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Articles

Mechanism of Continuous Learning Behavior among Massive Open Online Course Learners

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Abstract

In recent years, Massive Open Online Course (MOOC) has been popular with researchers due to its characteristics of supporting autonomous learning and reaching a larger audience than traditional online learning. Nevertheless, there are some obvious shortcomings of recent MOOC, including the low completion rate, unsatisfactory learning effect and high dropout rate subject to various difficulties. The influencing factors of self-regulated learning of MOOC learners, including service quality, attitude and course quality, are derived from the research of Nour and Farrah from the University of Malaysia. An interpretative structural model of the relationship among the influencing factors is further constructed based on the subjective experience of two coders. This procedure not only facilitated the classification of the influencing factors into layers but also clarified the factors and their influence paths on the self-regulated learning of MOOC learners. Finally, based on the above research, constructive suggestions are put forward to promote the continuous learning behavior of MOOC learners.

Keywords: continuance intention, interpretative structural modelling, MOOC, self-regulated learning.

1. Introduction

With the rapid development of the Internet in the information age, "Internet + Education" is increasingly becoming popular with educators owing to the advantages of fast information dissemination, high efficiency and openness of the Internet (Meet, Kala, 2021). Massive Open Online Course (MOOC), as a newly emerged online course development model of "Internet + Education", has been developed, and people have witnessed the rapid development of MOOCs with the emergence of Udacity and Coursera and the official launch of edX. Currently, millions of people of diverse nationalities and levels of education are actively enrolled in MOOCs. The emergence of MOOC promotes personalized education and educational equity and provides high-quality courses for learners to learn independently and efficiently (Chansanam et al., 2021). Although the rapid growth of MOOC courses and learners brings dividends to education, it also faces the problem of low completion rate and low success rate in MOOCs (Abdel-Maksoud, 2019; Alraimi et al., 2015; Hew, Cheung, 2014).

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Self-regulated learning in MOOC refers to the process in which learners actively use and control meta-cognition, motivation and behaviors to ensure learning success, improve the learning effect and achieve learning goals (Vandeveld et al., 2017). It emphasizes that learners can actively motivate themselves to have and use appropriate learning strategies. As a form of online learning, MOOC learners need to take more responsibility for their knowledge and have more ability to self-regulate learning with less supervision and management. Investigation studies demonstrate that learners with a high degree of self-regulated learning are more likely to succeed in MOOC (Kizilcec, Halawa, 2015; Nawrot, Doucet, 2014; You, Kang, 2014). Therefore, improving MOOC learners' self-regulated learning ability and promoting its continuity are vital to alleviate the problem of high dropout rates in MOOCs, which is the impetus of investigating this study.

Research results indicate that some factors influencing MOOC learners' self-regulated learning skills are associated with teaching service quality, online course quality and MOOC learners' attitudes (Albelbisi, Yusop, 2019). Along this line, this study further explores the interrelations among these factors using interpretative structure modeling. Also, the logical hierarchical relationship model among these factors and MOOC learners' self-regulating learning ability is established, further proposing effective strategies to promote MOOC learners to maintain continuous and efficient self-regulating learning.

The remainder of this paper is organized as follows: The sources of factors affecting MOOC learners' self-regulating learning ability are first described, and an interpretive structural model of the factors affecting MOOC learners' self-regulated learning ability is further constructed. Finally, the constructed interpretative structure model is detailed and analyzed, and some suggestions and strategies to promote the continuous self-regulation learning of MOOC learners are given.

2. Materials and methods

Preliminary Screening of Factors for continuous learning behavior of MOOC learners

This paper explores the mechanism of continuous learning of MOOC learners to alleviate the dropout problem. To achieve this, identifying the influencing factors is a key process. After reviewing the literature, it was found that the results of Albelbisi and Yusop (2019) were in line with the needs of this study, so this study selected the results of this article as the source of factors. The statistical results of Albelbisi and Yusop (2019) reveal that factors such as service quality, attitude and course quality influence the self-regulated learning of MOOC learners. The measurement variables corresponding to each construct are shown in the two columns to the left of Table 1, where the quality of service means that the instructor in MOOCs provides the quality of service to the learner, the attitude means learners' beliefs about the experience of using MOOCs, the course quality refers to the degree to which learners believe that MOOCs can offer quality content.

Table 1. Factors Influencing Learners' Self-Regulated Learning Skills in MOOCs

Construct	Measurement variables	Factors	Code names
Service quality	In my MOOC learning experiences, the instructors are good to learners.	Instructor's Dedication to Students	S1
	In my MOOC learning experiences, the instructors are friendly to learners.	Instructor's kindness to Students	S2
	In my MOOC learning experiences, the instructors are knowledgeable enough about the content.	Instructor's mastery of course content	S3
	In my MOOC learning experiences, the instructors are available via e-mail, phone or fax.	Availability of instructors	S4
Attitude	I feel confident in using MOOC.	Confidence in MOOC using	T1

	I enjoy using MOOC for my studies	Interest in MOOC	T2
	I believe that MOOC gives me the opportunity to acquire new knowledge.	Knowledge Acquisition in MOOC	T3
	I believe that MOOC enhances my learning experience.	Learning experience in MOOC	T4
	I believe that convenience is an important feature of MOOC.	Convenience in MOOC using	T5
	I believe that MOOC increases the quality of learning because it integrates all forms of media.	learning quality in MOOC	T6
	I believe that adopting MOOC allows for increased student satisfaction.	learning satisfaction in MOOC	T7
	I believe that studying courses that use MOOC is interesting.	Interest of MOOC courses	T8
	In my MOOC learning experiences, the courses content is up-to-date.	Novelty of course content	T9
Course quality	In my MOOC learning experiences, learning outcomes for the course are summarized in clearly written, straightforward statements.	Clear learning goals	C1
	In my MOOC learning experiences, courses are designed to encourage learners to work together by utilizing problem-solving activities to develop topic understanding.	Emphasis on capacity building	C2
	In my MOOC learning experiences, the course content is communicated well.	Quality of course content	C3

3. Materials and methods

3.1. Factor extraction and coding

The influencing factors in the existing study (Albelbisi, Yusop, 2019) includes five dimensions: system quality, information quality, service quality, attitude, and course quality. However, the statistical results show that only the last three dimensions impact self-regulated learning. Thus, this study used these three dimensions as the source of factors. As shown in Table 1, each dimension includes several measurement variables. Then, according to the specific contents of each measurement variable, its corresponding factors are extracted and coded, as shown in the two columns on the right of Table 1. Its purpose is to facilitate constructing and analyzing subsequent interpreted structural models.

3.2. Interpretative Structural Modeling (ISM)

Interpretive structural modelling (ISM) in MOOCs is an interactive learning process aiming to help people understand complex problems systematically (Attri, Sharma, 2013; Liu et al., 2018). ISM begins with a set of identified factors that are relevant to the problem being solved. These factors can be obtained through literature review, in-depth interviews, questionnaires, etc. By analyzing the binary relationship among these factors, the disordered factor set is transformed into an ordered, visible, hierarchical structure, which aims to facilitate an understanding of the relationships among these factors and their impact on solving the problem. In this study, the “question” means promoting MOOC learners to maintain continuous self-regulated learning. “Factors” refer to the 16 factors mentioned in Table 1.

3.3. Coders

Participants in this study are committed to studying self-regulated learning, especially online learning. One of them is the author of this article, who has a PhD in educational technology and

works on learning experience research for online courses. The other is a senior teacher with rich practical teaching experience. One focuses on theoretical research, and the other on experimental research. The two different perspectives of the two coders can be merged to provide more comprehensive and systematic information.

3.4. Overall Research Methodology

This paper mainly adopts the ISM process. The flowchart of the overall methodology is shown in [Figure 1](#). First, the factors used in this study were derived from the existing studies described above. Second, the ISM model was applied to appropriately calculate each factor's relative importance and the interrelations among them. Then, by analyzing the results of ISM, some suggestions were made to promote the continuous learning behavior of MOOC learners.

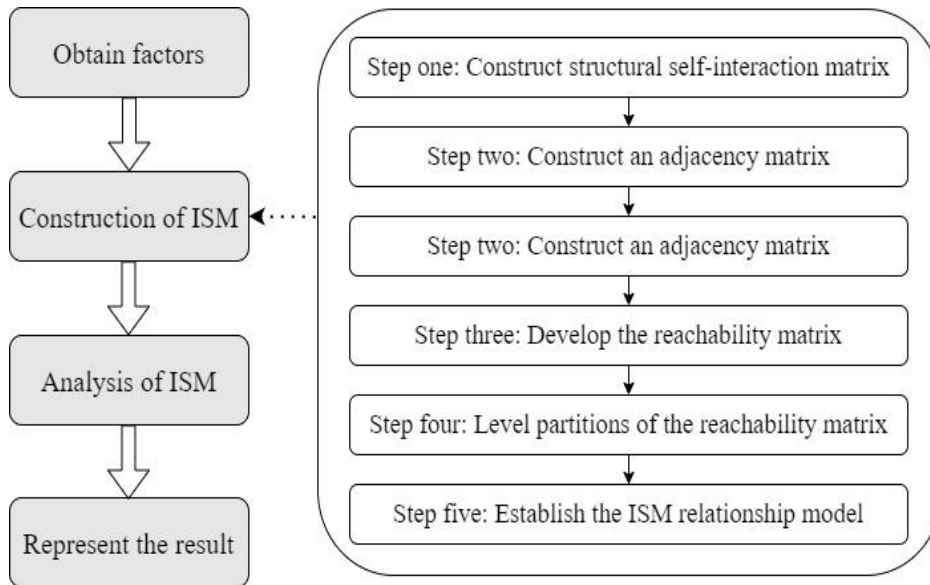


Fig. 1. Flowchart of the methodology

4. Results

4.1. Construction of ISM

The process for ISM development is described below with five steps ([Han et al., 2017](#)). Step one: Construct a structural self-interaction matrix (SSIM). According to previous knowledge and experience, two coders judge the contextual relationship between the influencing factors and represent it with four symbols labeled “V”, “A”, “X”, and “O”, where “V” means that factor *i* affects factor *j*; “A” means that factor *j* affects factor *i*; “X” means that factor *i* and factor *j* affect each other; and “O” means that factor *i* and factor *j* do not affect each other. Therefore, a complete SSIM is obtained based on four symbols, “V”, “A”, “X”, and “O”, as shown in [Table 2](#).

Table 2. SSIM of factors influencing MOOC learners' self-regulated learning

	S1	S2	S3	S4	T1	T2	T3	T4	T5	T6	T7	T8	T9	C1	C2	C3
S1	O	O	O	O	O	V	O	V	O	V	V	O	V	O	O	O
S2	O	O	O	O	V	V	V	V	O	V	V	O	O	O	O	O
S3	O	O	O	O	O	V	V	V	O	V	V	V	O	O	O	V
S4	O	O	O	O	O	V	V	V	V	V	V	O	O	O	O	O
T1	O	A	O	O	O	X	V	V	V	V	V	O	O	O	O	A
T2	A	A	A	A	X	O	V	V	V	V	V	V	O	O	O	A
T3	O	A	A	A	A	A	O	X	A	V	V	A	A	A	A	A
T4	A	A	A	A	A	A	X	O	A	X	X	A	A	A	A	A

T5	O	O	O	A	A	A	V	V	O	V	V	O	A	O	O	O
T6	A	A	A	A	A	A	A	X	A	O	X	A	A	A	A	A
T7	A	A	A	A	A	A	A	X	A	X	O	A	A	A	A	A
T8	O	O	A	O	O	A	V	V	O	V	V	O	O	A	A	A
T9	A	O	O	O	O	O	V	V	V	V	V	O	O	O	O	O
C1	O	O	O	O	O	O	V	V	O	V	V	V	O	O	O	O
C2	O	O	O	O	O	O	V	V	O	V	V	V	O	O	O	O
C3	O	O	A	O	V	V	V	V	O	V	V	V	O	O	O	O

Step two: Construct an adjacency matrix. The relational value is denoted as 1 if factor i affects factor j, and vice versa. The adjacency matrix is constructed by transforming SSIM. That is, “V” and “X” become 1, and “A” and “O” become 0. The adjacency matrix is obtained, as shown in [Table 3](#).

Table 3. Adjacency matrix of factors influencing MOOC learners' self-regulated learning

	S1	S2	S3	S4	T1	T2	T3	T4	T5	T6	T7	T8	T9	C1	C2	C3
S1	0	0	0	0	0	1	0	1	0	1	1	0	1	0	0	0
S2	0	0	0	0	1	1	1	1	0	1	1	0	0	0	0	0
S3	0	0	0	0	0	1	1	1	0	1	1	1	0	0	0	1
S4	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0
T1	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0
T2	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0
T3	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0
T4	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0
T5	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0
T6	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0
T7	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
T8	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0
T9	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0
C1	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0
C2	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0
C3	0	0	0	0	1	1	1	1	0	1	1	1	0	0	0	0

Step three: Develop the reachability matrix. The reachability matrix refers to the degree that can be reached after a certain length of the path between nodes of a directed connection graph in matrix form. In this research, we develop it using MATLAB, as shown in [Table 4](#).

Table 4. Reachability matrix of factors influencing MOOC learners' self-regulated learning

	S1	S2	S3	S4	T1	T2	T3	T4	T5	T6	T7	T8	T9	C1	C2	C3
S1	1	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0
S2	0	1	0	0	1	1	1	1	1	1	1	1	0	0	0	0
S3	0	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0
S4	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0
T1	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0
T2	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0
T3	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0
T4	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0
T5	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0

T6	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0
T7	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0
T8	0	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0
T9	0	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0
C1	0	0	0	0	0	0	1	1	0	1	1	1	0	1	0	0
C2	0	0	0	0	0	0	1	1	0	1	1	1	0	0	1	0
C3	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	1

Step four: Level partitions of the reachability matrix. This process further clarifies the hierarchical relationship among factors in the system. The method is that if the reachability set of a factor is the same as the intersection set, then this factor belongs to the first level of ISM, where the reachability set includes this factor itself and other factors that it can affect. The antecedent set includes this factor itself and other factors that can affect it. The intersection set is the union of the reachability and antecedent sets. Therefore, the first level factors of ISM are determined, and the first level factors are further removed from the reachability matrix and continue this operation. Finally, the factor set at each level of ISM is obtained, as shown in [Table 5](#).

It is obvious to see from Table 4 that factors T1 and T2 have exactly the same row and column values. The integration of factors T1 and T2 has defined a new factor labelled by TD. Similarly, factors T3, T4, T6 and T7 are integrated into a new factor labelled by TS.

Table 5. Level partitions of reachability matrix

Factor	Reachability Set	Antecedent Set	Intersection Set	Level
S1	S1、TD、TS、T5、T8、T9	S1	S1	
S2	S2、TD、TS、T5、T8	S2	S2	
S3	S3、TD、TS、T5、T8	S3	S3	
S4	S4、TD、TS、T5、T8	S4	S4	
T1	TD、TS、T5、T8	S1、S2、S3、S4、TD、C3	TD	
T2	TD、TS、T5、T8	S1、S2、S3、S4、TD、C3	TD	
TS	TS	S1、S2、S3、S4、TD、TS、T5、T8、T9、C1、C2、C3	TS	1
T5	TS、T5	S1、S2、S3、S4、TD、T5、T9、C3	T5	
T8	TS、T8	S1、S2、S3、S4、TD、T8、C1、C2、C3	T8	
T9	TS、T5、T9	S1、T9	T9	
C1	TS、T8、C1	C1	C1	
C2	TS、T8、C2	C2	C2	
C3	TD、TS、T5、T8、C3	C3	C3	
S1	S1、T1、T2、T5、T8、T9	S1	S1	
S2	S2、T1、T2、T5、T8	S2	S2	

S3	S3、T1、T2、T5、T8	S3	S3	
S4	S4、T1、T2、T5、T8	S4	S4	
T1	T1、T2、T5、T8	S1、S2、S3、S4、T1、T2、C3	T1、T2	
T2	T1、T2、T5、T8	S1、S2、S3、S4、T1、T2、C3	T1、T2	
T5	T5	S1、S2、S3、S4、TD、T5、T9、C3	T5	2
T8	T8	S1、S2、S3、S4、TD、T8、C1、C2、C3	T8	2
T9	T5、T9	S1、T9	T9	
C1	T8、C1	C1	C1	
C2	T8、C2	C2	C2	
C3	T1、T2、T5、T8、C3	C3	C3	
S1	S1、T1、T2、T9	S1	S1	
S2	S2、T1、T2	S2	S2	
S3	S3、T1、T2	S3	S3	
S4	S4、T1、T2	S4	S4	
T1	TD	S1、S2、S3、S4、TD、C3	TD	3
T2	TD	S1、S2、S3、S4、TD、C3	TD	3
T9	T9	S1、T9	T9	3
C1	C1	C1	C1	3
C2	C2	C2	C2	3
C3	T1、T2、C3	C3	C3	
S1	S1	S1	S1	4
S2	S2	S2	S2	4
S3	S3	S3	S3	4
S4	S4	S4	S4	4
C3	C3	C3	C3	4

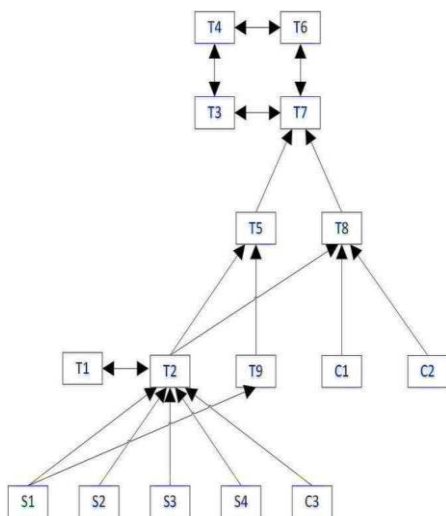


Fig. 2. Relationships among factors

Step five: Establish the ISM relationship model. According to the hierarchical results of the reachability matrix, the correlation diagram among the factors is depicted in Figure 2. The direction of the arrow indicates that the former factor affects the latter factor. Then, the specific contents of the factors are replaced by the code, and we can get the ISM model, as shown in Figure 3.

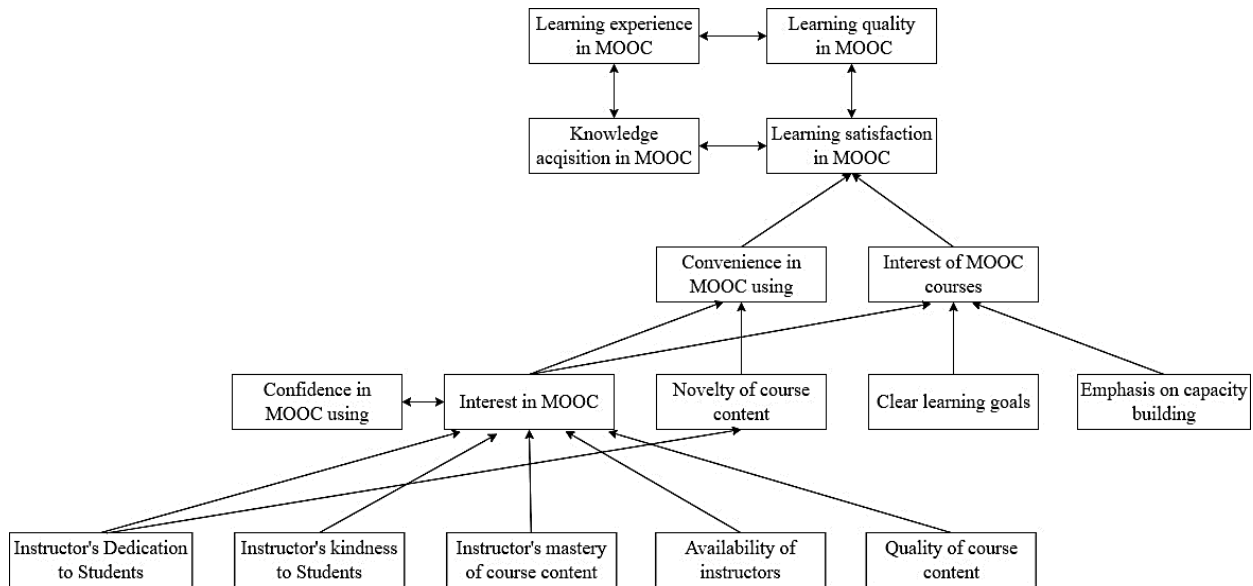


Fig. 3. ISM of factors influencing MOOC learners' self-regulated learning

4.2. Analysis of ISM

Several observations can be made from Figure 2. First, this mode is asymmetric. All factors can be divided into four levels. c T3, T4, T6 and T7 are at the top level of this structure. Factors S1, S2, S3, S4 and C3 are at the deepest level of this structure. The rest of the factors are in the middle. Third, factors T3, T4, T6 and T7 have bidirectional relationships. So are factors T1 and T2. Additionally, relatively more factors point to factor T2.

5. Discussion

Understanding how factors affect MOOC learners' continuous learning is essential to promote the MOOC learning experience and alleviate the dropout problem of MOOC learners. The ISM mode (Figure 3) disclosed some valuable insights into the relative importance of these factors as well as the interdependencies among them.

Five factors related to instructors' service are in the deepest level of the mode, which means that these factors have a significant potential influence on other dimension factors. They are the instructor's dedication to students (S1), the instructor's kindness to students (S2), the instructor's mastery of course content (S3), the availability of instructors (S4), and the quality of course content (C3). This finding is consistent with previous research (Albelbisi, Yusop, 2019; Zhao, 2016). They found that the instructor's service quality can increase learners' engagement and improve learning effectiveness in MOOC learning. In particular, the effect size of instructors' service quality is the smallest. In other words, the factors related to instructors' service quality are the lowest and the most basic among all the factors affecting the continuous learning of MOOC learners, playing the role of foundation support. In addition, research has shown that although the relationship between online learners and instructors does not directly lead to perceived learning gain and satisfaction, it can indirectly affect self-regulated learning, thereby affecting learning satisfaction (Zhou et al., 2021). Thus, this is similar to the findings of this study.

Four factors at the top level have a direct impact on the continuous learning of MOOC learners: knowledge acquisition in MOOC (T3), learning experience in MOOC (T4), learning quality in MOOC (T6) and learning satisfaction in MOOC (T7). These factors can directly affect the continuous learning of MOOC learners and cannot influence other factors. In addition,

the remarkable thing is that these four factors affect and interact with each other. This shows that if only you can learn something in MOOCs, you can have a good learning experience and satisfaction. Learning gains and the learning process experience are interlinked and mutually reinforcing. This finding is similar to existing studies (Al-Amri, 2022; Rossi et al., 2021), which reported that online learning engagement or experience could improve learners' performance on multiple skills.

The factors influence the factors in the middle levels at the deepest level and directly influence the factors in the top level, thus serving as a link between the levels above and below. Moreover, it is obvious that interest in MOOC (T2) has the maximum number of relationships, as it is influenced by factors S1, S2, S3, S4 and C3 and directly influences factors T5 and T8. Furthermore, it has a bidirectional relationship with T1. All of these relationships show that this factor plays a vital role in effectively alleviating the dropout problem of MOOC learners. It is proved that learning interest has a positive relationship with continuance intention to learn via MOOCs (Tsai et al., 2018). Therefore, it is recommended to increase learners' interest in MOOCs in various ways, such as improving instructors' social skills, increasing the readability of course content, and so on.

6. Conclusion

The facilitation of the continuous learning of MOOC learners is a complex issue with many uncertain factors. Analyzing its inner logic is conducive to maintaining a high degree of learning participation in MOOC learning. Unlike previous studies' structural equation modelling techniques (Albelbisi, Yusop, 2019; Tsai et al., 2018; Yang et al., 2017), this study used the ISM model to explore this issue and obtained the same results as theirs. In summary, the findings of this study lead to three recommendations. First, instructors' service quality plays a fundamental role in retaining learners to continue MOOC learning, including instructors' humanistic care for learners, teaching ability, etc. Especially in online learning, learners need more interaction and communication. Therefore, it is recommended that instructors should actively carry out interactive activities to improve learners' learning engagement in MOOCs. Second, learners' interest in MOOC positively correlates with continuance intention to learn via MOOCs. On the one hand, the instructors' high-quality teaching services can increase learners' interest in MOOC; on the other hand, cultivating learners' IT skills is also a kind of advice that can be referred to. Third, learners' attitude is directly related to continuous learning in MOOC. Thus, paying attention to learners' MOOC use experience and investigating their needs and suggestions are decisive measures to improve MOOC courses to retain learners to continue learning via MOOCs.

7. Limitations

The findings of this study help promote the continuous learning of MOOC learners and validate existing research. However, there may be errors in the data encoding in the ISM process, which requires further verification. In addition, MOOC learning includes many activities, and its influencing factors are also varied. Therefore, more factors need to be collected to support future research.

8. Declaration of Competing Interest

The manuscript's author declares that there is no interest in conflict, and all reference materials were dully acknowledged.

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Female Teachers' Promotion Barriers and Mitigation Strategies: Multiple Case Study Findings from South Africa

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Abstract

The study investigated barriers female teachers face when applying for promotional positions and their consequential impact on their teaching responsibilities. In this study, female and women are interchangeably used. The study was based on a qualitative multiple-case study research design and approach. Purposive sampling was used. In line with the design and approach, the sample consisted of five teachers from five different schools. An unstructured interview method was used to collect data, and the data collected were analysed by means of the thematic analysis method. The findings of this study revealed several barriers to management positions. These include domination by men, lack of leadership and management skills, lack of self-confidence, corruption in the schools, discrimination, and women not wanting to work far from their children or homes. These barriers burden women teachers because they become demoralised, demotivated, and bitter. Mitigation strategies that could help female teachers with their experience regarding promotional barriers also emerged as part of this study's findings. Based on the findings, conclusions and recommendations were made.

Keywords: congruity theory, female teachers, gender discrimination, management, promotion barriers, qualitative research, school governing body.

1. Introduction

Women have been found to form the bulk of the workforce in public education in both developed and developing countries (Sinyosi, Potokri, 2021). However, many studies have revealed that in school administration, men serve as bosses and that men are more likely to be found in positions with the greatest power, pay and prestige in comparison to women (Blackman, 2000; Smith-Doerr, 2004). In 2012, the total number of female educators in public and independent schools in South Africa combined was 285,252 (68%), while the number of male educators was 132,852 (32%) (Department of Basic Education; DBE, 2012). This means that female educators outnumber male educators by 7,107.

In Limpopo Province, where this study is delimited, there is a total of 58,194 educators. The number of female educators totals 34 074, while 24 120 are male educators (DBE, 2012). Again, this clearly indicates that female educators also dominate the teaching workforce in Limpopo Province. This figure shows that the DBE employs more female educators in South Africa than male educators. However, recent figures from 2017 indicate that male educators are promoted

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to higher positions than female educators. The Minister of Basic Education and Training, Angie Motshekga, confirmed this when she said:

“There are 8210 female principals and 14 337 male principals appointed in permanent positions in South Africa. This is a cause for concern, particularly because women constitute the majority in society and in the education sector in particular. The situation is worse in secondary schools where the majority of principals, their deputies and heads of department are male” (News 24, 2013).

Both the mentioned figures and statements of the Minister clearly show that the under-representation of women in school management continues unabatedly in post-apartheid South Africa. This is even though the government has attempted to address the issue of the under-representation of women in management positions by introducing legal frameworks. These include the South African Constitution (1996), the Labour Relations Act (No. 66 of 1995), the Employment Equity Act, 55 of 1998, as well as the concept of Affirmative Action, which informs the Employment Equity Act, among many other measures or frameworks. Given the above scenario, the researchers sought to investigate the barriers hindering female educators in the Groot Letaba Circuit of Mopani District primary schools in Limpopo Province from applying for and being promoted to school management positions. In addition, the impact of the barriers on their teaching responsibilities and the strategies that could be put in place to address the promotional barriers will be explored.

2. Literature Review

General barriers to promotions

According to Greyvenstein (1989), barriers to promotion are all the factors that prevent women or men from achieving fully on a professional level. Women face many challenges when applying for promotions in schools and other workplaces. Before discussing the barriers, it is essential to identify the metaphors related to the barriers experienced by women when they apply for promotional positions. The metaphors include the Glass ceiling, Glass escalator, Glass cliff, Pipeline, and Labyrinth.

Northouse's (2013) work indicates that during the 1960s and 1970s, when women attempted to advance beyond middle-management positions, they came up against an invisible, insurmountable barrier that kept them from attaining higher positions. This barrier was called “*glass ceiling*”. Accordingly, the glass ceiling prevents women and minorities from reaching more elevated positions in organisations, irrespective of their achievement and qualifications. Glass ceiling is the invisible upper limit in the organisation, beyond which it is very difficult or sometimes impossible for a woman and minority men to reach, despite their efficiency or qualifications. In other words, it is a well-ostracised measure perverted with the support of institutionalised culture and practice that prevent certain classes or categories of workers from not promoted beyond a certain rank or post.

The glass ceiling leads to inequalities and differentiations that cannot be explained by characteristics relevant to the female employees' work but can be explained solely by referring to an employee's gender (Cotter et al., 2001). Similar to the glass ceiling, the concept of the “*glass escalator*” is very much prevalent in the corporate world, and it means that men are progressing faster in the dominating female industry; namely, teaching and nursing, than women (Harlan, Berheide, 1994). This indicates that men are given more preference than women. The metaphor of the labyrinth was coined to emphasise that women are still faced with the interplay of diverse and complex factors which may work against them on their journey toward top-management positions (Eagly et al., 2007). Finding their way through a labyrinth requires women's constant awareness and resilience, focus on their professional development, and ability to understand the challenges ahead of them. These can be foreseen or unexpected, for example, prejudice against women, stereotypes, views on management styles and credibility, or family responsibilities (Carli, Eagly, 2016).

The *labyrinth* appears to have given rise to the Glass cliff – a metaphor which indicates that cracks have now begun to appear in the glass ceiling and women are making it into top positions, although as yet only in small numbers (Eagly et al., 2007). According to Ryan et al. (2011), women who have broken through the cracks are more likely than men to be appointed to leadership positions in companies facing difficult times. Brescoll et al. (2010) unveil that if they fail to turn the company around, they are more harshly judged than men would be in similar situations. The lack of women in top leadership positions has been explained using the metaphor of a *pipeline* that staff move through

up the organisational hierarchy (Einarsdottir et al., 2018). According to the pipeline theory, correction of the gender ratio will happen in due time as women and men gain entry-level positions in equal numbers and are therefore expected to reach top-management positions in equal numbers.

Barriers women face in the workplace

Actual barriers faced by women refer to intrinsic and extrinsic barriers. Intrinsic barriers are internal or personal, which are within women because of their femaleness, while extrinsic barriers are environmental challenges that influence the promotion of women into management positions in the teaching profession (Van der Westhuizen, 1997). Globally, about one out of every two adult women participates in the labour force compared to three out of every four men (World Bank, 2020). On average, women who participate in the labour force earn less than their male counterparts (Jayachandran, 2020). The barriers women face at the workplace are classified into different categories: gender stereotypes, philosophies and attitudes about women, lack of mobility, lack of aspiration, gender discrimination, home-related factors as barriers, lack of support, and organisational barrier factors.

Gender stereotypes

Gender stereotyping refers to the perceived and socially received traditional social roles, status differences, and power inequalities between men and women (Long, 2011). According to Neidhart and Carling (2003), women's identities and roles have traditionally been associated with parenting and caring, while men's identities have been associated with paid employment as well as becoming public and industrial managers. This perception leads to personal sanctions and guilt, lack of ambition, poor self-image, and poor self-confidence in female educators. According to Jonsen et al. (2010), people use stereotypes as a shortcut to predict how people will behave, and their abilities and stereotypes are enforced by society. Gender stereotypes are, therefore, oversimplified ideas, messages and images about differences between males and females. In other words, gender stereotypes make generalisations, assumptions and judgements about a person's personality, behaviour, appearance, skills, and interests.

Owing to sex role orientation, men are viewed as being dominant and aggressive, while women are viewed as passive and dependent (Potokri, 2015). When the traditional views are broken, and women seek roles that are traditionally reserved for men, then gender stereotyping occurs. Stereotypes have several adverse effects on human beings, such as decreased working memory, increased stress and anxiety (Potokri, 2015). According to Tearle (2004), the best way to avoid stereotypes is to focus on the fact that women are more than merely their gender. Tearle (2004) recommends that women should focus on discovering their true power from within, finding ways to use this power to help organisations achieve greatness, help others to discover the power that they have within them and encouraging others to direct their incredible power (Potokri et al., 2018).

Philosophies and attitudes about women

Women have been conditioned and socialised from childhood to believe that femininity is synonymous with a gentle and passive approach to everything (Greyvestein, 1989). Osumbah (2011) emphasises that women are labelled as mothers and wives and not capable of top management positions. That is why there is a sentiment which says, "women take care, men take charge" (Welbourne, 2005). This view is supported by Lipman-Blumen (1984) when he emphasises that women are regarded as unfit for leadership because they are portrayed as weak, soft-hearted, people-oriented, sensitive, manipulative, talking too much, prone to lying, protective, passive, emotional, dependent, fearful, and unsure about themselves.

Lack of mobility

Mobility is the capacity to move freely from one place to another (Home, 1998). In most cases, promotions require a person appointed to move from one place to another; the movement can be from one town or village to another town or village. A study by Home (1998) revealed that both married and single women are not interested in moving their families from one place to another. Another study by Chabaya et al. (2009) showed that many female teachers turn down promotions that require them to move their families to other places. According to Akpinar-Sposito (2012), many female teachers appointed in higher positions are not prepared to relocate to other places because of their children's education and social support systems.

Lack of aspiration

The term aspiration refers to a strong desire to achieve something high or great (Oplatka, Tamir, 2009). Many studies revealed that women do not have aspirations to occupy top positions in the workplace because of low self-esteem, an inferiority complex and a lack of confidence (Chabaya et al., 2009). Smith found that “many women have to a certain degree, internalised the attitudes and role expectations about women that they have learnt to fit neatly into the stereotypes” (Chabaya et al., 2009). Furthermore, Chabaya et al. (2009) found that many female teachers are not interested in promotional positions because of the challenges associated with higher positions. In addition, Coleman (2001) found that women are not interested in becoming principals of schools because of a lack of self-confidence. When female teachers are eventually appointed as principals of schools, they cannot solve the challenges because they do not believe in their abilities.

Gender discrimination

The term “gender discrimination” refers to treating someone unfavourably because of that person’s sex (Okechukwu et al., 2014). According to Hall (2004), for many decades, women in all spheres of life were not regarded as equal to men because they were not allowed to vote during elections. They did not earn the same salaries as compared to men; men received better benefits than women in terms of general working conditions in the workplace. Furthermore, in education, a female educator was not supposed to be pregnant before marriage; those who fell pregnant were suspended or dismissed, and very few female educators occupied management positions. After 1994, everybody believed that gender inequality in South Africa would disappear. This was emphasised by Honourable Nelson Mandela, the first President of the Republic of South Africa, when he said that democracy and freedom would never be acquired until all the people of South Africa and the whole world emancipated women from all types of oppression (South African Government, 1994). Nelson Mandela also emphasised that unless we in South Africa can observe that the conditions of the women of South Africa have transformed radically for the better, and that all the women of South Africa are all empowered to intervene equally with all citizens of our country, freedom cannot be achieved (South African Government, 1994). After 1994, the South African democratic government introduced various legislations aimed at eliminating discrimination against women. Although the South African government worked very hard to eliminate discrimination and racism, sexual discrimination is still applied, and women are prevented from occupying top leadership and management vacant posts in South Africa (De Braine, 2011).

There is still a higher percentage of males filling top posts in government institutions than females, which undermines the regulations, legislations and Acts of the Republic of South Africa (2001). According to the Minister of Basic Education in South Africa, men continue to dominate school principal positions despite an overwhelming number of women in the education sector (News 24, 2013). In 2016, 31.2% of school managers in the Limpopo Province were females. The districts with the highest female manager ratios are Lebowakgomo (39.8 %), Waterberg (38.8 %), Mokgalakwena (35.8 %) and Mopani (34.8%) (DBE, 2016). Most school managers are black Africans. In contrast to the school managers who are predominantly male, six out of ten educators (59.9% in the Limpopo Province are female (34.8%) (DBE, 2012).

Home-related factors as barriers

Women’s barriers extend far beyond the confines of the workplace, such as school (Einarsdottir et al., 2018). For many female managers, the home environment presents several obstacles that must be overcome to achieve upward mobility. One obstacle is that some women managers, especially those with families, experience the so-called “second shift syndrome”, where they must work on the first shift in the workplace and continue to the second shift in the home environment (Einarsdottir et al., 2018). This challenge is caused by the way girls and women have been socialised in many countries, which makes them believe in the overriding importance of being a mother and wife first, and that anything else, including their careers, is secondary (Chabaya et al., 2009). Several women managers are exposed to stress owing to the multiple role demands of running a career and managing a home (Meyerson, 2001).

The burden of juggling work-related goals with family responsibilities is a serious concern for some women. Women who find themselves in this circumstance are also called “dual career women”, where performance at work and home is necessary. Performing this balancing act between professional development and personal life may prove too difficult for some women in

many ways (Brownell, 2004). Some women eventually receive inadequate support from their respective families to pursue career advancement goals. Top positions are also a challenge to women because they are required to work long hours, attend lengthy meetings and regularly travel, negatively affecting their families (Chuma, Ncube, 2010). Women are therefore expected to sacrifice long-term relationships and have children. Many women cannot compromise this challenge because they want to spend more time with their families (Warsame, 2006).

Consequently, female teachers are not prepared to apply for management positions. Similar to Warsame's (2006) work, Chabaya et al. (2009) stress that lack of confidence contributes to the under-representation of women in school management positions. Chabaya et al. (2009) thus concluded that women are their own worst enemies when it comes to promotional prospects because they lack self-confidence. Owing to their lack of self-confidence, many women are not interested in applying for management positions in schools. Hansard (1990) also emphasises that women lack self-confidence because they fear criticism and taking risks.

Strategies to assist female educators in overcoming promotional barriers

There is an urgent need to assist female educators in overcoming barriers to promotions to senior positions in schools and other sectors of life. Various strategies may be implemented to overcome the promotional barriers of female educators.

Creation of awareness programmes

In South Africa, there is a need for a very strong awareness programme which will make everyone aware that women face serious challenges when applying for promotions. According to Simpson (2008), an awareness programme is the creation of awareness and understanding, as well as an acceptance of the process aimed at changing the status quo in the organisation. Researchers such as Mckeen and Burke (1991) have suggested that male managers who are aware of the issues facing women in management could support change in relation to gender issues in their organisations. This implies that men should lead awareness programmes to demonstrate that men are not against the programme. The programmes designed to reduce bias, such as blind review of resumes, can limit bias in crucial aspects of the hiring process and encourage effective workplace culture change (Hill et al., 2016).

Mentorship programme

One of several ways in which women overcome barriers is through mentorship programmes. According to Noe (2008), mentoring is an activity that provides career guidance and psychological support to all employees, especially women. Coleman (2001) recommends that additional support should also be provided to men. The importance of mentorship is emphasised by Bush and Coleman (2010), who state that mentorship is important to career advancement, higher pay and greater career satisfaction. Moreover, the mentoring relationship may be critical to the advancement of women in organisations, although demand exceeds supply (Bush, Coleman, 2010). Mentoring should, however, not end when the aspirant achieves a position in management but should continue to support the success and advancement of those in management (Noe, 2008). Mentors create opportunities to operate outside organisational norms and set high-performance standards that stimulate personal motivation. Lumby and Azaola (2010) found that mentorship has many advantages for women who participate in mentorship programmes and some of the advantages are greater self-confidence, motivation and effective management.

Mobilising and educating women about their abilities to manage

According to Aifeng (2000), the strategies for mobilising and educating women can be achieved by focusing on girl child education in terms of women in top educational management and leadership providing realistic role models, meeting biological and sanitation needs of girls in school, and removing all negative stereotypes of women at all levels of education. This strategy is vital to educate female children to be confident so they can be as effective as managers as their male counterparts. Pirouznia (2013) supports this view by underscoring that to change women's attitudes, it is important to examine what is done about this in early childhood and primary school gender role education.

Changing the views of patriarchal and traditional societies about gender roles

According to Archer and Lloyd (2002), patriarchy has long been cited as the root cause of women's role conflict in traditional societies. This indicates that males, as husbands, fathers, co-workers, and the dominant force in school management positions, are part and parcel of the

problem of the under-representation of women in management positions. In a study conducted in the United Kingdom, Liu (2000) emphasises that the higher demands on the professional roles of women teachers make the conflict and tension between self-respect and feelings of inferiority even more acute. Therefore, women must take charge of their destinies and be proactive to succeed. Aifeng (2000) also emphasises that males must change their perceptions of the value of women and discard traditional gender concepts formed thousands of years ago.

Theoretical framework: the role congruity theory

Eagly and Karau (2002) developed the role congruity theory. Accordingly, role congruity theory is grounded in social role theory's treatment of the content of gender roles and their importance in promoting sex differences in behaviour. The role congruity theory postulates that prejudice towards female leaders occurs because inconsistencies exist between the characteristics associated with female gender stereotypes and those associated with typical leadership. The concept "prejudice" refers to preconceived and unfavourable feelings towards people or persons because of their political affiliation, sex, gender, beliefs, values, social class, age, disability, religion, race, ethnicity, language or nationality (Dovidio, Gaertner, 2010). Prejudice is an affective feeling towards a person based solely on that person's group membership (Eagly, Diekmann, 2005). This view implies that a group will be positively evaluated when its characteristics are recognised as aligning with that group's typical social roles. The role congruity theory of prejudice toward female leaders proposes that perceived incongruity between the female gender role and leadership roles leads to two forms of prejudice. These include perceiving women less favourably than men as potential occupants of leadership roles and evaluating the behaviour that fulfils the prescriptions of a leader role less favourably when a woman enacts it (Eagly, 2005).

According to the role congruity theory, one of the two main causes of prejudice preventing women from achieving high-status positions or success is the perception of women when placed in leadership positions (Eagly, 2005). The possibility of prejudice against female leaders inherent in the female gender role follows from its dissimilarity in what people expect from leaders. Prejudice can also occur when people judge women as the wrong replacements for particular leadership positions. People believe that women do not possess the qualities required to succeed as a leader. Furthermore, people tend to have dissimilar beliefs about leaders and women and similar beliefs about leaders and men. Eagly and Karau (2002) emphasise that women who are leaders are perceived less positively when compared to male leaders. Eagly (2005) also showed that women have a more difficult time achieving high-status positions in the workplace and in maintaining these positions through achievement and success. These accepted gender stereotypes allow for a greater prediction of sex differences between males and females in social behaviours, which arguably may impact promotional ambition or desire at places of work. Owing to their socially accepted roles, women are more often perceived in lower-status positions than their male counterparts, and men emerge as leaders more than women.

The role congruity theory further indicates that women in academic positions such as lecturers, professors and researchers struggle with meeting the expectations of the male-dominated role (Whitley, Kite, 2010). Caplain (1994) asserts that the characteristics associated with the female stereotype, such as nurturance, warmth and supportiveness, are incongruent with the expectations of the faculty, which are masculine, such as directive, assertive and knowledgeable. Therefore, a female faculty member violates societal expectations for both women and leaders. This violation results in both discrepant expectations for men and women and negative evaluations of women in such positions. The role congruity theory asserts that women are subject to higher standards for leadership competence than their male counterparts. This implies that women have to work harder than men to prove their competency and capability as leaders by putting in more time and energy and monitoring stereotypical expectations that they face as women. However, this hard work has the potential negative side effects of women leaders being unfavourably judged as characteristically trying too hard.

The role congruity theory also emphasises that women are expected to choose between being viewed as competent leaders or being liked by co-workers and followers. Women who adopt a masculine leadership style are often viewed as competent but receive more negative evaluations of their interpersonal skills when compared to women who adopt a feminine leadership style. When women assert themselves, they risk being seen as competent but cold (Fine, 2010). The role

congruity theory predicts that women will be less likely than men to emerge as leaders when expectations for the leader role are incongruent with gender stereotypes. Although women have gained increased access to supervisory and middle management positions, they remain quite rare as elite leaders and top executives. However, Eagly and Karau (2002) emphasise that women should experience reduced prejudice and gain increased representation and acceptance in leadership roles in the future because organisations have shifted away from a traditional view of leadership toward a more democratic and participatory view. The role congruity theory is considered helpful in this study because it assisted the researcher in understanding gender inequality and the barriers experienced by women in the workplace.

2. Method

The study was based on a qualitative multiple-case study research design and approach (Sarfo et al., 2021). Regarding the selection of participants, we used purposive sampling (Sarfo et al., 2022). In line with multiple case studies, the sample consisted of five teachers from five schools in the Groot Letaba Circuit of Mopani District in the Limpopo Province of South Africa. An unstructured interview method was used to collect data. The interview was intended to gather information about the participants' experiences, understandings and feelings about female educators' barriers when applying for educational and promotional positions. Five educators who applied for promotional positions and failed were interviewed. To protect the identity of the participants, they are referred to as Participants 1, 2, 3, 4 and 5. In sequence or accordingly, Participants 1 to 5 are from schools 1 to 5.

The data collected through interviews were analysed by the Tesch Method of qualitative data analysis (Creswell, 2014). This involved interpreting the data in the basic sense of reflecting on the data until a better understanding of what was meant was achieved. After the transcription of the interviews, a general impression was observed by reading all transcripts. Moreover, ideas about possible categories were jotted in the margins as they appeared in mind. Similar topics were put together. A list of the topics was returned to the data and abbreviated as codes. The codes were written next to the appropriate segments of text. The most descriptive wording for the topics was written and then turned into themes or categories. Related topics were grouped together to reduce the number of categories. Interrelationships between categories were identified, and a final decision was taken on the abbreviation for each category. The researchers assembled the data material belonging to each theme or category in one place and did a preliminary analysis. Finally, the researchers started interpreting and reporting the research findings.

3. Results and Discussion

Data collected from the five teachers through individual interviews are presented and analysed accordingly. The responses of participants to the interview questions are categorised into different themes. Based on the research questions, three main themes and four sub-themes emerged from coding interview transcripts. See Table 1 for details.

Table 1. Responses by participants on the main themes

Main theme	Sub-themes
1. The barriers faced by female educators when applying for promotional positions in schools.	- Women do not have self-confidence. - Women are not fit to occupy management positions
2. Promotional barriers impact women educators' teaching and other responsibilities at school.	- Women become so demoralised that they are not able to perform to their best level.
3. The strategies that can be implemented to assist female educators in overcoming promotional barriers to management positions.	- Men and the government should support women to overcome barriers to management positions

Main theme 1: The barriers faced by female educators when applying for promotional positions in schools

This theme relates to the first research question. The participants were asked questions about the barriers faced by female educators when applying for promotional positions in schools. An analysis of the participants' responses produced two sub-themes. First, women do not have confidence in themselves. Second, women are not fit to occupy management positions.

Common to the participants' voices is the belief that women do not have confidence in themselves because they are not supported, especially by people who are supposed to or the ones they look up to for support, which discourages them. According to Participant 1, *most women are not interested in management positions because they are not supported and are afraid of being victimised by men*. The participant further said *that when women are given schools to run and have to work with men, they find it difficult and always think that men are undermining them and will not cooperate*. This possibly explains why men dominate Deputy Principalship posts and Principalship posts in schools. The beliefs of women also enhance men's dominance in these positions.

An excerpt from Participant 2 indicates that women educators or teachers themselves are not sure if they can perform in those positions. In her words, *women are naturally and culturally taken as weak vessels, and they may not be equal to the task sometimes*. Further to this, *some are afraid to leave their families behind in case they get the post far from their homes*, and this is the case for some promotional posts that are vacant or advertised.

As echoed, Participant 3 thinks *women lost confidence because they are being labelled as people who are only fit to occupy kitchens and not fit to be given schools to manage*. *They are also discouraged from applying for promotional posts by people who think they may not succeed in managing a successful organisation as a school*. Whenever a woman gets a chance to occupy principalship positions, people are likely to make statements, such as *that school is heading for fall because no woman can ever run a successful school*, said Participant 3.

The views of the participants expressed above are not different from other participants. For example, it is emphasised by Participant 4 said that women have lost confidence because they are always undermined for promotions. Accordingly, she reveals *that women are always discouraged from applying for promotional positions because they are regarded as weak for those positions compared to men*. *Surprisingly, women are always compared to men and not to other women*. This perception indicates that there is gender-based discrimination in the appointment of teachers in higher positions. For Participant 5, *women lost confidence in themselves because they were still looked down on by society and were still regarded as powerless people*. *Women also lose confidence because they feel oppressed by men and are afraid to challenge men*. *Women also think they do not have the strength to lead men*. As researchers, we agree with the further assertion of the participant that it is not true because strength is not necessarily required for promotional posts female teachers seek; only skills and knowledge count.

The views of participants, as shown above, reveal that lack of self-confidence and belief that women do not fit or are capable of occupying management positions are mainly the barriers female educators face when applying for promotional positions in schools. This revelation, part of this study's findings, agrees with the assertion of other writers and researchers scanned from reviewed literature. Chabaya et al. (2009), for example, revealed that women do not have aspirations to occupy top positions in the workplace because of low self-esteem, inferiority complex and lack of confidence. As researchers of this study, we would assume in agreement with Coleman (2001) that women's lack of confidence in themselves is why many women teachers are not interested in becoming principals. To a large extent, given the finding established here, we believe that lack of confidence and belief that women are not fit or capable of occupying management positions "internalised the attitudes and role expectations for women, including female teachers, which culminates into the stereotypes" (Chabaya et al., 2009).

Main theme 2: How promotional barriers impact women educators' teaching and other responsibilities at school

This theme related to the second question revealed that all the participants indicated that promotional barriers demoralise women to the extent that they cannot perform their work effectively. This view was confirmed by Participant 1, who indicated that the barriers to promotional positions negatively affect her work because she is always angry when performing. According to her, *the anger which is caused by discrimination against her because of her gender*

demotivates her from working hard. The participant indicates that she *always performs very well in the interviews, but she is not appointed because she is a woman, and this is clear because only men are appointed to senior positions.* Participant 2 also expressed that she is experiencing a negative impact on her work because of demotivation. Participant 2 indicates that the barrier to occupying a promotional position negatively affects her work. She said she could hardly satisfactorily teach her learners joyfully as she used to and loved to do. She believes she can be a principal, but she is not appointed. She is demotivated in her work because she is not appointed as a principal, and only men are appointed. She can no longer perform her work effectively because she is always worried about this barrier. Participant 3 also confirms that discrimination against her affects her work at school, including teaching her learners. According to Participant 3, *promotional barriers cause many problems at school because all side-lined women do not perform their work to their best level.* Participant 3 emphasises that the promotional barrier also demoralises and prevents women from improving their academic and professional qualifications. Of what point or need will the improvement of academic and professional qualifications be? If women are not considered for promotion. Participant 3 said, *I know several women who have high qualifications but are not promoted.* Participant 4 also supports that gender discrimination in promotional positions negatively affects her work. Unlike Participants 1, 2 and 3, who emphasises that the barrier affects their workplace responsibilities and women's performance, Participant 4 indicates that the gender-based barrier affects both female and male teachers because incompetent male teachers are appointed to higher positions, such as school managers. The male principals struggle to manage and lead the schools due to their incompetence. Owing to her high competence in management and leadership, she is pressured to perform many duties of the male principal, which creates an overload and stress. The overload and stress result in poor performance of the female teacher.

As deduced from theme 2, demoralisation is a major impact of promotional barriers on women teachers, negatively impacting their teaching responsibilities. They are usually demoralised after their promotion applications and, sometimes, by the promotion application outcomes of other women teachers they know. This demoralisation can be factored in or equated to the concept of "prejudice" highlighted in this study's theoretical framework. The concept refers to preconceived and unfavourable feelings towards people or persons because of their political affiliation, sex, gender, beliefs, values, social class, age, disability, religion, race, ethnicity, language or nationality (Dovidio, Gaertner, 2010). The concept of "prejudice" allows for women to be perceived less favourably than men as potential occupants of leadership roles and positions (Eagly, Karau, 2002). This leaves women educators or teachers demoralised and subsequently impacts their job responsibilities, including teaching their learners, as mentioned by participants. Participants in this study, like women in academic positions given the work of Whitley and Kite (2010), struggle with meeting the expectations of leadership posts. We ascribe their struggle to their psychologically conceived perception that leadership roles are for men because society sees leadership as a male role.

Main theme 3: The strategies that can be implemented to assist female educators in overcoming promotional barriers

Most participants indicate that support from the government and men is the best strategy to assist women in overcoming promotional barriers to management positions. This implies that the government and men should support female teachers to overcome the barriers associated with demoralisation and the belief that women are not fit to occupy management positions, impacting their confidence level. In the words of Participant 1, *the government should support women by ensuring that the Equity Act of South Africa is effectively applied to avoid discrimination against women and gender-based violence.* The government must apply this act as a strategy by ensuring that interviews are conducted fairly and without discrimination and corruption and ensure that more women occupy managerial positions. Participant 1 also emphasised that *the government should encourage women to further their studies and submit applications for promotional positions.* The support for female teachers as a strategy to fight promotional barriers facing women is confirmed by Participant 2, who indicates that *the government and teachers must always give women responsible positions in schools, avoid discrimination against women, empower women and ensure that Equity Act is effectively implemented.* The provision of support to women as a strategy for avoiding barriers to promotional positions women is also supported by Participant 3, who asserted that *men, especially male teachers, should support women by respecting women's*

rights and supporting women when they are appointed to managerial positions. To this end, the government should monitor interview processes to avoid discrimination and corruption.

The suggestion of most participants about government and men's support for women has been the best strategy to assist women in overcoming promotional barriers concurs with Mckeen and Burke's (1991) finding. Accordingly, Mckeen and Burke argue that male managers, particularly those aware of the issues facing women in management, should support change in relation to gender issues in their organisations. The same support should be extended to female teachers who aspire or seek promotion to higher or managerial positions. In view of this, Aifeng's (2000) notion that males must change their perceptions of the value of women and discard traditional gender concepts formed thousands of years ago must be upheld. The emphasis and call of this study's participants for effective implementation of the Equity act in the country suggest that it is not well implemented as it ought to be. It could help address or mitigate the promotional barriers if effectively implemented. This argument sounds logical when one draws on the work of Hill et al. (2016). For these authors, any programme directed at the eradication of barriers for women, which could be in the form of legislation and acts must be designed to reduce bias, such as blind review of resumes, can limit bias in crucial aspects of the hiring process and encourage effective workplace culture change (Hill et al., 2016).

4. Conclusion and Recommendation

The analysis of this study's data revealed that female teachers face numerous barriers when they apply for promotion in schools. These barriers include the domination of men at their respective schools, which is their place of work. Men, the dominant ones, can influence policy, control and encourage their male colleagues as opposed to the female ones. In view of this, female teachers do not get support for promotional issues. Apart from the already mentioned barriers, other barriers include female educators' lack of leadership and management skills, resistance to work far from their homes or children, lack of self-confidence, corruption, and societal beliefs about women.

Evidently, the barriers prevent women from getting promoted to higher managerial posts and impact their teaching responsibilities. Three impacts of promotional barriers on women educators' teaching and other responsibilities at school include: (1) It is a burden because women are compelled to do other people's work, (2) Women who are being side-lined do not perform to their level best, because they become so demoralised, (3) Women become demotivated and bitter by promotional barriers. In sum, the barriers' impact negatively impacts the job satisfaction of women teachers who are unable to get a promotion because of the barriers that prevent them from applying and/or being promoted.

Based on the barriers illuminated in this study, ways of overcoming the barriers must be sought. We, therefore, recommend that the Department of Education should motivate the communities, men, principals, SGB members, teachers and heads of department to support the promotion of women to management positions in schools. Further, we recommend that the Department of Basic Education should organise and conduct effective workshops to discuss improving the promotion of women to management positions. The Department of Basic Education should also design new policies to enhance women's promotion to management positions. Importantly, the employment equity act should be properly implemented. The communities, principals, school governing board (SGB) members, teachers and heads of departments should always promote gender equality by supporting the promotion of women to management positions in schools.

5. Conflict of Interest Statement

The authors of the manuscript declare that there is no interest in conflict, and all reference materials were dully acknowledged.

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Emotional Labour and Psychosocial Well-Being among the Clergy in Ghana

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Abstract

This study was conducted among the clergy in Accra, Ghana, to examine the level of emotional labour and how that impacts psychological well-being, satisfaction with job and life among pastors/'men of God'. The study recruited 111 participants from various Christian religious denominations (Orthodox, Charismatic and Pentecostal) in Accra. Quantitative data were obtained using standardised scales with acceptable psychometric properties to measure emotional labour and psychosocial well-being (satisfaction with life, job satisfaction and psychological well-being). The results of the study are that the clergy experience above-average emotional labour, which is significantly and positively correlated with psychological distress. Emotional labour is, however, not significantly correlated with satisfaction with life and job satisfaction among the clergy. Our findings have implications for pastoral mental health promotion, education and research.

Keywords: charismatic, clergy, emotional labour, ghana, orthodox, pentecostal psychosocial well-being.

1. Introduction

The psychological well-being of the 'man or woman of God' in Ghana has been ignored for a long with the perception that the Almighty God spiritually insulates them they are serving. However, the 'man or woman of God' may be emotionally labouring, leading to psychological problems in their lives. Research in Ghana is almost non-existent, making it challenging to inform crucial interventions for this group of citizens. Meanwhile, religion is an important part of Ghana, with the clergy playing an instrumental part. The clergy is also globally most trusted in society (Weaver et al., 2002).

Emotional labour has been well considered in the industrial/organisational setting where its original underpinnings are met; face-to-face or voice-to-voice contact with clients (de Castro et al., 2004). In Ghana's Christian community, there is an emerging pattern requiring religious leaders to present the best appearances and emotions to instil joy, hope and confidence among the membership. The work of the 'Man or woman of God' (Pastor, Priest, Elder, deacons, etc.) requires regular meetings and conversation with people, usually in their congregation, including vulnerable ones, thereby becoming the support base for many people (Weaver et al., 2002). They are expected to promise and deliver hope, joy and wellness (Rudolfsson, Milstein, 2019). In this regard, the pastor is expected to be sensitive to many people (emotional, spiritual, and practical needs) (Carroll, 2006). This makes it clear that pastors must endure considerable emotional dissonance.

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The effect of this will reflect in their satisfaction with life (Gopalan et al., 2013), well-being (Karim, Weisz, 2010) and job (Psilopanagioti et al., 2012).

By extension, the pastor's challenges affect their family and friends. What is even scary is that the members who seek help will also be affected. Unfortunately, the pastor has to assist the people, a situation that can render the pastor helpless in the face of challenges. Ash (1984) maintained that talking to the pastor's wife is the best way of getting what is happening to the pastor's home/family. This suggests that they (the pastors) endure a lot of challenges but have to always put up a good front. In current times where membership is a big concern for churches in Ghana, the congregational leaders are expected to maintain a certain level of 'goodness' towards the congregation. They must thus bury their emotions and hurts to save the 'flock'. The act of the pastor covering up his emotions to serve his duty is very well defined by the term 'emotional labour'.

By definition, Hochschild (1983), the one who coined the term, defined emotional labour to be 'the management of feeling to create a publicly observable facial and bodily display.' Emotions are feelings that people experience, interpret, reflect on, express, and manage (Mills, Kleinman, 1988). These emotions arise through social interaction and are influenced by social, cultural, interpersonal, and situational conditions (Martin, 1999). In many daily life situations, people suppress feelings and display more socially acceptable emotions that are deemed more appropriate. The regulation of one's emotions to comply with social norms is called 'emotion work' (Hochschild, 1990). This is particularly when a job requires displaying particular emotions and suppressing others to make a wage.

Theoretically, Grandey (2000) used the emotional regulatory theory [which explains a process by which an individual can personally influence or regulate which emotions to express, when and how (Gross, 1998)] to explain emotional labour. Grandey's model emphasises surface and deep-acting factors influencing emotional labour (situational, personal and organisational) as well as consequences for individuals (job satisfaction, burnout) and organisations (absenteeism and turnover intentions). A perspective by Morris and Feldman (1996) on emotional labour based on the interactionist model of emotion indicates that people's emotional expressions are externally/socially constructed, basically in line with the understanding they gain from their interaction with their environment.

Emotional labour is corroborated by the 'Person-Environment Fit' theory, which emphasises the joint effect of the environment and the person, viewing emotional labour as a product of the compatibility between a person's characteristics and those of a specific job (Caplan, 1987). Thus, a mismatch between the characteristics of the individual and the job (especially regarding behavioural requirements) will more likely result in stress and labour. Unfortunately, research on emotional labour among the clergy has not received much attention, especially in Ghana and Africa. This is particularly important because there are incidences of suicide, rape and fraud occasionally recorded among this population in different parts of Ghana and elsewhere. Their psychological experiences must be studied to provide the needed support they may need.

Though the clergy is considered the mouthpiece of God and so should be protected by God, research indicates that they experience work-related challenges such as trouble separating themselves from their job (Beebe, 2007; Hill et al., 2003), job dissatisfaction (Mueller, McDuff, 2004). The number of engagements pastors have could also be exhausting, leading to stress and related distress (Evers, Tomic, 2003; Carroll, 2006). This was supported by Knox et al. (2002), who found that the clergy experience higher levels of anxiety and depression compared to the general population. Consequently, if the 'Man or woman of God' experiences emotional labour, they will experience negative psychological health, namely depression and anxiety (Michie, Williams, 2003) as well as somatic complaints (Buys, Rothman, 2010). This will effectively be to the disadvantage of the people they try to help.

Therefore, this present study seeks to explore the prevalence of emotional labour and its impact on the clergy's psychological distress and satisfaction with life and their job. Specifically, the study aims to a) examine the level of the emotional labour of pastors in Charismatic and orthodox churches in Ghana, b) examine how emotional labour is associated with psychological distress among pastors, c) examine how emotional labour is related to life and job satisfaction among the clergy in Ghana.

2. Materials and methods

Study Design

Using standardised questionnaires, this study used the cross-sectional survey design to collect data across a diverse section of the population under study. This allowed for the consideration of several groups within the Christian community in Ghana.

Population and Sample

The population of this study was the clergy (Pastors and Priests) in Accra, Ghana. This includes the Pentecostal, Charismatic and Orthodox churches/denominations. Pastors who qualified for the study were those identifiable with a particular mission or church. We conveniently selected a sample of 111 for the study (Sarfo et al., 2022). This consists of 94 males and 17 females, representing 84.7 % and 15.3 %, respectively. The sample is also made up of 23 (20.7 %) Orthodox, 39 (35.1 %) Pentecostal, and 49 (44.1 %) Charismatic. In terms of rank in the respective churches, there are 40 (36 %) senior ranks, 54 (48.6) junior ranks and 17 (15.3) other ranks. The mean age of the sample is 45.25 (standard deviation = 10.83), with a mean duration in the ministry of 13.49 (standard deviation = 9.29) (see Table 1).

Measures

The study used four questionnaires; the Emotional Labour Questionnaire, the Brief Symptom Inventory (BSI), the Satisfaction with Life Scale and Job Satisfaction Scale.

Emotional Labour Scale: this was assessed using Brotheridge and Lee's (1998) Emotional Labor Scale. This is a 14-item, 5-point Likert scale that measures five domains of emotional labour: frequency, intensity, variety, deep acting and surface acting. Responses on this scale range from 1 = Never to 5 = always, where a higher score represents higher emotional labour. The scale is reported to have good reliability of Cronbach's alpha = .86.

Brief Symptom Inventory (BSI): This is a 53-item, four-point Likert scale with nine domains of psychological distress, namely somatisation, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. It has a Global Severity Index (GSI), the average score of all 53 items. The scale shows a good internal consistency of Cronbach's alpha ranging from 0.71 to 0.85 for the nine subtests. It also has test-retest reliability from 0.68 to 0.91 (Derogatis, Melisaratos, 1983). It correlates strongly with the Symptom Checklist (SCL-90) (the full version of the BSI), ranging from 0.90 to 0.99 (Derogatis, 1993).

Satisfaction with Life Scale: The satisfaction with life scale is a five (5)-item 7-point Likert scale developed by Diener et al. (1985) to assess an individual's overall satisfaction with life. The scale is scored by adding all the scores on each item. It has a Cronbach's alpha reliability = .74 (López-Ortega et al., 2016).

The Generic Job Satisfaction Scale: This is a 10-item five-point Likert questionnaire that measures an individual's general satisfaction with a job. The scale was developed by Macdonald and MacIntyre (1997). It has a reliability of Cronbach's alpha = 0.77. It is scored by adding up all the responses to obtain a total score.

Data Collection Procedure

Formal permission was sought from the respective churches recruited for the study. In each church, the head pastor(s) was contacted, and the study purpose was duly explained to them. Apart from the head pastors, consent was sought from the individual pastors who agreed to participate in the study, with confidentiality assured them. They were given two days to respond to the questionnaires for subsequent retrieval.

Ethical considerations

Ethical clearance was obtained from the Ethics Committee for Humanities at the University of Ghana, Legon (Clearance number ECH 017/16-17). The aim of the study was clearly explained in a consent form to research participants, and their consent was also sought for their participation in the study. There was no form of coercion or inducement for participation in the study. Confidentiality was also promised and strictly adhered to in this study.

3. Results

The SPSS version 16 was used to analyse the data collected to meet the aims of the study. Table 1 presents the demographic features of participants in the study as well as mean scores of emotional labour, psychological distress, and life and job satisfaction at the various demographic levels of participants. It must be noted that these mean differences were not statistically significant. However, the aim was to inspect which group surpassed the measured variables.

Table 1. Demographics and mean scores on study variables

Demographic	Frequency	Percentage	EL [M (SD)]	GSI [M (SD)]	LS [M (SD)]	JS [M (SD)]
Sex						
Male	94	84.7	38.8 (7.2)	.5 (.4)	23.3 (6.2)	128.5 (24.7)
Female	17	15.3	41.0 (6.5)	.4 (.2)	23.4 (6.9)	132.4 (31.3)
Church type						
Orthodox	23	20.7	37.5 (7.6)	.4 (.38)	23.6 (6.9)	128.8 (30.4)
Pentecostal	39	35.1	39.2 (7.8)	.5 (.5)	24.3 (5.1)	132.5 (20.1)
Charismatic	49	44.1	39.9(8.1)	.5 (.4)	22.4 (6.1)	126.57 (27.4)
Rank						
Senior pastor	40	36.0	38.2(6.4)	.4 (.3)	22.5 (6.4)	126.1 (27.3)
Junior pastor	54	48.6	40.2(7.3)	.6 (.5)	24.6 (5.7)	130.9 (22.9)
Other rank	17	15.3	40.0(8.9)	.5 (.4)	23.0 (7.0)	134.9 (27.2)
Age [M (SD)]	45.25 (10.83)					
Duration in ministry [M(SD)]	13.49 (9.29)					
EL [M(SD)]	39.2 (7.1)					

Notes: M = Mean, SD = Standard Deviation; EL=Emotional Labour, GSI = Global Severity Index, LS = Satisfaction with Life, JS = Job Satisfaction

The results indicate that the mean score for the study sample is 39.2 (SD = 7.1). This is slightly above the mid-score on the emotional labour scale. From this, female ministers of God experience higher levels of emotional labour (mean = 41.0) than males (38.8). However, these women reported slightly lower levels of psychological distress (0.4) than the men (0.5) and slightly higher levels of job satisfaction than the men (see Table 1).

The results also show that Pentecostal and Charismatic ministers experience the same emotional labour and psychological distress levels as the orthodox. However, the Pentecostal ministers experience slightly higher satisfaction levels with life and job satisfaction, followed by the Charismatic. Senior pastors reported slightly lower emotional labour and psychological distress levels than the junior and other ranks. However, senior pastors experience lower satisfaction with life and job satisfaction than the junior and other ranks. Table 2 presents the association between emotional labour, psychological distress, job satisfaction and life satisfaction among the clergy.

Table 2. Correlation matrix showing the relationship between study variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Duration															
2. Age	.52*														
3. EL	-.05	.03													
4. SOM	-.09	-.12	.21*												
5. OC	-.01	-.07	.22*	.69*											
6. IS	-	-.12	.25*	.59*	.61**										
	.22*														

7. DE	- .22*	-.12	.25*	.59*	.61**	1.0*									
8. ANX	-.15	-.16	.24*	.73*	.67*	.68*	.68*								
9. HOS	- .20*	-.18	.25*	.68*	.65*	.71**	.71**	.72*							
10. PA	-.07	-.18	.16	.68*	.70*	.58*	.58*	.77**	.71**						
11. PAR	- .24*	-.14	.34*	.54*	.54*	.67*	.67*	.59*	.70*	.50*					
12. PSY	-.16	-.14	.30*	.70*	.68*	.63*	.63*	.81*	.71**	.77**	.51**				
13. GSI	-.18	-.16	.30*	.83*	.82*	.85*	.85*	.88*	.87*	.83*	.77**	.85*			
14. LS	.17	.09	.13	-.14	-.13	-.09	-.09	-.04	-.11	.01	-.07	.00	-.09		
15. JS	.07	-.02	.05	-.08	-.02	-.02	-.02	-.11	.02	-.01	-.03	-.03	-.04	.31**	

Notes: EL = Emotional Labour, DE = Depression, ANX = Anxiety, HOS = Hostility, Som = Somatisation, OC = Obsessive Compulsion, IS = Interpersonal Sensitivity, PA = Phobic Anxiety, PAR = Paranoia, PSY = Psychoticism, GSI = Global Severity Index, LS = Satisfaction with Life, JS = Job Satisfaction

From the correlation results in [Table 2](#), emotional labour is found to correlate positively and significantly with psychological distress (GSI) (0.30) and with all its domains except phobic anxiety [somatisation, $r = 0.21$, $p < 0.05$; obsessive compulsion, $r = 0.22$, $p < 0.05$; interpersonal sensitivity, $r = 0.25$, $p < 0.01$; depression, $r = 0.25$, $p < 0.01$; anxiety, $r = 0.24$, $p < 0.05$; hostility, $r = 0.25$, $p < 0.01$; paranoia, $r = 0.34$, $p < 0.01$; psychoticism, $r = 0.30$, $p < 0.01$]. Emotional labour is, however, not significantly correlated with satisfaction with life and job satisfaction.

4. Discussion

The emotional labour encountered by the clergy is essential, especially in Ghana, because many people turn to the clergy for spiritual and related spiritual support. Unfortunately, not many expect the 'man or woman of God' to experience personal struggles, probably affecting their job. As seen from the results of this study, the clergy experience as much as above half of the scores on emotional labour. This indicates that the clergy also tries to manage their emotions as they attend to the needs of others ([Carroll, 2006](#)). This pertains to face-to-face occupations ([de Castro et al., 2004](#)).

The 'man or woman of God' has their own lives. They may have a family, financial needs, and emotional needs as well as health concerns. Followers of these people may wish to see them consistently stable and ready to support. Eventually, there is the tendency for followers to assume that the 'man or woman of God' does not need it since they are insulated spiritually by the Almighty God. Therefore, their needs are always provided for since they work for God. However, it is the case that most pastors are not paid salaries for their pastoral job. They have to juggle their jobs and the ministry work. They have families to feed. They experience health challenges. Some followers have even become their dependents. These may place a sufficient toll on them and cause them to be emotionally drained. However, pastors enter into a state of emotional labour as their congregations expect them to show no worries.

The findings show that female ministers experience a little higher emotional labour than males. In as much as the difference may not be huge, it is worth considering that women are generally more emotional than men ([Chaplin, 2015](#); [Deng et al., 2016](#)) and so must be supported on a task that requires setting aside such emotions. Women may experience more emotional labour, perhaps due to their nature predisposing them to care for others ([Queller, 1997](#)). Thus, they may try to endure more and show less of their feelings/emotions. Pastoral work is an emotion-laden job; women are good at caring for and bearing their own emotions. It is revealed from the results that though females are higher on emotional labour, they scored relatively lower on psychological distress and higher on job satisfaction, with no difference in satisfaction with life compared to males. Consequently, the female minister may be able to endure enough emotions through her care for followers and yet feel better about it and enjoy her pastoral role ([Weaver et al., 2002](#)).

Another study finding is that emotional labour is higher among Pentecostal and Charismatic minister compared to the orthodox minister, with the latter scoring lower on psychological distress. In the current state of the church in Ghana, there are more attendees at Pentecostal and Charismatic churches than the orthodox ones. There are more one-on-one engagements through counselling and prayers in Pentecostals and Charismatics. This provides more avenues for emotional experiences for ministers in these churches. They may tend to deal with their emotions regularly since they have more meetings with their followers. However, the Pentecostals tend to report relatively higher life and job satisfaction, followed by the orthodox. The demand and rewards from the job of ministers are essential for job satisfaction. In addition, intrinsic motivation is important. These factors must be explored further among ministers to aid the support they may require in caring for their followers.

In terms of emotional labour and psychological distress, junior pastors and those of other senior and junior ranks score more. Perhaps they tend to have more engagements with the congregation, but they may also have less experience with the job and feel a little stretched on it. However, these two groups feel slightly more satisfied with their lives and job than the seniors.

Emotional labour relates positively and significantly with general psychological distress and all its dimensions except phobic anxiety. The literature has shown that emotional labour is very much associated with psychological distress (Carroll, 2006; Evers, Tomic, 2003; Michie, Williams, 2003). Indeed, laying aside one's emotions and challenges to satisfy another person's needs should be demanding. This may result in depression and anxiety, as shown by the study results, as well as other somatic symptoms (Buys, Rothman, 2010). This should be an important concern for churches since spiritual leaders tend to be affected by the nature of their work. They may be spiritually insulated but be labouring emotionally. This, in effect, will affect the followers and the entire congregation.

It is, however, found that emotional labour does not significantly relate to job satisfaction and satisfaction with life among the ministers. The mean scores on both life and job satisfaction for all categories of pastors surpassed half of the total scores. This may inspire some hope that ministers at least enjoy their role in the house of God and how their lives turn out. They must be supported with the requisite resources to enhance their caring job.

5. Limitations

Some limitations regarding this study have been noted. The sample size is small, mainly due to the nature of the population. Many church leaders are pretty closeted in Ghana, making it difficult to have a lot of them participate in the study. Recruiting a bigger sample size in future studies will provide an avenue to include more of the older section of the population. Also, since this population stands strongly for spirituality, it would have been insightful to measure and relate spirituality with the key study variables.

6. Conclusion

The aim of this study is to identify the presence and level of the emotional labour of the clergy and how this relates to psychological distress, job satisfaction and satisfaction with life among them. Overall, the emotional labour recorded among the clergy is a little above the average. This score relates significantly and positively to psychological distress among the clergy. It, however, does not significantly correlate with job satisfaction and satisfaction with life among the clergy.

Indeed, the clergy are at risk of experiencing emotional labour due to the nature of their work. They carry the challenges of their congregants at the expense of their own emotions and problems. This tends to trigger psychological challenges such as depression, anxiety, interpersonal sensitivity and obsessive compulsions. This makes it imperative for the ministers and congregants to be mindful of their own states and how much they can take in their duty. Nevertheless, it is heartwarming that the level of life and job satisfaction is adequate among the clergy.

7. Recommendations

Regardless of the limited sample size used in the study, the findings draw attention to the state of affairs among the clergy in Ghana, thereby signalling extensive research efforts for further understanding. It must be recommended that the 'men of God' beware of their work's inherent psychological implications and adopt appropriate strategies to deal with them accordingly. It is also

necessary for church management to institute measuring for ministers to be cared for, wind down and delegate emotionally draining tasks. Ministers must endeavour to access psychological and social support from professionals, friends and families for their well-being.

8. Acknowledgement

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9. Conflict of Interest Statement

We declare no conflict of interest

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Effect of Computer-Assisted Instruction on Students' Performance in Selected Cell Division Topics: A Quasi-Experimental Study at Adisadel College, Ghana

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Abstract

This quasi-experimental study explored the effectiveness of CAI in a Biology classroom at Adisadel College in Ghana. The study participants were 80 second-year Biology students who were conveniently sampled from the Green Track and the Gold Track of students in the school. The experimental group consisted of 40 students and was engaged in using CAI for five consecutive weeks. The students in the control group were taught by the conventional method. Students in both groups were exposed to the same content for the same period. The same pre-test and post-test were conducted on both groups, and the responses were analyzed using a t-test. A 10-item Likert-scale questionnaire was administered to the experimental group after the treatment to assess the impact of the CAI on their learning. The study's findings revealed that students exposed to CAI performed significantly better than their counterparts taught with conventional instruction. The students also support the use of CAI in their classrooms. The Physics Education Technology (PhET) simulations used during the study improved students' understanding of the concepts and thus reflected in their performance in the post-test. Science teachers are encouraged to employ PhET simulations in their teaching.

Keywords: computer-assisted instruction, simulation, performance, concepts, quasi-experimental study, Adisadel college, Ghana.

1. Introduction

Computer Assisted Instruction (CAI) has proven to be very effective in the teaching and learning process in many classrooms. However, not much can be said about its effectiveness in the Biology classroom in Ghana. This is evidenced in a study conducted by Owusu et al. (2010) in two senior high schools in Ghana. They investigated the comparative effectiveness of CAI and conventional teaching method in Biology on students in two different senior high schools in Ghana. Findings reported by the authors show that students in the conventional or traditional classroom outperform their counterparts who were taught with CAI. This finding contrasts with results from studies conducted in different fields and geographical areas (Yakubu et al., 2022; Ahiatrogah et al., 2013). Evidence from numerous studies in other countries has shown that using CAI can improve students' performance in the classroom. For example, in their study conducted in Nigeria, Mudasiru and Adedeji (2010) reported a significant difference in performance between students exposed to CAI and their counterparts in the conventional classroom. According to Mudasiru and

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Adedeji, the students exposed to CAI either individually or cooperatively performed much better than those in the conventional classroom. Akour (2008), in a similar study about the effects of CAI on Jordanian college students' achievements in an introductory computer science course, found that students who were taught by the conventional instruction method combined with CAI performed better than those taught using only the conventional method of instruction.

According to Collier (2004), instruction supplemented by a properly designed CAI is more effective than instruction without CAI. The use of CAI helps build in students a knowledge capacity (Kareem, 2015). Thus, the integration of CAI in teaching proves to be very useful in teaching various subjects. CAI has emerged as an effective and efficient media of instruction (Nazimuddin, 2015). Simulations allow learners to observe real world experience and understand complex concepts properly (Widiyatmoko, 2018). The use of CAI proves to be significant compared to the classroom lecture method in terms of achievement in knowledge (Kausar et al., 2008).

Grounded on the findings reported in the studies mentioned previously, the authors decided to explore the effectiveness of using CAI in a senior high school Biology classroom in Ghana. Unlike the study by Owusu et al. (2010), the current study used two different classes of students from the same school. Owusu et al. used two other classes of students from two different schools. The conditions at both schools might have been different, which could have affected their study outcome. Therefore, the authors employed CAI and conventional methods to teach two groups of second-year students at Adisadel College in Ghana some topics in cell division.

Hypotheses

H₀1. There is no significant difference in the mean pre-test scores of the experimental and control groups.

H₀2. There is no significant difference in the mean pre-test and post-test scores of the experimental group.

H₀3. There is no significant difference in the mean post-test scores of the experimental and control groups.

2. Materials and methods

The study employed the quasi-experimental research design. Shuttleworth (2008) stated that quasi-experimental research design involves selecting groups upon which a variable is tested without random pre-selection processes. Quasi-experimental research design aims to demonstrate the causal effect between an intervention and an outcome. Quasi-experimental research design generates results faster and is at a lower cost than a true-experimental design (Sarfo et al., 2022). A quasi-experimental design was chosen over an experimental design because the school's curriculum by the Ghana Education Service could not permit adequate and uninterrupted experimental study. According to McMillan and Schumacher (2010), nonequivalent groups of pre-test-post-test control or comparison group design are very prevalent and useful in education because it is often impossible to assign subjects randomly. Also, in quasi-experimental, the researcher uses intact, already established groups of subjects, gives a pre-test, administers the intervention condition to one group, and provides the post-test.

The sample for the study was 80 second-year Biology students of Adisadel College, Cape Coast. The participants were categorized into two groups: 40 students from the Gold Track as the control group and 40 from the Green Track as the experimental group. The second-year students from Gold Track and Green Track were selected for the study because students from both tracks share similar characteristics. The co-author is a staff of the school and the Biology teacher of the two classes. The students were selected using a convenient sampling technique. Both classes were present in the school as the Ghana Education Service calendar for senior high schools demanded. Two tests of the comparable standard were used to collect quantitative data from the experimental and control groups. The pre-test and the post-test were conducted based on the concept of cell division. The pre-test was administered a week before the treatment. The pre-test was used to find out the strength and weaknesses of the students' level of understanding of cell division and also to review students' previous knowledge of cell division. The post-test was administered after the treatment. The pre-test and post-test of the nonequivalent group design were used to collect data to find out if there was any significant difference in academic achievement between the control and experimental groups. At the end of the treatment, a 10-item Likert-scale questionnaire was administered to the students in the experimental group. This was done to find out from students

whether the treatment had an impact on their learning. Their responses were analyzed into simple frequencies, percentages and mean score and standard deviation of each item calculated.

Treatment

The intervention was implemented for five weeks in the first semester of the 2019/2020 academic year. The experimental group (Green Track) were instructed using CAI, and the control group (Gold Track) were instructed using the conventional instruction method. Students in both groups were exposed to the same content for the same period. The experimental group was treated as described weekly below.

Week 1: The lesson began with a revision of students' previous knowledge of concepts associated with cell division. The concepts discussed were karyokinesis, cytokinesis, haploid, diploid, germ cell, somatic cell, chromosome, chromosome number, chromatid, centromere, centriole, and kinetochore.

Week 2: The downloaded Physics Education Technology (PhET) simulations were projected on a screen in the classroom for students to observe the processes that occur in the interphase stage of cell division and the main stages involved in mitosis. The main stages of mitosis are the prophase, metaphase, anaphase, and telophase.

Week 3: Students were taken through the meaning of meiosis. Simulations were projected on a screen in the classroom for students to observe the stages and processes involved in the first phase of meiosis. The stages are prophase I, metaphase I, anaphase I, and telophase I.

Week 4: Students were taught the main stages and processes involved in the second phase of meiosis with simulations. The stages are prophase II, metaphase II, anaphase II, and telophase II.

Week 5: Students were taught the importance of mitosis and meiosis, including the main differences between mitosis and meiosis.

The control group were taught the concept of cell division using the conventional instruction method of teaching and learning. The lecture method, discussion, demonstration, and brainstorming were the instructional methods employed for the study period. Students in the control group were taken through the same topics as was done to their counterparts in the experimental group.

3. Results and discussion

Independent sample t-test statistics were used for both pre-test and post-test for the two groups and to test the null hypotheses at a significant level of 0.05. Table 1 shows the t-test analysis of the pre-test scores of the control and experimental groups. The table shows that the control group's mean score is slightly higher than that of the experimental group. However, there is no significant difference in the mean scores of the two groups at a significant level of 5 % ($t = 0.11$; $p > 0.05$). This indicates that there was no significant difference in the performance between the two groups at the onset of the study.

Table 1. T-test Analysis of Pre-test Scores of Control and Experimental Groups

Group	Test	N	Mean	SD	df	t-value	p-value
Control	Pre-test	40	11.10	1.84	78	0.11	0.91
Expt.	Pre-test	40	11.05	2.40			

Table 2. T-test Analysis of Pre-test and Post-test Scores of Experimental Group

Group	Test	N	Mean	SD	df	t-value	p-value
Expt.	Pre-test	40	11.05	2.40	39	23.02	0.00
Expt.	Post-test	40	17.05	1.52			

Table 2 shows the t-test analysis of the pre-test and post-test scores of the experimental group. According to the Table, the mean score of the post-test is higher than that of the pre-test. This indicates a significant difference between the two means at a significant level of 5 % ($t = 23.02$; $p < 0.05$). This finding shows that CAI had a positive effect on the academic performance of the experimental group.

Table 3 shows the t-test analysis of the post-test scores of the control and experimental groups. From the table, the mean score of the experimental group is higher than that of the control group. The analysis revealed a significant difference between the two means at a significant level of 5 % ($t = 6.82$; $p < 0.05$). The experimental group performed better in the post-test than the control group. Thus, the post-test showed the CAI helped students learn to understand.

Table 3. T-test Analysis of Post-test Scores of Control and Experimental Groups

Group	Test	N	Mean	SD	df	<i>t-value</i>	p-value
Control	Post-test	40	14.50	1.81	78	6.82	0.00
Expt.	Post-test	40	17.05	1.52			

Students' Perceptions of CAI

Concerning students' perceptions about CAI after being exposed to computer simulations during lessons on cell division, a 10-item questionnaire was administered to the students in the experimental group. The items were measured using a 5-point Likert-type scale which ranged from Strongly Agree = 5, Agree = 4, Uncertain = 3, Disagree = 2 to Strongly Disagree = 1. Students' responses were analyzed by calculating each item's mean and standard deviation. The result from the analyses is presented in Table 4.

Table 4. Students' Perceptions of the Use of CAI

Item	Strongly agree F (%)	Agree F (%)	Uncertain F (%)	Disagree F (%)	Strongly disagree F (%)	Mean	SD
CAI enhanced my critical thinking skills	15 (37.5)	20 (50.0)	2 (5.0)	3 (7.5)	0 (0.0)	4.20	0.70
I think CAI improves the quality of instruction	17 (42.5)	19 (47.5)	3 (7.5)	1 (2.5)	0 (0.0)	4.30	0.52
CAI enabled me to be more active during lessons	12 (30.0)	23 (57.5)	3 (7.5)	1 (2.5)	1 (2.5)	4.10	0.74
CAI made me understand the cell division	16 (40.0)	22 (55.0)	0 (0.0)	2 (5.0)	0 (0.0)	4.30	0.52
CAI enabled me to improve my performance	16 (40.0)	20 (50.0)	3 (7.5)	1 (2.5)	0 (0.0)	4.28	0.65
CAI aroused my interest in cell division	20 (50.0)	18 (45.0)	0 (0.0)	2 (5.0)	0 (0.0)	4.40	0.55

I think other science teachers must use CAI	17 (42.5)	21 (52.5)	2 (5.0)	0 (0.0)	0 (0.0)	4.40	0.54
CAI made cell division more practical for me	20 (50.0)	15 (37.5)	2 (5.0)	3 (7.5)	0 (0.0)	4.43	0.78
I learned new computer skills with CAI	14 (35.0)	24 (60.0)	0 (0.0)	1 (2.5)	1 (2.5)	4.23	0.63
CAI enabled me to retain more information	17 (42.5)	18 (45.0)	2 (5.0)	3 (7.5)	0 (0.0)	4.43	0.80

Data clearly shows that most students support using CAI because of the enormous benefits they gain when it is used. About 87.5 % of students declared that CAI enhanced their critical thinking skills and enabled them to be more active during lessons. Almost 90 % of the students think CAI improves the quality of instructions and enables them to improve their performance. Nearly 95 % of the students believed that CAI aroused their interest in learning cell division and enabled them to understand the concept. About 87.5 % of students opined that CAI made cell division more practical and enabled them to retain more information. Approximately 95 % of the students believed that they learned new computer skills with CAI and thought other science teachers in the school must use CAI.

The extent to which the performance of the experimental and control groups differed concerning cell division before the treatment was nil. According to Table 1, the t-test analysis of the mean pre-test score shows no significant difference ($t=0.11$; $p>0.05$). This indicated that the two groups were comparable in their initial understanding of cell division. The sample was drawn from a student population similar in academic achievement before the treatment. Table 2 shows the t-test analysis of the experimental group's mean pre-test and post-test scores, indicating significant differences ($t = 23.02$; $p < 0.05$). This was a result of the exposure of the experimental group to CAI. The findings of this study also confirm that of Widiyatmoko (2018), who revealed that simulations allow learners to observe real-world experiences and understand difficult science concepts properly.

The performance of students exposed to computer-assisted instruction differs significantly from their counterparts taught with conventional instruction. According to Table 3, the t-test analysis of the mean pre-test and post-test scores shows a significant difference ($t = 6.82$; $p < 0.05$). The experimental group performed better than the control group in the post-test. This indicates that when students are taught using CAI, they perform better than the conventional method of instruction. This study finding is inconsistent with that of Owusu et al. 2010 but consistent with the results of Akour (2008). Akour reported that students taught by the conventional method combined with CAI performed significantly better than those taught using only the conventional method. The result is also in line with Mudasiru and Adedeji (2010) findings. They reported in their study that students exposed to CAI either individually or cooperatively performed significantly better than students taught with conventional instruction. The study also sought to find out from students the impact of CAI on their learning of cell division. Data from Table 4 indicates impressive responses from students. This indicates a high level of agreement about using CAI in teaching and learning cell division.

4. Conclusion

The study explored the effectiveness of using CAI in a Biology classroom at Adisadel College in Ghana. This study's findings indicated that students exposed to Computer-Assisted Instruction (CAI) performed significantly better than their counterparts taught using the conventional instruction method. The findings of this study also showed that the integration of PhET simulations in teaching and learning cell division positively impacted the experimental group. Thus, students understood the processes involved in mitosis and meiosis very well.

5. Recommendations

The interactive nature of PhET simulations positively impacts students' performance. Therefore, science teachers must be encouraged to use simulations in their lessons. Computer-assisted instruction should be used to teach science concepts that are abstract and difficult to understand. The computer-assisted instruction can transform students from passive learners to active learners.

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7. Declaration of Competing Interest

The authors of this study declare that there is no interest in conflict, and all reference materials were dully acknowledged.

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