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The Influence of Student Interaction on Sense of Community and Academic Performance in Blended Learning Courses in Selected Tanzania Universities

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ABSTRACT

The Student interaction has been reported to be essential in enhancing students' performance and sense of community, although it tends to differ across various variables. This study investigates students' interaction in blended learning (BL) courses at two Tanzanian universities and how their interaction ultimately relates to a sense of community and academic performance. A total of 492 undergraduate students studying education, accounting and economics were involved. The data were collected using the interaction and sense of community scales, and student performance was obtained from coursework scores. Furthermore, the data analysis involved mean scores, regression and Kruskal Wallis Tests. The results of this study demonstrate that students' characteristics, such as gender and ICT skills, did not result in any significant differences regarding interaction; only degree programmes were significant. Additionally, student interaction did not predict their academic performance but only predicted their sense of community. The findings of this study indicate that degree programmes influence student interaction. Additionally, student interaction positively contributes to a sense of community without impacting academic performance. Study contribution and implications are also discussed. **©authors**

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1. Introduction

Students are expected to achieve greater academic success and engagement with increased learning interaction that ideally develops a sense of community in the learning environment. Through interaction and shared learning activities, students actively collaborate in constructing meaningful and relevant knowledge and skills (Jonassen et al., 2008). Equally, meaningful interaction relates to learning motivation, interest, and satisfaction (Bolliger & Martindale, 2004; Rovai, 2002) that advance students' communication, collaboration, and reflection on what is learned. In the current era, learning interaction is capitalised on by digital technologies, which led to the emergence of blended learning in the learning environment. Blended Learning represents a standardised modality which facilitates access to learning opportunities by fostering collaboration, interactivity, and intensive use of technology (Turpo & García, 2020). It is a delivery mode when the learning environment is no longer purely synchronous or asynchronous; instead, this hybrid learning combines multiple learning approaches that integrate offline and online interaction (Prohorets & Plekhanova, 2015). The offline and online activities keep students and teachers connected as a learning community, which engages students in constructivist learning (Villanueva et al., 2023). It makes teachers and students communicate outside the traditional classrooms and actively participate in the learning process (Buran & Evseeva, 2015). It is worth saying that blended learning should become a top-priority mode for teaching and learning in modern conditions.

However, one of the most critical challenges in the blended learning approach is designing feasible interactive activities that might be adapted for online use or flipped to the opposite environment. It is the fact that certain classroom practices, processes and procedures facilitate learning, while others may hinder learning (Walsh, 2021). Correspondingly, the level of learner interaction and satisfaction depends on the effectiveness of blended learning, which is influenced by learning environment, culture, and interactional competence that differ based on context. Considering blended learning in Tanzanian contexts, there is a pressing need to rethink issues of student interaction and its influence on enhancing their sense of community and academic performance. Therefore, the main objective of this study was to explore student interaction in blended learning and its impact on their academic performance and building a sense of community.

2. Literature Review

2.1.Blended learning and student interaction

In the modern era, research on blended learning is highly dominant and still in demand. The literature shows that blended learning is an important area that still calls for more research as it incorporates an online learning mode that is highly demanded and challenging (Smith & Hill, 2019; Kumar et al., 2021; Ashraf et al., 2021). As defined by Dziuban, Hartman and Moskal (2004) as well as Cronje (2020), blended learning is viewed as a pedagogical approach which combines face-to-face learning and online instruction. Face to face requires students and teachers to be in one place for instructions. Meanwhile, online learning implies that students and teachers work together simultaneously but in different places. It can be synchronous or asynchronous online delivery. Synchronous virtual learning requires everyone to be online at a prescribed time. However, an asynchronous environment delivers education in non-real-time. Thus, blended learning allows interaction between the learner and teacher and among learners irrespective of time and space (Ashraf et al., 2021; Beldarrain, 2006).

Regardless of the outcome, blended learning intends to enhance student academic learning by promoting the interaction among teachers, students and learning resources. Thurmond and Wombach (2004, p.4) define learning interaction as “the learner’s engagement with the course content, other learners, the instructor, and the technological medium used in the

course to increase the understanding of course content or mastery of the designed goal." While teachers interact with students on the one hand, students interact with their fellow students and materials on the other. Learning interaction is an important aspect of teaching as it influences learning. The learning interaction can be considered from different angles, including social, cognitive, emotional, and technological exchanges, which are crucial to students' learning (Lee & Bonk, 2016). Social interactions involve the sharing of social cues, cognitive interactions involve the sharing of knowledge through discussions and interactions. Meanwhile, emotional interactions entail sharing feelings (Rimé et al., 2020; Lee & Bonk, 2016).

Instructors need to keep in mind that designing learning interaction in blended learning mode differs from traditional classroom (Fleischmann, 2021). In blended learning mode, students interact from face-to-face sessions and discussions to live classes, chat rooms, video conferencing, and social media networks. The interaction across this range of learning modes differs based on different factors. For example, Baragash and Al-Samarraie (2018) studied the influence of multiple delivery modes on students' performance in blended learning courses. The results of their study demonstrate that students interact mostly using WhatsApp, virtual classrooms, interactive e-books, formal and informal discussion boards, Facebook and Twitter. Similarly, study by Donnelly (2010) shows that in blended learning of problem-based learning courses, the students preferred live interactions for sharing and discussing. Blended learning takes advantage of flexible asynchronous and synchronous delivery environments to give access to the teaching material, discussions, and forums and receive quick feedback (Prohorets & Plekhanova, 2015). Thus, a suitable blended learning environment must be created to utilise the mode for students learning thoroughly.

2.2. Theoretical lens

Learning refers to changes in behaviour, cognitions, and attitude due to experience or training (Tshabalala, Ndeya-ndereya, & Merwe, 2014). Learning is inherently community-based and collaborative (Garrison, 2013) and occurs in social settings (Vygotysky,1978). This notion has become central in constructivist theory, which emphasises learning as a community enterprise (Anderson et al., 2000). The modern process of knowledge construction occurs through interaction in the learning community mainly in blended mode. The face to face and online mode of interaction has been a preferred learning modes among students globally. However, the degree of interaction depends on the value of interaction and harnessing opportunities among members of a learning community (Prohorets & Plekhanova, 2015). As such, the interaction in the blended learning community has been associated with social exchange theory, which claims that individual behaviour is based on reciprocity, i.e., individuals participate in activities only if they achieve (or expect to achieve) values from the exchange (Luo et al., 2017). Based on social exchange theory, student interaction influences their motivation to participate in a lesson due to the social, cognitive and emotional exchanges associated with such interactions (Saeed & Zyngier, 2012). Likewise, student interaction is explained through the social-cultural learning theory, which proposes that learning occurs through social interactivity, resulting in the individual's integration and retention of the acquired knowledge (Brinkmann, 2018). Further, student interaction influences their learning and enhances their interaction and sense of community even more.

Following the introduction of blended learning, which offers more flexibility in expanding interactions, researchers have now paid more attention to studying students' sense of community (Gillen-O'Neel, 2021; Drouin & Vartanian, 2010). The sense of community includes things such as membership, influence, shared emotional states, connectedness and integration. A sense of community is defined as "a feeling that members matter to one

another and to the group, and a shared faith that members' needs will be met through their commitment to being together" (McMillan & Chavis 1986). It is an interactive relationship which is facilitated by the instructor, in which students have cultivated trust with each other, care, collaborate (with), feel, and comfort one another, and have a shared sense of purpose (Gillen-O'Neel, 2021). The sense of community is emphasised in various theories, including the community of inquiry model (Zimmerman & Nimon, 2017) and the sense of connectedness (Bolliger and Inan (2012). Within the community of inquiry, members can highly unite, collaborate and work together to achieve community and individual goals. Thus, in the learning community, students can significantly improve their interaction and academic performance (Zhu, 2012; Amro et al., 2015). Studies have investigated a sense of community in online courses (Lin & Gao, 2020; Chatterjee & Correia, 2020; Bolliger & Inan, 2012; Oviawe, 2020), but little about BL courses. Similarly, though student interaction is known to influence learning, motivation and satisfaction, little is known about how student interaction affects the sense of community and academic performance, especially in BL courses (Almasi, 2019; Oviawe, 2020). Therefore, drawing on Vygotsky's social-cultural learning and social exchange theories, this study examined students' interaction and its influence on their sense of community and academic performance in BL courses in selected Tanzanian universities.

2.3. Student interaction in relation to a sense of community

In the context of blended courses, a sense of community involves the values students obtain from their interaction within the BL community and their sense of connection among themselves and the course (Luo et al., 2017). Therefore, a sense of community relates to students' interaction among themselves in their BL courses and how they feel about the interaction. This interaction could be asymmetrical, in which only one-way communication is involved, such as a student watching a documentary, or symmetrical, wherein two parts are involved—for instance, two students discussing a point via an online forum or web-based chat programmes (Holden & Westfall, 2006). Luo et al. (2017) argue that in the context of e-learning, interpersonal interactions can be classified into two types: student-instructor interaction and student-student interaction; however, Luo and associates seem to disregard [1]human-technology interaction. Nevertheless, active participation in online interactions is an important way to maintain students' sense of community, and other studies have linked student interaction to their satisfaction (Rovai, 2002). Furthermore, student interaction and collaborative learning have been reported to influence students' feelings of closeness and knowledge sharing. In particular, in their study on the effects of a written collaborative learning environment on perceived learning, (Challob et al., 2016) found that student collaborative writing was related to a sense of community and perceived learning. Studies conducted elsewhere, such as (Rovai & Jordan, 2004; and Tayebinik and Puteh, 2013), show that interactive BL courses produce a stronger sense of community compared to fully online or traditional face-to-face courses. Students' sense of community has also been related to student satisfaction and success (Wicks et al., 2015; Cacciamani et al., 2019).

2.4. Student interaction and academic performance

Some authors consider student interaction as an essential component of learning in an online and/or BL environment (Garrison, 2000; Rovai, 2002). Some authors suggest that access and time spent using e-learning platforms can be used as indicators of student interaction and engagement in BL courses (Baragash & Al-Samarraie, 2018). A study by Baragash and Al-Samarraie (2018) found a significant negative influence on student performance based on their use of web-based BL. A study by Lee and Bonk (2016) found that using

[1] Human-technology interaction refers to the ways human use technology and its influence on their social, cognitive and emotional lives

blogs positively contributed to student learning and their sense of community. Other studies have demonstrated that students find instructor-learner interaction and learner-content interaction to be crucially important in influencing their learning compared to the interactions among themselves (Kyei-Blankson et al., 2016). On the contrary, student interaction has been linked to learning persistence in other studies (Yu et al., He, and Li, 2020). Their meta-analysis (Caskurlu et al., 2020) reports a moderate correlation between student learning and instructor-student interaction through teaching presence. Therefore, the studies have yielded different student interaction and academic performance results, thus calling for further studies which guided by three research questions.

1. Do student characteristics such as Gender, ICT skills, and pursued degree programmes relate to how they interact in BL courses?
2. Does student interaction predict their academic performance in BL courses?
3. How does student interaction relate to their sense of community?

3. Method

This study employed a quantitative approach with a non-experimental survey design to explore student relations and their relation to the sense of community and academic performance in the blended learning environment in Tanzania. The study design was utilised as it provided an opportunity to predict a sense of community and academic performance without manipulation (Johnson, 2001).

2.5.Context

Two accredited and chartered universities (a fully-fledged university and university college), Mzumbe University (MU) and Dar es Salaam University College of Education (DUCE) were selected following their use of the BL mode of delivery in some courses. The courses selected were offered for one semester, including Economics, Accounting and Languages. Student coursework, comprised of continuous assessment provided by their instructors in terms of graded scores, was used to indicate student performance. The DUCE coursework was converted to reflect MU's coursework structure following differences in how the coursework was graded in terms of total aggregates.

2.6.Samples' Characteristics

This study involved 492 students in undergraduate courses in education, accounting, and finance. Most of the students were male, with 312 (63.4%) and 180 females (36.6%). The majority of the respondents, with 434 (88.2%), respondents were aged between 22 and 34 years old, while those aged 21 and below numbered 55 (11.2%), and those 35 and above numbered only 3 (0.6%). The majority of the students were from DUCE (372) (75.6%), while the remaining 24% (118) were from MU. Seventy-four (74) of the students (15%) rated their ICT skills as novice-level, while the majority (346), an equivalent of 70.3%, rated themselves as intermediate, while only 72 (14.6%) rated their skills as advanced. The introductory accounting course had 72 students (14.6%), language courses had 303 (61.6%), and intermediate macroeconomics accounted for 117 (23.8%).

2.7.Instruments and procedure

This study used interaction and sense of community scales to measure the two constructs. Students were supplied with a survey containing the two scales and were asked to indicate their responses using a Likert Scale. This scale ranged from 1, representing *strongly disagree,* to 5 representing *strongly agree.* These scales were based on Bolliger and Inan's (2012) Online Student Connectedness Survey (OSCS) with .98 Cronbach Alpha. Student interaction was measured using five items: *I work with others in my blended learning*

course, I relate my work to others work in my course, I share information with other students in my course, I have discussions with other students in this course, and I collaborate with other students in this course. Sense of community was also measured using the same survey, which contained a scale measuring students' sense of community. Some features of questions from Rovai's (2002) Classroom Community Scale (CCS) with .93 Cronbach Alpha was adopted. This scale had ten items, which included: *I have gotten to know some of the faculty members and classmates well, I feel that this BL course is like a family, I do not feel a spirit of community, I feel isolated in this BL course and I feel uncertain about others in this BL course,* and *I feel emotionally attached to other students in this BL course.* The newly adopted questionnaire, the Blended Learning Sense of Community Survey, has the learning dimension of Rovai's (2002) CCS and OSCS of Bolliger and Inan's (2012). Student performance was measured based on the tests and assignments provided during the semester. A graded score was obtained at the end of the continuous assessment, which comprised the tests and the group and individual assignments. The total score for all assignments and tests was measured at 50, and the average performance in all courses was 29, SD = 4.2, which means the students scored above average.

2.8.Reliability of the scale

In this study, we used interaction and sense of community scales. These scales contained five items, which were rated on a Likert Scale. The reliability analysis for the interaction scale was high, as the Cronbach Alpha .836 indicated. The reliability of the sense of community scale was low .344. The overall reliability was .543. This could be attributed to the small number of items used in the scale measuring the sense of community attribute.

2.9.Data analysis

This study adopted a correlational design in which quantitative data involving student interaction and grade scores were collected. Student demographical data was analysed using frequencies and percentages, while regression analysis and non-parametric analysis, such as the Kruskal Wallis Test, were used to analyse the links between interaction and student performance and interaction and student characteristics. The choice of methods was based on whether the particular data set met the required assumptions for the identified statistical analysis. Student reports of interaction and sense of community were computed in the SPSS, and their mean scores were obtained. The overall mean score for interaction was then run against the students' grade scores and then against the mean score of the student's sense of community.

4. Findings

4.1 Student characteristics and student interaction

The first objective was to examine whether students' perceptions of interaction differed based on their characteristics. As such, we studied students' gender, ICT skills, and programme of study characters in relation to their interaction. Using the Man Whitney U test to test this relationship, the findings show no significant differences regarding gender regarding student interaction in the selected BL courses with a p-value of .595. We further analysed students' ICT skills and interaction. The findings of this demonstrated that there were no significant differences regarding students' perceived ICT skills and interaction, with a Chi-Square (2) = .0971, p =. 616 with the mean rank for a novice as 231, intermediate = 249, and advanced = 248. We further conducted a Kruskal Wallis Test regarding the students' degree programmes against their reported scores of interactions, with the results showing a significant difference in the reported interaction across degree programmes (Chi-Square (4) = 13.128, p=. 011). Students studying a Bachelor of Arts in Finance reported a higher interaction mean rank, 265.27, followed by BEEM, = 212; Bachelor of Education students

had a mean rank = 255, then BSc. Eco (Project Planning and Management) = 242, and B.Sc. Economics (Policy and Development) had the lowest mean rank = 179.36. This difference means students seeking a Bachelor of Arts in Finance interact more than their Education and Economics counterparts.

4.2 Student interaction and academic performance

The second objective was to examine whether student interaction predicts their academic performance. We conducted a regression analysis to test this objective. The results from the regression analysis showed that interaction does not predict student academic performance.

Table 2. Students' Interaction versus Academic Performance

Variable	Unstandardised B	Standardised Coefficients beta	T	Sig
Constant	.321	.049	22.508	.274
Student performance	28.144		1.096	.000
R square	.002	F value	.274	.000

a. Dependent Variable: Student performance

b. Predictors: (Constant). Interaction

4.3 Student interaction and sense of community

The third objective of the study was to determine if students' interaction predicts their sense of community. The regression analysis results demonstrate that students' interaction predicts their sense of community. This means that in courses where students interact, there is a tendency to feel a sense of belonging compared to other courses.

Table 3. *Student Interaction and Sense of Community*

Variable	Unstandardised B	Standardised Coefficients beta	T	Sig
Constant	3.326		18.809	.000
Student performance	.277	.054	5.128	.000
R square	.051	F value	26.294	.000

a. Dependent Variable: interaction

b. Predictors: (Constant), Scommunity

5. Discussion

This study investigated student interaction in blended learning courses and how it influences their academic performance and sense of community. Specifically, it determined the influence of students' gender, programme of study, and ICT skills on their interactions. Further, the study determined the influence of student interaction on academic performance and a sense of community.

5.1 Student characteristics and interaction

The study conducted by Aguillon et al. (2020) and Park & Kim (2020) shows that characteristics such as gender influence the students' interactions. However, the finding of this study shows no significant differences regarding interaction in relation to students' gender and ICT skills. This means gender and ICT skills are not influential factors when it comes to student interaction. Even though the finding does not concur with Aguillon et al. (2020) and Park & Kim (2020), similar findings were found by Havik & Westergård (2020) and Brush (2008) studies. The dissimilarity of the study findings can be attributed to the difference in the study context. Blended learning is common worldwide, yet not very

popular in developing countries, especially Tanzania. In that sense, the ICT level of the students can be at the same level, and gender characteristics might not determine student interaction as instructors' actions and directives commonly affect the students. Despite the study showing insignificant gender and ICT level characteristics, it displayed significant differences regarding degree programme types and interaction. Because the nature of the programmes involved in the study was unrelated to ICT, we can say differences in programme instructors, design, and nature of content contributed to the differences. In general, different student features such as gender, ICT level, and programme of study influence the interaction, yet other factors can mediate and change the direction of influence.

5.2 Student interaction and academic performance

Various studies have shown a relationship between student interaction and academic performance. In this study, student interaction did not predict academic performance. This means academic performance does not depend on how students interact. This may be because learning is a multivariate factor. In contrast to this study, a meta-analysis by Abuhassna et al. (2020), Lee & Bonk (2016), Al-Rahmi & Zeki (2017), and Bernad et al. (2009) found that increasing interaction in online courses positively affected student learning. The students' feelings of closeness enhance their involvement in collaborative learning activities, which in turn improves their performance (Challob et al., 2016). Even though some studies contrast the findings, a study by Baragash & Al-Samarraie (2018) and Arbaugh & Benbunan-Fich (2007) found that student engagement in web-based learning negatively influenced student performance. These studies reveal the complexity of the online-based learning interaction on academic performance in the sense that context and other variables, such as the nature of the course, might be contributing factors.

5.3 Student interaction and sense of community

A sense of community has been linked with interaction. Thus, the study explored how student interaction relates to a sense of community. This study found that student interaction predicted students' sense of community. This is an important finding highlighting that the more students interact, the more they feel and cultivate a collective sense of community. This link between student interaction and their sense of community could be explained based on the argument that student interaction motivates students to come together and, therefore, cement their sense of connection (Rovai, 2002). As such, the findings are similar to those of Luo et al. (2017), who found that student-student, student-content, and student-instructor interaction play a positive role in forming a sense of community among students. The studies of Nistor et al. (2015), Mamonov et al. (2016), and Lee and Bonk (2016) also identified a positive association between social interaction and students' sense of community. The study findings undeniably highlight the importance of student interaction in enhancing students' sense of community and concurs with other studies. This implies that instructors must improve course interaction, thus aiding a sense of connection, which is crucial for learning.

6. Conclusion

This study investigated student interaction and how it relates to student's academic performance and a sense of community. Based on the findings, several conclusions can be made. First, this study reports a high sense of interaction in the studied BL courses, indicating that students in BL courses experience high levels of interaction. Secondly, regarding students' characteristics and interaction, this study concludes that gender and ICT skills did not influence student interaction. This implies that students of different genders and various levels of ICT skills tend to interact similarly. The fourth conclusion is that student interaction influences their sense of closeness and community. This implies that when students interact

with each other, the content, and the instructor, they learn specific values that ultimately bring them together. It could, therefore, be possible that the learning tasks that have been provided have compelled students to share things to enhance their closeness.

7. Implications of the study

The findings of this study have several implications for researchers, educators, blended learning experts, researchers and even the government. Regarding theoretical implications, this study was guided by community and interaction theories. Interestingly, some findings confirm the selection of theories for the study by reinforcing current understandings. Firstly, one study demonstrates a high sense of community and interaction among students in the studied BL courses, which shows that the studied courses have interactive effects, thus stimulating students' sense of connection. Furthermore, the theoretical implications of the study originate from the fact that student interaction is thought to relate to the sense of community. Thus, in this study, students' interaction predicted their sense of community, confirming the theory that student interaction is related to their sense of community. This implies encouraging more interactions among students in both online and offline instructional/educational platforms.

Another theoretical implication of the study stems from the finding that student interaction is related to their learning. This is because this finding confirms the theory that active participation in online and offline interactions enhances students' sense of community. However, in one of the findings, students' interaction did not predict their performance, though this finding does not confirm the theory that student interaction relates to their academic performance.

The findings of this study have the following practical implications. First, with the introduction of blended learning, which is fundamentally different from online learning and traditional face-to-face instruction, there is a need to redefine the sense of community to include various aspects in the cited literature. This means there is a need to develop an overall scale which measures the sense of community in BL courses. This scale should include online and traditional face-to-face components, given that previous scales have only concentrated on measuring the sense of community in online courses, which fundamentally differ from BL courses.

Secondly, the findings further suggest redesigning BL-taught courses in the visited universities to enhance connections, interaction, and sense of community among students. This is based on the fact that students' interaction did predict their academic performance, as purported by the theory. Therefore, instructors should design learning tasks that enable students to work together and collaborate. Discussions, chat forums, and welcoming notes allow students to introduce themselves and share their experiences in both face-to-face and online sessions, which may enhance their sense of community, and thus further enhance their learning.

Thirdly, Tanzania as a country and Tanzanian universities do not have policies guiding BL. This means BL courses at Tanzanian universities are conducted without guiding policy guidelines. Since BL courses require a paradigm shift in that a portion of the learning will occur online and the remainder in the traditional classroom, this study recommends that universities and the ministry responsible develop a guiding policy for BL courses. This recommendation is made in response to questions raised by various stakeholders, such as the Ministry of Education, when traditional universities tend to offer courses using the BL approach. This study acknowledges that some universities, such as Mzumbe University, have been working to develop policies which will guide their BL courses; however, such policies have not been implemented. Tanzanian universities and policymakers thus need to view BL as a pedagogical approach that calls for the transformation of learning that compels learners to interact, participate, collaborate, and share their perspectives on learning.

8. Limitations of the study

This study was limited in several ways. First, the data was collected only on students taking accounting, education, and/or economics programmes at two universities in the country. This limited the study to generalisations regarding other programmes and possibly other universities. Using a self-reported survey to indicate student interaction and a sense of community hindered any more profound understanding of these expressive constructs. On top of that, using student coursework scores in terms of grades might have influenced the results regarding the link between student interaction and academic performance.

Declaration of Competing Interest

The author declares that he has no competing financial interests or known personal relationships that would influence the report presented in this article.

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