning suggesting that good technology, tools and high interaction levels with independence in learning led to learners being highly motivated. Finally, none of the independent variables considered under this study were predictors of learning outcomes (grade).

## Discussion

In this study we have investigated learning outcomes as dependent variables to establish if particular learner characteristics/backgrounds and design features are related to the outcomes for blended learning effectiveness and if they predict learning outcomes in blended learning. The study suggests that the characteristics and design features examined are good drivers towards an effective blended learning environment though a few of them predicted learning outcomes in blended learning.

Student characteristics/background, blended learning design features and learning outcomes<sup>11</sup> The learner characteristics, design features investigated are potentially important for an effective blended learning environment. Performance by gender shows a balance with no statistical differences between male and female. There are statistically significant differences ( $p < .005$ ) in the performance between age groups with means of 62% for age group 20–30 and 67% for age group 31–39. The indicators of self regulation exist as well as positive attitudes towards blended learning. Learners do well with word processing, e-mail, spreadsheets and web browsers but still lag below average in html tools. They show computer confidence at 75.3%; which gives prospects for an effective blended learning environment in regard to their computer competence and confidence. The levels of family and social support for learners stand at 61 and 75% respectively, indicating potential for blended learning to be effective. The learners' balance between study and work is a drive factor towards blended learning effectiveness since their management of their workload vis a vis study time is at 60 and 61% of the learners are encouraged to go for study by their bosses. Learner satisfaction with the online system and its tools shows prospect for blended learning effectiveness but there are challenges in regard to locating course content and assignments, submitting their work and staying on a task during online study. Average collaborative, cognitive learning as well as learner-teacher interactions exist as important factors. Technology quality for effective blended learning is a potential for effectiveness though features like the blog and wiki are rarely used by learners. Face-to-face support is satisfactory and it should be conducted every month. There is high intrinsic motivation, satisfaction and knowledge construction as well as good performance in examinations ( $M = 62\%$ ,  $SD = 7.5$ ); which indicates potentiality for blended learning effectiveness.

Among the design features, technology quality, online tools and face-to-face support are predictors of learner satisfaction while learner characteristics of self regulation and attitudes to blended learning are predictors of satisfaction. Technology quality and interactions are the only design features predicting learner knowledge construction, while social support, among the learner backgrounds, is a predictor of knowledge construction. Self regulation as a learner characteristic is a predictor of knowledge construction. Self regulation is the only learner characteristic predicting intrinsic motivation in blended learning while technology quality, online tools and interactions are the design features predicting intrinsic motivation. However, all the independent variables are not significant predictors of learning performance in blended learning.

The high computer competences and confidence is an antecedent factor for blended learning effectiveness as noted by Hadad (2007) and this study finds learners confident and competent enough for the effectiveness of blended learning. A lack in computer skills causes failure in e-learning and blended learning as noted by Shraim and Khlaif (2010). From our study findings, this is no threat for blended learning our case as noted by our results. Contrary to Cohen et al. (2012) findings that learners' family responsibilities and hours of employment can impede their process of learning, it is not the case here since they are drivers to the blended learning process. Time conflict, as compounded by family, employment status and management support (Packham et al., 2004) were noted as causes of learner failure and drop out of online courses. Our results show, on the contrary, that these factors are drivers for blended learning effectiveness because learners have a good balance between work and study and are supported by bosses to study. In agreement with Selim (2007), learner positive attitudes towards e-and blended learning environments are success factors. In line with Coldwell et al. (2008), no statistically significant differences exist between age groups. We however note that Coldwell, et al dealt with young, middle-aged and old above 45 years whereas we dealt with young and middle aged only.

Learner interactions at all levels are good enough and contrary to Astleitner, (2000) that their absence makes learners withdraw, they are a drive factor here. In line with Loukis (2007) the LMS quality, reliability and ease of use lead to learning efficiency as technology quality, online tools are predictors of learner satisfaction and intrinsic motivation. Face-to-face sessions should continue on a monthly basis as noted here and is in agreement with Marriot et al. (2004) who noted learner preference for it for facilitating social interaction and communication skills. High learner intrinsic motivation leads to persistence in online courses as noted by Menager-Beeley, (2004) and is high enough in our study. This implies a possibility of an effectiveness blended learning environment. The causes of learner dissatisfaction noted by Islam (2014) such as incompetence in the use of the LMS are contrary to our results in our study, while the one noted by Hara and Kling, (2001) as resulting from technical difficulties and ambiguous course instruction are no threat from our findings. Student-teacher interaction showed a relation with satisfaction according to Swan (2001) but is not a predictor in our study. Initiating knowledge construction by learners for blended learning effectiveness is exhibited in our findings and agrees with Rahman, Yasin and Jusof (2011). Our study has not agreed with Eom et al. (2006) who found learner interactions as predictors of learner satisfaction but agrees with Naaj et al. (2012) regarding technology as a predictor of learner satisfaction.

## Conclusions

An effective blended learning environment is necessary in undertaking innovative pedagogical approaches through the use of technology in teaching and learning. An examination of learner characteristics/background, design features and learning outcomes as factors for effectiveness can help to inform the design of effective learning environments that involve face-to-face sessions and online aspects. Most of the student characteristics and blended learning design features dealt with in this study are important factors for blended learning effectiveness. None of the independent variables were identified as significant predictors of student performance. These gaps are open for further investigation in order to understand if they can be significant predictors of blended learning effectiveness in a similar or different learning setting.

In planning to design and implement blended learning, we are mindful of the implications raised by this study which is a planning evaluation research for the design and eventual implementation of blended learning. Universities should be mindful of the interplay between the learner characteristics, design features and learning outcomes which are indicators of blended learning effectiveness. From this research, learners manifest high potential to take on blended learning more especially in regard to learner self-regulation exhibited. Blended learning is meant to increase learners' levels of knowledge construction in order to create analytical skills in them. Learner ability to assess and critically evaluate knowledge sources is hereby established in our findings. This can go a long way in producing skilled learners who can be innovative graduates enough to satisfy employment demands through creativity and innovativeness. Technology being less of a shock to students gives potential for blended learning design. Universities and other institutions of learning should continue to emphasize blended learning approaches through installation of learning management systems along with strong internet to enable effective learning through technology especially in the developing world.

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