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ASSESSING THE IMPACT OF INTERACTION ON THE EFFECTIVENESS OF OPEN DISTANCE LEARNING IN NATIONAL OPEN UNIVERSITY NIGERIA

[1] **Agatha Samson***, [2] **Isah Y. Jibrin, & [3] Joy C. Chukwudolue**
***Corresponding authors' email**: asamson@noun.edu.ng

[1 & 3] Faculty of Education, National Open University of Nigeria, Abuja – Nigeria
[2] Faculty of Management Science, Abubakar Tafawa Balewa University Bauchi State – Nigeria

ABSTRACT

This study investigates the factors influencing the effectiveness of Open Distance Learning (ODL) at the National Open University of Nigeria (NOUN) centers in Bauchi state, focusing on full-time final-year undergraduate students. Out of the total population, 137 questionnaires were distributed, with 128 returned filled and valid. Utilizing regression analysis and ANOVA tests, the study reveals significant positive correlations between student interactions and ODL effectiveness, underscoring the importance of fostering meaningful engagement in ODL environments.

Keywords*:* Open Distance Learning, ODL effectiveness, interactions, educational technology, learning outcomes, collaborative learning

1.0 Introduction

As the effectiveness and impact of education change, so does the significance of interaction in online distance learning environments. Interaction, which includes participation between students, instructors, and course materials, facilitates the exchange of ideas, feedback, and support that are essential for academic achievement (Blasco-Arcas et al., 2013). Given the challenges created by resource shortages and geographic limits, open-ended learning (ODL) has emerged as a crucial method of flexible and accessible education in Nigeria (Ibeme, 2019). The more technology continues to transform education, the more crucial contact is in ODL settings. In the 21st century, also referred to as the century of knowledge, adult education has a better chance of keeping up with trends in globalization, claim Onasanya, et al., (2015). The quality of an adult population determines how far a nation can go, so it is critical that they are exposed to the variety of advances that have occurred this century. They also added that since adults, not children, will be the ones to transform the nation, adult education should lead other professions in terms of advancement and that adult education programs should heavily incorporate mobile phones (e-learning) in order to help the nation meet its educational goals (Coale & Hoover, 2015).

With the development of technology, online and remote learning today offer a wide range of interactive learning alternatives (Ali, 2020). Depending on the participants and their level of engagement, various perspectives and circumstances define interaction differently (McMahan, 2013). E-learning, according to Jethro et al. (2013), is interactive learning that allows students to connect synchronously (via chat rooms, shared whiteboards, and video conferencing) or asynchronously (through email and group news) with the instructor, other students, and the subject. Discussion boards and thread conversations also provide interaction. This is the main feature of e-learning, which is defined by electronic

communication between the learner and the content, the teacher, and other students. It has been observed that contact is necessary for e-learning and distant education to be suitable and successful overall (Alqahtani & Rajkhan, 2020). According to many academics, interaction is the most crucial element in any learning environment (Jaoua, 2022). Additionally, they think that online, remote, and traditional learning environments (Tirri & Kuusisto, 2013; Woo & Reeves, 2007; Bernard et al., 2009) all depend heavily on interaction. Arbaugh & Benbunan-Fich (2007) suggest that online and distant learning necessitate contact. Although contact is becoming more widely recognized as an essential component of effective distance learning, little is known about how it impacts ODL in Nigeria (Jegede, 2016).

The study explores the impact of interaction on the effectiveness of Open Distance Learning (ODL) at the National Open University of Nigeria (NOUN). The objectives are to examine how student-instructor interaction, student-student interaction, and student-content interaction influence the effectiveness of ODL. By focusing on these interactions, the study aims to provide valuable insights into enhancing learning outcomes in distance education environments, particularly within Nigeria. The remaining sections of this study review pertinent theories and studies in the literature review section, discuss the methodology section's approach and data analysis technique, present and discuss the results section's findings, and provide a summary and recommendations based on the study's conclusions in the conclusion and policy implications section.

1.1 Research Questions:

1. What is the influence of student-instructor interaction on the effectiveness of ODL at the National Open University of Nigeria?

2. How does student-student interaction influence the effectiveness of ODL at the National Open University of Nigeria?

3. What is the influence of student-content interaction and the effectiveness of ODL at the National Open University of Nigeria?

2.0 Literature Review

2.1 Conceptual Review

2.1.1 Interaction

An interaction in the context of education is any dynamic exchange between learners, instructors, and learning materials. This includes how learners, instructors, and learning materials move around, communicate with each other, and how this indeed affects the process of learning (Vlachopoulos & Makri, 2019). Effective interaction can facilitate understanding, motivation, and knowledge retention and is thus very important, especially in the distance learning environment with limited face-to-face contact.

2.1.2 Open Distance Learning (ODL)

Open Distance Learning (ODL) refers to an educational approach in which learning activities take place away from a traditional classroom setting. It is characterized by the use of various technologies and flexible scheduling to accommodate learners' needs (Maphosa, et al., 2019). ODL aims to extend educational provision to those persons for whom it would not be possible or would be very difficult to participate in face-to-face classes due to such constraints as geography, cost, and a variety of personal factors (Sukon, et al., 2012). In light of this, the effectiveness of ODL largely depends on the quality of the interaction among students, tutors, and the course content.

2.1.3 Students-Instructor Interaction

This mode of engagement involves the direct interaction and communication of the learner with the instructor through activities such as virtual office hours, feedback sessions, and direct responses to queries (Pianta, et al., 2012). Effective interaction between a student and an instructor provides a source of clarifying doubts, seeking guidance, and getting support in relation to academic development. This acts as a very strong tool in increasing the motivation and engagement of students, something quite relevant to the general success of the learning experience (Serrano, et al., 2019).

2.1.4 Students-Students Interaction

It refers to the interaction and collaboration among peers in a learning environment, which may include discussions, reviews, and projects between students (Li-ping, 2018). Such interaction will foster a sense of community and provide for cooperative learning that may enrich understanding and retention of material (Laal & Laal, 2012). Indeed, especially in distance learning, where there is normally physical separation, peer interactions could build up a supporting network for active learning.

2.1.5 Students-Content Interaction

It refers to the interaction between students and the learning material or course content, for it details activities like engaging in the learning of online modules, participating in interactive simulations, and doing assignments (Purarjomandlangrudi, et al., 2016). Effective student-content interaction is the core of deep learning, through which students can apply the knowledge and skills they have learned in real-life situations. Better-quality, interactive content could really make the learning experience more appealing and relevant to students (Serrano, et al., 2019).c

2.2 Theoretical Background

In accordance with Moore's 1973 transactional theory of independent study, distance between students and teachers need not prevent effective instruction from occurring. This theory stresses that successful instructional communication can occur even when students and teachers are geographically separated, provided there is a strong level of interaction between the student, teacher, and course materials. This theory provides a framework through which to analyze the impact of interaction on ODL at NOUN, since it specifies how these interactions affect learning outcomes in the context of remote education. It puts great emphasis on the quality and nature of interactions, hence leaving wide open the door for the assessment of how student-instructor, student-student, and student-content interaction contributes to the general performance of the ODL programs. It has been criticism for the quality of online interactions, challenges in simulating traditional classroom environments, and problems with the depth of engagement with the curriculum, despite placing a major emphasis on interactions between students, professors, and course materials (Ajani, 2023). Despite its critics, the theory guides the development of remote learning platforms; however, further research is required to address its flaws and enhance techniques.

2.3 Empirical Review

2.3.1 Students-Instructor Interaction and Effectiveness of ODL

Recent research in this area recognizes a close student-instructor relationship as central to the success of ODL. A study by Martin and Borup (2022) explored the Online learner engagement: Conceptual definitions, research themes, and supportive practices. Their findings indicated a highly strong connection between more student engagement and high levels of satisfaction,

resulting in better academic outcomes. Hence, timely feedback and personalized communication are critical elements that contribute toward students' perception of effectiveness in ODL settings.

A study by Benfaida, (2023). examined Exploring Student-Centered Teaching and Learning Experiences In Higher Education During Emergency Remote Instruction. Their study showed that proactive communication from the instructors in the form of regular check-ins and interactive webinars decreased significantly the dropout rate of students, increasing their level of engagement. It is this component that concluded the research: strong student-instructor interaction is a requirement for creating an atmosphere of care in learning, and thus contributing to overall effectiveness in ODL.

2.3.2 Students-Students Interaction and Effectiveness of ODL

Students-student interaction has also been shown to play a vital role in the effectiveness of ODL. A study by Mumtaz., et al. (2024) investigated the Quality of interaction-based predictive model for support of online learning in pandemic situations. The study reported that those students taking part in various collaborative activities, such as group discussion and peer reviews, showed improvement in understanding and retention of course material. This led the researchers to conclude that eliciting community through student-student interaction would greatly influence better academic results and higher levels of satisfaction among students.

In another study conducted by Pham and Lai, (2022). the researchers explored the Online Learning Satisfaction during COVID-19: Evidence from a Vietnamese Higher Education Context. The results showed that the ones who kept regular contact with their peers were more likely to stay motivated and complete their courses. Indeed, peer support networks lowered the feelings of isolation, which are recognized as a big stumbling block in ODL. Thus, the study recommended that online course developers accommodate provisions for collaborative tools and activities in order to foster student-student contact.

2.3.3 Students-Content Interaction and Effectiveness of ODL

The interaction between students and content is a crucial determinant of the effectiveness of ODL, as highlighted in recent research. A study by Ginting et al., (2024) explored Student-centered learning in the digital age: in-class adaptive instruction and best practices. The results of the researchers proved that students who participated by responding to the multimedia content and engaging with interactive simulations were able to perform better during assessment exercises, hence achieving deeper understanding in the disciplines concerned. Again, the study underscores the importance of developing appropriate content likely to foster active learning and engagement.

Similarly, a study by Al Mamun and Lawrie, (2023). examined the student-content interactions: Exploring behavioural engagement with self-regulated inquiry-based online learning modules. Results indicated that the students who used interactive and adaptive learning materials were most likely to stay engaged, thereby registering higher academic performances. According to the researchers, through this kind of technologically-enhanced content gamification or adaptive learning platforms ODLs can be very effective in terms of providing customized services to meet a wide variety of learning preferences and needs.

2.3.4 Identified Gaps

Though the literature profited from some insightful recent studies, a number of gaps remain. First, surprisingly few studies focus on the Nigerian context and directly on the National Open

University of Nigeria. Additionally, most previous studies generalise their findings across different ODL platforms without reflection on the peculiar challenges and contexts facing individual institutions or regions. While studies of this nature, and other cross-sectional studies, do provide important snapshots of data, there is a real need for more longitudinal research into the long-term impact of interactions on the effectiveness of ODL. This would address these gaps in knowledge and give a clearer picture of how interactions shape the effectiveness of ODL within different education settings.

2.4 Hypothesis

2.4.1 Student-instructor interaction and the effectiveness of ODL

Although the general consensus suggests that there is a strong positive correlation between student-instructor interaction and the success of Open and Distance Learning (ODL), recent research provides a more complex explanation for this association. Miller, (2014) discusses the distinct dynamics of interaction in virtual spaces, but they do not provide a clear correlation between the degree of contact between students and teachers and ODL's overall effectiveness. Instead of assessing how different forms of contact directly impact learning objectives, they are more focused on defining them. Learner-learner and student-tutor interactions are crucial components of distant learning programs, claim (Katsarou & Chatzipanagiotou, 2021). However, their findings do not prove a causal relationship between these interactions and the effectiveness of ODL.

Song et al., (2016) highlights the importance of student-teacher communication in both traditional and online learning environments. On the other hand, opinions differ regarding the extent to which this interaction affects ODL's overall effectiveness. Furthermore, while Bonfiglio et al., (2016) highlight the potential benefits of increased interaction opportunities in online learning environments, their results do not necessarily refute the theory that postulates a lack of significant correlation between ODL effectiveness and student-instructor interaction. Morris (2017), points out that gender differences exist in preferences for online interactions, but their results do not directly challenge the general notion that the effectiveness of online instruction is influenced by student-instructor contact.

Additionally, Sheet (2018), emphasizes the value of instructor feedback, but it's unclear exactly how this input influences ODL's overall effectiveness. The literature that has already highlighted the importance of student-teacher connection in virtual learning environments; nevertheless, more research is needed to determine the precise effect of this interaction on the effectiveness of online distance learning. As a result, the following theory is put forth:

H_1: *There is no significant influence between student-instructor interaction and the effectiveness of ODL at the National Open University of Nigeria.*

2.4.2 Student-student interaction and the effectiveness of ODL

Previous research suggests that student-to-student interaction plays a critical role in the effectiveness of online distance learning (ODL) environments. According to Wu and Gao (2020), learning and student satisfaction in online courses are significantly influenced by interactions between students and between tutors and learners. Quinn (2023), has emphasized the importance of the learner-to-learner connection in reducing the perceived danger of mediocre performance in online courses. He argues that in the absence of this kind of interaction, students may grow disenchanted with the online learning environment, which may affect their overall efficacy. Learner-to-learner interaction and course completion rates are positively correlated, according to Conmy (2016). This suggests that these kinds of interactions foster students' commitment and engagement. However, Moore et al., (2016),

present a different perspective, arguing that there is a negative correlation between student-to-student contact and satisfaction. They contend that the root of unhappiness may be a lack of guidance on how to engage with peers in online chats. Furthermore, students' satisfaction levels with inter-student contact vary based on their individual characteristics and interests. Despite these findings, student-to-student interaction remains a critical element in creating a flexible learning environment, as noted by Nortvig et al. (2018). Gao et al. (2013) go on to emphasize the benefits of online forums for students to compare and enhance their understanding of the subject matter through critique and discussion. Different perspectives on the theory "

Research indicates that while some point to a positive impact on learning outcomes and satisfaction, there are still barriers and disparities in satisfaction levels. Further research is needed to determine exactly how student-student contact impacts the effectiveness of ODL. Hence the hypothesis:

H_2: *There is no significant influence between student-student interaction and the effectiveness of ODL at the National Open University of Nigeria.*

2.4.3 Student-content interaction and the effectiveness of ODL

Numerous factors have been suggested by prior research to affect the effectiveness of online distance learning (ODL) and the degree to which students interact with the content. According to Moore (2018), a course's structure plays a crucial role in conveying the degree of rigidity or flexibility in its instructional strategies, goals, and evaluation methods. However, whether or not this structure significantly affects ODL's effectiveness remains to be seen, particularly with regard to student-content interaction. Behrens (2018) highlighted the challenges that students face in understanding the content that is covered in the course, which could impact their engagement with the material. According to Tong et al. (2022), a number of factors, including as the standard of the readings, assignments, and conversations as well as the effectiveness of the instructors, can influence how satisfied students are with the effectiveness of an online course. Similar findings were made by Anthony et al. (2019), who discovered that a variety of factors, including technological tools, task fit, teacher feedback, course organization, clear outcome, and content format, all influenced how happy students were with their online learning experiences.

Diep et al. (2019) state that when a course fails to meet the needs and preferences of its students, low learner participation may result. Surprisingly, Alqurashi (2019) found that the interaction between the student and the content was a strong predictor of student happiness in e-learning environments. However, it is not clear from the literature if the effectiveness of ODL is significantly impacted by the level of student-content interaction. Further research into this influence is necessary to determine the veracity of H3. hence the hypothesis:

H3: There is no significant influence between student-content interaction and the effectiveness of ODL at the National Open University of Nigeria.

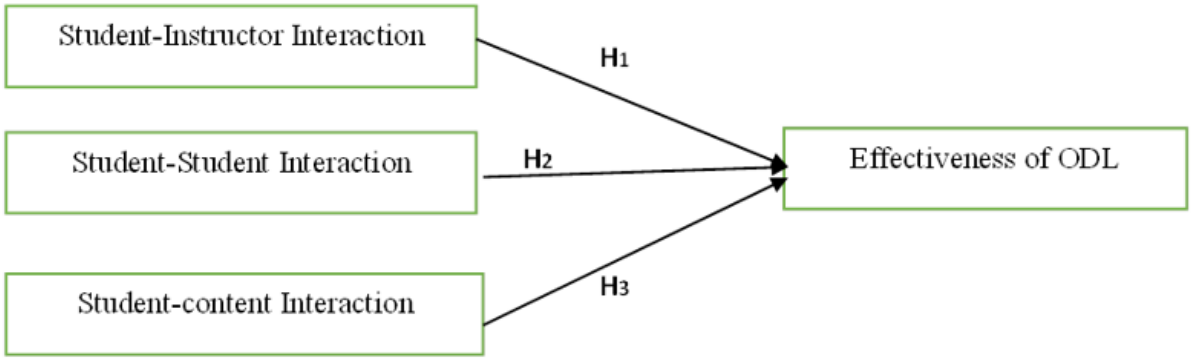

Figure 1: Conceptual Framework

3.0 Methodology

3.1 Research Methodology

Quantitative methods were employed for both data gathering and analysis in this study. The respondents, who are full-time final-year undergraduate students at the National Open University of Nigeria (NOUN) study centers in Bauchi State, were surveyed.

3.2 Study Area

The study was conducted at NOUN centers in Bauchi, which is a state located in the northeastern part of Nigeria. Bauchi State is known for its diverse cultural heritage and is a significant educational hub in the region, with multiple tertiary institutions, including the NOUN centers that cater to distance learning students.

3.3 Population and Sample Size

The population for this study comprises full-time final-year undergraduate students at the NOUN centers in Bauchi State. Using the Soper A-priori Sample Size Calculator, a sample size of 137 participants was determined. Out of the total population, 137 questionnaires were distributed, with 128 returned filled and valid, ensuring a robust data set for statistical analysis.

3.4 Sampling Technique

A convenient sampling technique was used in this study, allowing researchers to select respondents who were readily available and willing to participate in the survey.

3.5 Method of Data Collection

Data was collected through questionnaire. The questionnaire consisted of 16 items designed to measure both independent and dependent variables. The items were adapted from Ali & Mirza (2020) and were categorized into three main groups: interactions between students, interactions between students and instructors, and interactions between students and content. Responses were recorded on a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree").

3.6 Techniques of Analysis

Data analysis was conducted using the Statistical Package for Social Sciences (SPSS). Inferential statistics, including regression analysis, were employed to assess the relationships between variables.

3.6.1 Multiple Regression Model

To analyze the data and understand the relationship between the dependent and independent variables, a multiple regression model was used. The model is designed to identify the impact of interactions (independent variables) on the effectiveness of ODL (dependent variable). The general form of the multiple regression model used in this study is as follows:

$$Y=\beta0+\beta1X1+\beta2X2+\beta3X3+\epsilon$$

Where:

- Y represents the dependent variable (ODL effectiveness).
- β0 is the intercept.
- β1,β2,β3 are the coefficients representing the relationship between the independent variables and the dependent variable.
- X1,X2,X3 represent the independent variables (interactions between students, interactions between students and instructors, and interactions between students and content).
- ϵ is the error term.

4.0 Data Analysis and Results

With a 95 percent confidence level, the primary data was analyzed using the Linear Regression tool. The tests particularly target the null versions of the bivariate hypotheses H1, H2, and H3. Using the 0.05 significance level as the criterion, one can calculate the likelihood of accepting the null hypothesis at (p>0.05) or rejecting it at (p0.05).

Table 1: Model Summary

Model	R	R-square	Adjusted R-square	Std. Erro of the Estimate
1	.981[a]	.962	.961	.19421

Source: SPSS Output

a. Predictors: (Constant), Student Content Interaction, Student Instructor Interaction, Student Interaction.

The outcomes of a multiple linear regression analysis were compiled in Table 1. The independent and dependent variables in this case had a very significant positive association (likely p-value < 0.05). The model with the R-squared accounts for 96.2% of the variation in the dependent variable, indicating that the model may not be significantly overfit. Standard Error of the Estimate demonstrating a strong model fit.

Table 2: ANOVA*

Model	Sum of Squares	df	Mean Square	F	Sig.
1. Regression Residual Total	156.189 6.224 162.412	3 165 168	52.063 .038	1380.306	.000[b]

Source: SPSS Output

a. Predictors: (Constant), Student Content Interaction, Student Instructor Interaction, Student Interaction.

An ANOVA test is summarized in Table 2. A highly statistically significant result (likely p-value < 0.001) is shown by the F-statistic (1380.306) and Sig. (0.000b). This indicates that a sizable amount of the variance in the efficacy of open-distance learning can be explained by the model that incorporates the predictors (student-content interaction, student-instructor interaction, and student-student interaction).

Table 3: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.222	.069		-3.219	.002
	Student Instructor Interaction	.319	.028	.265	11.225	.000
	Student Student Interaction	.110	.027	.122	4.123	.000
	Student Content Interaction	.635	.027	.665	23.523	.000

Source: SPSS Output

a. Dependent Variable: Effectiveness Of Open Distance Learning

Table 3 demonstrated that there is a statistically significant positive impact of all three interactions (student-student, student-teacher, and student-content) on the efficacy of open-distance learning. The student-content interaction appears to have the biggest impact, followed by the student-instructor interaction and the student-student interaction, according to the beta coefficients.

Based on the above outcomes, the previously stated null hypotheses are set aside hence the study found out that:

H_1: There is significant influence between student-instructor interaction and the effectiveness of ODL at the National Open University of Nigeria.

H_2: There is significant influence between student-student interaction and the effectiveness of ODL at the National Open University of Nigeria.

H_3: There is significant influence between student-content interaction and the effectiveness of ODL at the National Open University of Nigeria.

4.1 Discussion of Findings

Using the linear regression tool and a 95% confidence interval, the results showed that interaction had a substantial beneficial impact on the effectiveness of open distance learning at National Open University Nigeria. The study also demonstrated how the three types of interactions—student-instructor, student-student, and student-content—affected how effective open-distance learning was.

Hypothesis H1 asserts that the effectiveness of open-distance learning (ODL) is not much impacted by interactions between students and instructors. Our data, however, disproves this theory by showing a statistically significant positive association ($p < 0.000$) between the efficiency of ODL and student-instructor contact. More specifically, the significantly positive correlation for Student-Instructor contact ($B = 0.319$, $p < 0.000$) suggests that a higher degree of contact between students and instructors positively affects the effectiveness of ODL. This result supports earlier work by Martin & Borup (2022), which highlighted the critical role that

learner-instructor engagement plays in creating meaningful online learning opportunities. It emphasizes how crucial active student-teacher interactions are to enhancing the effectiveness and results of remote learning initiatives.

Similarly, **Hypothesis H2** implies that the effectiveness of ODL is not much impacted by student-to-student interaction. However, our research reveals a statistically significant positive correlation ($p < 0.000$) between the efficiency of ODL and student-student interaction. Increased student-student interaction is favorably correlated with ODL effectiveness, as indicated by the positive coefficient for student-student interaction ($B = 0.110$, $p < 0.000$). This research supports Moore's (1973) social constructivist viewpoint, which emphasizes the value of collaborative learning environments in distance learning contexts. In line with earlier research by O'donnell & King (2014), it emphasizes the critical role that peer interaction plays in knowledge acquisition and retention (2012).

Moving to **Hypothesis H3**, suggests that the efficiency of ODL is not much impacted by student-content interaction. Nonetheless, our data shows that the interaction between students and content has a highly substantial beneficial impact on the effectiveness of ODL ($p < 0.000$). The efficiency of ODL is considerably shaped by the interaction between students and course content, as indicated by the notably high coefficient for Student-Content Interaction ($B = 0.635$, $p < 0.000$). This result is consistent with the work of Kester, Kirschner, and Corbalan (2011). The Cognitive Theory of Multimedia Learning places significant emphasis on the interaction between learners and instructional resources. It emphasizes how important it is to have thoughtfully created and captivating course materials in addition to successful teaching techniques that encourage students to actively engage with the topic in distance learning settings.

All of our data point to the importance of these three kinds of interactions in determining how successful open-ended learning is at the National Open University of Nigeria: student-content, student-instructor, and student-student. The relevance of interactions in remote learning is empirically supported by these results, which are in line with current research and theoretical frameworks. These linkages are validated by the model's strong statistical significance, positive correlations, and high explanatory power. In the context of distant education, these findings have applications for instructional design, course delivery, and student support services. In order to improve learning outcomes, they stress the significance of creating meaningful interactions between students, teachers, and course material.

5.0 Conclusion

To sum up, this study explored the intricacies of Open Distance Learning (ODL) efficacy at the National Open University of Nigeria, emphasizing the relationships between students, teachers, and course materials. The results unequivocally demonstrate how important contacts are in determining ODL efficacy. In particular, strong student-teacher engagement, peer collaboration, and active use of course materials were found to be critical elements affecting the success of distant learning outcomes. These linkages' strength and importance were highlighted by the statistical studies carried out, which offered strong support for the results made. The results are much more credible due to the regression model's high explanatory power and strict statistical significance.

Educators, legislators, and instructional designers can enhance the effectiveness and impact of remote learning initiatives by utilizing the practical insights provided by these studies.

5.1 Recommendation of the study

Based on the findings of this study the following were recommended:

i. **Enhance Student-Instructor Interaction**: Provide Structured Interaction Opportunities: Structured opportunities for regular interaction between the student and the instructor will be given, along with scheduled virtual office hours, interactive Q&A sessions, and feedback loops. This is going to build a more engaging and supportive learning environment that would provide better outcomes for the ODL.

ii. **Promote Student-Student Collaboration**: Facilitate Peer Interaction: Embed in your curriculum collaborative activities such as group projects, discussion forums, and peer review assignments. These would enhance peer-to-peer interaction, leading to richer learning experiences, since student-student interaction proves to influence the effectiveness of ODLs.

iii. **Improve Student-Content Engagement**: Develop Interactive Course Materials: Support the development of, and integration of interactive, multimedia course material to actively engage students in the content. These include interactive quizzes, simulations, and use of other engaging multimedia resources that will enhance students' involvement in the learning process and improve their learning outcomes.

5.2 Limitation and Area for Further Studies

It is crucial to recognize the limitations of this study, particularly its focus on a single school, and to emphasize that stakeholders may effectively improve students' learning experiences by prioritizing and promoting meaningful connections within Open and Distance Learning (ODL) contexts. This study emphasizes the importance of contacts in forming educational experiences, which adds to the continuing discussion on effective distance learning strategies.

Future research endeavours should explore additional variables and validate these findings across diverse educational contexts as well use a larger sample size and students and instructors from different institutions.

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