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THE MEDIATING ROLE OF SELF-EFFICACY ON ADULTS' RETURN TO THE MATHEMATICS CLASSROOM AMID ABUSE AND NEGLECT

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Abstract
It is envisaged that the number of adult learners in undergraduate programmes will remain stable or increase in the future. To meet the growing demand of adults for undergraduate degrees, some universities in Ghana have mounted sandwich modules. Admittedly, adult students exhibit low efficacy in mathematics learning, and they suffer abuse at the hands of some instructors. Nonetheless, the desire for practising teachers in basic schools in Ghana to pursue undergraduate mathematics education sandwich programmes remains relatively high and stable. This survey, involving the use of adapted scales examined the potential effect of adult students' abuse and neglect on 250 sandwich adult students' self-efficacy and learning in mathematics. The study's results revealed that adult students were abused about 40% of the time, they lost about 15% of their mathematics learning but had a strong level of self-efficacy. As expected, the result showed that increasing adult abuse decreased their mathematics learning and reduced their efficacy to study mathematics. Although the adult students' self-efficacy marginally reduced the level of learning loss which was perhaps occasioned by adult abuse, a partial mediation result was established. It was concluded that mathematics instructors strive to minimise abusive learning environments to promote mathematics learning gains and self-efficacy among adult students.

Keywords: Mathematics Classroom. Abuse, Neglect, Mediating Role, Self-Efficacy

Introduction

Educational reforms in Ghana recommend age four as a school-going age in recent times. Per this arrangement, children who enrol in school at age four complete basic education at age 12 and secondary education at age 16. All things being equal, students who seek to pursue tertiary education for the award of a Bachelor's degree should be in tertiary institutions from age 16 to 21 years. Paradoxically, the number of students conventionally entering tertiary levels of education in Ghana (as the data in Africa show) declines. Musau (2018) has suggested that while Africa has made tremendous progress in eliminating the elementary school enrolment gap, secondary and university enrolments are still behind those in America and Asia. Only four percent of African children are expected to graduate or postgraduate school, compared to 36 percent in Latin America and 14 percent in South and West Asia (Musau, 2018).

Despite this enrolment gap, people in their adult age find alternative ways of attaining tertiary education certificates in later years. As a result, some people start Bachelor's degree programmes as mature students (at least 25 year-olds) deemed adult students (Adu-Yeboah & Forde, 2011; Jameson & Fusco, 2014). The category of adult students in this study are in-service teachers who have returned to pursue a Bachelor's degree in mathematics education on a sandwich module. This categorisation differs from other descriptions of adult learners. Be it as it may, Jameson and Fusco (2014) explain that adult learners make up a major component of present-day undergraduate populations and estimate that the number of adult learners will remain stable or

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increase in the future. For instance, available statistics from the Institute of Education, cape coast university, show that adult students admitted into the sandwich mathematics-education programme have averagely been stable and high (403 students) for the period 2018 – 2021.

Accordingly, Cho and Kim (2018) intimate that the mad rush by adult students for graduate degrees in mathematics could be to satisfy professional needs. Besides, Cho and Kim (2018) argue that adult students are enthusiastic about studying mathematics after perceiving it in a new light because they stand convinced that mathematics could be applied to their life. Moreover, these adult students' joy from studying mathematics cannot be undervalued. Although Maguire believes that adult students are not as sharp as young students in pursuing higher education (Adu-Yeboah & Forde, 2011, p. 403), the life experiences of adult students such as working, raising families, working under pressure, and meeting deadlines instil confidence in their expectations for higher education (Musau, 2018). Consequently, adult students might demonstrate more desirable learning approaches than younger students who have conventionally pursued tertiary education directly after full-time pre-tertiary schooling. Admittedly, there are shreds of evidence suggesting that adult students encounter barriers to attaining higher educational levels due to their age. These barriers could be personal, professional, and institutional (Ritt, 2008). A recent study by Mazana et al. (2020) shows that punitive actions of mathematics teachers' anger result in students' abuse and can be deleterious to students' mathematics learning. It can be inferred from Mazana et al. (2020) that the zeal, enthusiasm, and participation of adult students in advanced mathematics learning could be frustrating in the face of teacher abuse and neglect. Thus, the high attrition rate, anxiety, and low morale among adult students pursuing high education standards may partly be attributed to this stress (Kazis et al., 2007). Hence, whereas carrier demands (Cho & Kim, 2018; Kelly, 2019) and the ability to cope with daily learning hassles and stress (Jameson & Fusco, 2014) can spur adult students to pursue advanced mathematics learning, adult abuse and neglect could hurt adult students' mathematics learning.

Even though previous studies (Hollis-Sawyer, 2011; Jameson & Fusco, 2014; Watts, 2011) have explicated gender and age issues in adults' mathematics learning, Galligan and Taylor (2008) point out that the field of adults learning mathematics remains under-researched. This might explain why investigations into the impact of adult students' abuse on mathematics learning have received little consideration despite the necessity for a population with increasing mathematical knowledge and abilities in this 21st-century (Galligan & Taylor, 2008). To this end, this study purposed to examine the effect of purported abuse and neglect on adult students' self-efficacy and learning in mathematics. The findings will expand the research frontiers of adult mathematics learning and provide empirical evidence supporting anti-instructional abuses and neglect for adult learners. Two research questions were answered in this study:

1. To what extent does the abuse of adult students affect their self-efficacy and learning in mathematics?
2. How well does self-efficacy mediate the relationship between the abuse of adult learners and their mathematics learning?

Universities in Ghana, notably the University of Cape Coast, have dedicated opportunities to help adult students acquire graduate degrees in all disciplines of study, including mathematics-related programmes. Adult students enter regular programs through mature entrance channels or additional opportunities such as a sandwich or distance education modules. In-service teachers highly patronise the sandwich module. Courses studied within the 5-semester sandwich programme (Bachelor of mathematics education option) encompass perceived academic-related mathematics courses (36.8%) and teaching-related mathematics courses (63.2%). These mathematics courses, such as curriculum studies in mathematics education, secondary school mathematics curriculum, and advanced study of basic school mathematics, enhance teachers' understanding of important mathematics topics for elementary and secondary education in ways that reflect suitable instructional techniques. Other courses such as the psychological basis of teaching and learning mathematics and pedagogical content knowledge in Mathematics improve teachers' understanding of cross-cutting issues such as technology, diversity, and equality in mathematics education and their ability to alter their teaching approaches in teaching supporting all students in learning mathematics. Additionally, courses such as the nature of Mathematics, developing algebraic thinking, and teaching problem-solving improve instructors' problem-solving, critical thinking, and mathematics communication abilities in ways that may directly apply to classroom activities. Furthermore, these courses encourage instructors to collaborate professionally and network. Although the sandwich programme is held during vacation for in-service teachers, classroom instruction for these adult students is hosted in selected colleges across the country. With college campuses that mostly serve

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conventionally-aged students, Tinto opines that adult students, in particular, feel alienated or marginalized on such campuses (Chaves, 2006, p. 145).

According to Bernstein, enhancement, inclusion, and participation are three pedagogic rights for students' learning(FitzSimons, 2019, p. 47). Whereas the right to enhancement is a requirement for confidence and a right to critical knowledge and new possibilities, inclusion is the right for students to be involved socially, intellectually, culturally, and individually. Besides, the right to participation guarantees the freedom to participate in learning actions that produce results. Robbing students of such pedagogic rights may lead to their abuse (Susanta, 2019) in the learning milieu. The abuse of adults in the learning environment may take different forms, such as neglect, discrimination, and exploitation though at varying degrees of severity. While adult students are inclined to self-neglect, instructors can also be negligent – instructors act in a way that is likely to harm adult students bodily, mentally, or emotionally. Rendón (2002) recounts that some instructors believe that certain types of students are incapable of learning, bombard students with information or withhold information, instil doubt and fear in students, distance themselves from students, silence and oppress students, or create extreme competitive learning environments that pit students against one another. Consequently, adult students get severely disadvantaged in this "no pain, no gain" learning environment (Rendón, 2002). Among older adults in Ghana, Asiamah et al. (2021) settled on two levels of abuse (neglect and assault, and discrimination and exploitation). Asiamah et al. (2021) contented that neglecting an adult despite being obliged to, demeaning an adult using insulting language, and physically assaulting an adult constitutes neglect and assault. However, the deliberate discrimination of an adult based on age, cheating, defrauding, sexual harassment, deception, denial of service, and causing fear and panic are identifiers of discrimination and exploitation (Asiamah et al., 2021).

The exploitation of an adult, such as theft, extortion, duress, deceit, false representation, or pretences, involves the act or practice of taking advantage of an adult or the adult's physical or financial resources without informed permission. Exploiting adult students sexually, such as kissing, touching, or a sex act, as defined in the Criminal Offences Act 1960, Act 29; Criminal and Other Offences (Procedure) Act 1960, Act 30 of Ghana, constitutes abuse. Another form of adult abuse includes an instructor's wilful act or statement intended to shame, degrade, humiliate, or otherwise harm the adult student's dignity, or when the instructor knew or should have known that the conduct would cause shame, degradation, humiliation, or injury to the dignity of a reasonable person. Although not all forms of neglect and abuse hurt social involvement (Asiamah et al., 2021), it is hypothesised that all sorts of neglect affect adults. Particularly, abuse may affect adults in mathematics learning because, according to Singh, adults' dislike for mathematics is caused by mathematics instructors' various mathematics teaching and assessment approaches (Klinger, 2006, p. 165). Hence, the understanding and design of strategies to address abuses that might prevent adult students from participating in mathematics learning is a matter of necessity.

In terms of age, maturity is no barrier to learning undergraduate mathematics. Research (Cho & Kim, 2018; FitzSimons & Boistrup, 2017; Kelly, 2019) shows several compelling reasons, such as the excitement of wanting to study the principles, procedures, riddles, history, and aesthetics of mathematics, motivate adult students to take up mathematics learning. Other reasons include the desire for personal development, meeting requirements for work or further education, and new connections. Moreover, being among like-minded people who share this journey, affectively and cognitively, in a respectful setting where no inquiry is dismissed or disregarded or benefiting from different, meaningful, and respectful adult teaching techniques motivate adult students to take up mathematics learning. In contemporary times, the desire to stay current with technology, particularly new mathematics and learning technologies, motivate adult students to take up mathematics learning. Consequently, adults, such as in-service teachers who return to school, have diverse mathematics experiences. According to Todd (2008), adult students' memories from their formal schooling procedures have interrelated with personal and professional experiences to produce fresh insights such that mathematics skills learned in school may have been improved in different ways. Hence, they select from many experiences and strategies, including common sense, to confront mathematics learning challenges in learning mathematics.

However, (Wheater et al., 2013) report that many adults have difficulty learning mathematics; suspiciously, most students, irrespective of their age, regard mathematics as a difficult subject (Arigbabu et al., 2012). Arguably, adult students are not as sharp as young students pursuing higher education (Maguire, as cited in Adu-Yeboah & Forde, 2011, p. 403). That notwithstanding, Musau (2018) argued that older students' life

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experiences could instil confidence in their expectations for higher education. Abosalem (2015) adds that students' attitudes to the study of mathematics are not related to their age. Similarly, in a study of mathematics learning anxiety among pre-service teachers, Malinsky et al. (2006) could not conclude that older students of at least 25 years have greater levels of mathematics anxiety than younger students.

Bandura defines self-efficacy beliefs as people's assessments of their skills to plan and carry out the steps necessary to achieve specific outcomes (Klinger, 2006, p. 166). Related to teachers, Gulistan and Hussain (2017) explain that teachers' self-efficacy refers to their belief in their ability to instruct their learners and help them reach their learning and academic performance goals. When the definitions are taken together, a student's mathematics self-efficacy assesses the student's ability to cope with mathematics learning hassles and stress. Having a high level of self-efficacy is indicative that the individual views difficult situations as just another task to do, develops a considerably stronger interest and commitment to the activities being undertaken, and the individual heals faster from disappointments and defeats. It stands to reason that an individual's self-efficacy can be considered a true personal variable because individual experiences influence it. According to Klinger (2006), mathematics self-efficacy beliefs are a stronger predictor of mathematics success and attitude. Among adult students, Jameson and Fusco (2014) observe that adults exhibit low levels of mathematics self-efficacy in areas considered more academic than areas considered to be more utilitarian. Although research reports relating the self-efficacy of adult students to abuses and neglect they suffer are scarce, the relation may be negative since Schwarzer and Jerusalem (1995) indicated that self-efficacy correlates negatively with depression, stress, and burnout.

The humanist theory of learning is one of the theories that provide a framework for appreciating features of and motivation for adult learning (Bélanger, 2011). Inherent in humanism is the desire to fulfil the individual's potential or self-actualising the individual's aspiration to learn. Thus, irrespective of the difficulties adult students encounter in advanced mathematics learning (Wheater et al., 2013), their quest for self-actualisation motivates them to pursue undergraduate degrees. However, threats associated with learning and compromised settings from instructors are potential setbacks to adult learning (Rogers, as cited in Bélanger, 2011, pp. 36–38). Since threats are forms of abuse (Shackman et al., 2007), and abuses can affect adult students' mathematics learning (Singh, as cited in Klinger, 2006, p. 165), it might take adult students' ability to cope with mathematics learning hassles, stress and threat to succeed.

Methodology

This study adopted a cross-sectional design. A combination of descriptive statistics, Pearson's correlation test, and multiple linear regression were used to analyse the quantitative data obtained from the participants in this study. This study analysed data from 250 undergraduate students aged 25 years or above. Participants were purposively recruited from the 419 sandwich students pursuing a Bachelor of Education (Mathematics option) at Kibi Learning Centre (Kibi is one of the learning centres the University of Cape Coast uses for providing Sandwich Bachelor's Education). Participation in this study was voluntary. We initially sought permission from the centre coordinator to conduct this study. Consequently, we explained the purpose and research procedure to the students in their classrooms. Three hundred and two participants expressed interest in the study, and the same signed a consent form. Recruited participants were given 24 hours to respond to the research questionnaires. However, 279 completed questionnaires were returned. We deleted 29 responses from the analysis because of non-engaged responses and under-declared age in screening the data.

The questionnaire was the primary instrument utilized to collect data. The questionnaire collected students' biographic data on gender and age, mathematics self-efficacy, learning, and abuse. The generalized self-efficacy scale (GSE) (Schwarzer & Jerusalem, 1995) was adopted to assess the adult students' self-efficacy. The GSE is a unidimensional 4-point, 10-item scale with responses 1 = Not at all true; 2 = Hardly true; 3 = Moderately true; and 4 = Exactly true. The GSE was appropriate because the GSE was applied to adult students only. Besides, Schwarzer and Jerusalem (1995) confirm the reliability of the GSE, which has a Cronbach alpha ranging from .76 to .90. We used the 2-item learning loss scale (LLS) (Richmond et al., 1987) to assess mathematics learning. The LLS is a 10-point scale in which the respondents select scores between zero and nine. A zero score indicates the absence of learning, and a score of nine represents learning so much more than in any other subject. The perceived learning loss is calculated by subtracting a student's response to the first question, "How much did you learn in this class?" from the response to the second question, "How much do you think you could

have learned in this class had you had the ideal instructor?" The LLS has a reliability score of between .85 to .88, making it a reliable instrument for measuring learning (Chesebro & McCroskey, 2000). Regarding the abuse and neglect of adult students, we adapted Asiamah et al. (2021) neglect and abuse scale. Although all 11 items of the scale were used, in consultation with the lead proponent of the neglect and abuse scale, the context was changed from older retired adults to adult students in undergraduate studies. Nonetheless, the descriptive anchors (that is, 1 = not all; 2 = sometimes; and 3 = always) were maintained yet, the scale was found reliable (Cronbach's alpha = .745) similar to the findings of Asiamah et al. (2021) who achieved a reliable scale (Cronbach's alpha = .90).

Results

The Statistical Package for Social Sciences (SPSS) version 21 was used to analyse the data. The screened data were analysed in two phases according to the research questions. Both descriptive and inferential statistics were used.

Research Question 1: To what extent does the abuse of adult students affect their self-efficacy and learning in mathematics?

In exploring the extent to which the abuse of adult students affected students' mathematics learning and self-efficacy, we performed a standard multiple regression analysis. The means, standard deviations (SD), and coefficients of variation (CV) for learning loss, self-efficacy, and adult abuse, and their dimensions are presented in Table 1. Also included in Table 1 are the correlations among students' learning loss, self-efficacy, adult abuse, discrimination and exploitation, and neglect and assault dimensions of adult abuse.

Table 1: Means, standard deviations, coefficients of variation, and correlations among dimensions of adult abuse, learning loss, and self-efficacy in mathematics (N = 250)

Variables	Descriptive statistics			Correlations			
	Mean	SD	CV%	1	2	3	4
1. Learning Loss	1.380	1.201	87.0	1			
2. Self-efficacy	3.262	.446	13.7	-.232*	1		
3. Discrimination & Exploitation	1.198	.195	16.3	.733*	-.166*	1	
4. Neglect & Assault	1.079	.178	16.5	.334*	-.032	.200*	1

** Correlation is significant at the 0.05 level (2-tailed)*

The data analysis on the 250 adult students (Table 1) showed that an average of 15.3% ($M = 1.380, SD = 1.201$) of mathematics learning was a loss. Also, on average, the adult students had about 81.6% ($M = 3.262, SD = .446$) ability to cope with mathematics learning hassles and stress. More so, the data showed that, on average, the adult students were 39.9% ($M = 1.198, SD = .195$) discriminated against and exploited, but 36% ($M = 1.079, SD = .178$) neglected and abused. They indicated that adult students suffered more discrimination and exploitation than neglect and abuse. From Table 1, whereas the adult students' perceived mathematics learning loss varied remarkably ($SD > 1$), there was a seeming consensus about their efficacy to learn mathematics and the level of abuse ($SD < 1$). Using the correlation benchmarks ($r < .3$, small $.3 \leq r \leq .5$, medium; and $r > .5$ large) (Syrjala et al., 2010), the results showed a statistically significant negative correlation between learning loss self-efficacy. They indicated that an increase in adults' self-efficacy in mathematics learning might, to a small extent, reduce the loss in mathematics learning ($r = -.232$). However, the correlation between learning loss and the levels of adult abuse and neglect was significantly positive, which indicates that a possible increase in discrimination and exploitation, and neglect and abuse may respectively increase mathematics learning loss in adult students to a large ($r = .733$), and moderate ($r = .334$).

More so, the correlation between self-efficacy and adult abuse and neglect levels was significantly negative. Increasing the abuse and neglect of adult students will possibly reduce the self-efficacy of adult students, though to a small extent ($r = -.166$). Subsequently, we regressed students' learning loss and self-efficacy on the dimensions of adult abuse in two separate standard multiple regression analyses. Multiple regression assumptions were tested, and no significant violations were committed. A visual inspection of box plots showed that the data on learning loss, self-efficacy, discrimination and exploitation, and abuse and neglect were

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relatively normally distributed. Multicollinearity among the predictor variables was absent since the Tolerance for discrimination and exploitation and abuse and neglect was greater than .2, as Garson (2012) suggested. The results of the standard regression models are presented in Table 2. (Note: the effect of predictors R^2 was estimated using Cohen's (1988) guidelines, which suggested ($R^2 = .02$) for small, ($R^2 = .15$) for medium and ($R^2 = .35$) large effect sizes)

Table 2: Model summary of multiple regression of learning loss and self-efficacy on dimensions of adult abuse

Variables	Coefficients			t	Sig.	95% CI	Tol.
	B	SE	β				
Model 1: Dependent variable (Learning loss)							
Intercept	-5.149	.396		-12.995	.000	±1.56	
Discrimination and exploitation	4.268	.261	.693	16.344	.000	±1.03	.960
Neglect and Assault	1.316	.286	.195	4.599	.000	±1.13	.960
Model 2: Dependent variable (Self-efficacy)							
Intercept	3.714	.222		16.744	.000	±.87	
Discrimination and exploitation	-.381	.146	-.167	-2.604	.010	±.58	.960
Abuse and neglect	.004	.160	.001	.022	.982	±.63	.960
Model fit	*Model 1*				*Model 2*		
R^2	.573				.028		
Adjusted R^2	.570				.020		
Durbin Watson	1.996				1.659		
F	165.819				3.520		
P	.000				.031		

Note: SE = standard error; CI = Confidence interval; Tol. = Tolerance

Table 2 showed that the regression models for the learning loss ($F(2, 249) = 165.819, p < .001$) and self-efficacy ($F(2, 249) = 3.520, p < .05$) were both statistically significant. Nonetheless, whereas the dimensions of adult abuse explained about 57% (R^2 = .573, Adjusted R^2 = .570) of variance in learning loss, only 2% (R^2 = .028, Adjusted R^2 = .020) of variance in self-efficacy was explained by the dimensions of adult abuse. The Durbin Watson value produced by the model met the assumption of independence of errors (Garson, 2012). Table 2 again showed that both dimensions of adult abuse positively contributed to predicting the losses in mathematics learning of the students. Nevertheless, the contribution of discrimination and exploitation ($\beta = .693, t = 16.344, p < .001$) was larger than the abuse and neglect dimensions ($\beta = .195, t = 4.599, p < .001$), (see figure 1). Regarding the self-efficacy of adult students, discrimination and exploitation alone was significant predictor of self-efficacy, although negative ($\beta = -.167, t = -2.604, p < .05$), (see figure 1). Based on standard coefficients in Table 2, a unit increase in the level of discrimination and exploitation (holding abuse and neglect constant) could result in a 69% rise in learning loss among adult students. Similarly, a unit increase in the abuse and neglect of adult students (annihilating discrimination and exploitation) could lead to a rise of about a 20% increase in learning loss. Conversely, a unit increase in the level of discrimination and exploitation (neglecting abuse and neglect) could result in a 17% decrease in the self-efficacy of adult students to learn mathematics.

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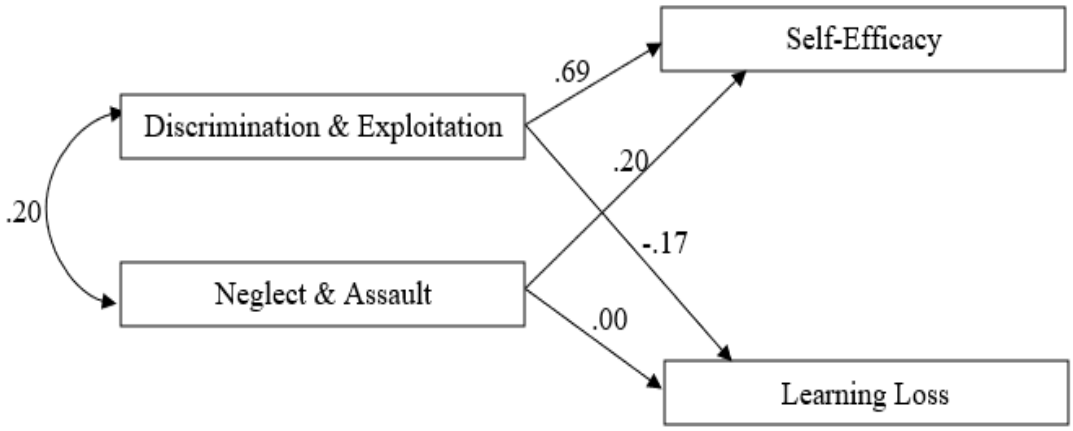

Figure 1: Path diagram of regressing learning loss and self-efficacy on learning abuse

Research Question 2: How well does self-efficacy mediate the relationship between the abuse of adult learners and their mathematics learning?

A summary of the mediation effect of adult abuse and self-efficacy on learning loss is presented in Table 3. The analysis in Table 3 included only the discrimination and exploitation dimension since the dimension of neglect and abuse was not a statistically significant predictor of self-efficacy.

Table 3: Regression Analysis for Mediation of Self-efficacy between Discrimination and Exploitation and Learning Loss (N = 250)

Variables	Coefficients			*t*	Sig.	95% CI
	B	**SE**	***β***			
Model 1: Self-efficacy						
Intercept	3.717	.174		21.423	.000	±.684
Discrimination and exploitation	-.380	.143	-.167	-2.659	.008	±.563
Model 2: Learning loss						
Intercept	-4.017	.323		-12.440	.000	±1.272
Discrimination and exploitation	4.509	.266	.734	16.945	.000	±1.048
Model 3: Learning loss						
Intercept	-2.881	.539		-5.350	.000	±2.123
Discrimination and exploitation	4.392	.267	.714	16.469	.000	±1.051
Self-efficacy	-.306	.117	-.113	-2.617	.009	±.460
Model fit	*Model 1*		*Model 2*		*Model 3*	
R	.167		.733		.741	
R^2	.028		.537		.549	
F	7.068		287.147		150.384	
p	.008		.000		.000	

Table 3 (Model 1) revealed that discrimination and exploitation explained about 2.8% variance in self-efficacy ($F(1, 248) = 7.068, p < .05$). The regression of discrimination and exploitation on self-efficacy was also statistically significant ($\beta = -.167, t(248) = -2.659, p < .05$). They indicated that a unit increase in discrimination and exploitation could reduce the self-efficacy of adult students by about 17%. Furthermore, Table 3 revealed that the direct effect of discrimination and exploitation (Model 2) explained about 53.7 % of the variance in a learning loss ($F(1, 248) = 287.147, p < .001$). The regression of discrimination and

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exploitation on learning loss was statistically significant ($\beta = .734, t(248) = 16.945, p < .001$). They indicated that a unit increase in discrimination and exploitation could increase learning loss by about 73%.
Also, from Table 3, Model 3 showed that discrimination and exploitation, and self-efficacy together explained about 54.9% variance in the learning loss ($F(2, 247) = 150.384, p < .001$). This result implies that self-efficacy was a minor, yet significant predictor ($\beta = -.113, t(247) = -2.617, p < .05$) of learning loss by controlling for discrimination and exploitation (see Figure 2). Similarly, by controlling for self-efficacy, discrimination and exploitation was major and significant predictor ($\beta = .714, t(247) = 16.469, p < .001$) of learning loss. Hence, though significant, the indirect effect of discrimination and exploitation on learning loss had a partial mediation effect. Therefore, we could only establish a partial mediation model since discrimination and abuse had statistically significant direct effects (4.392) and indirect effects (.116).

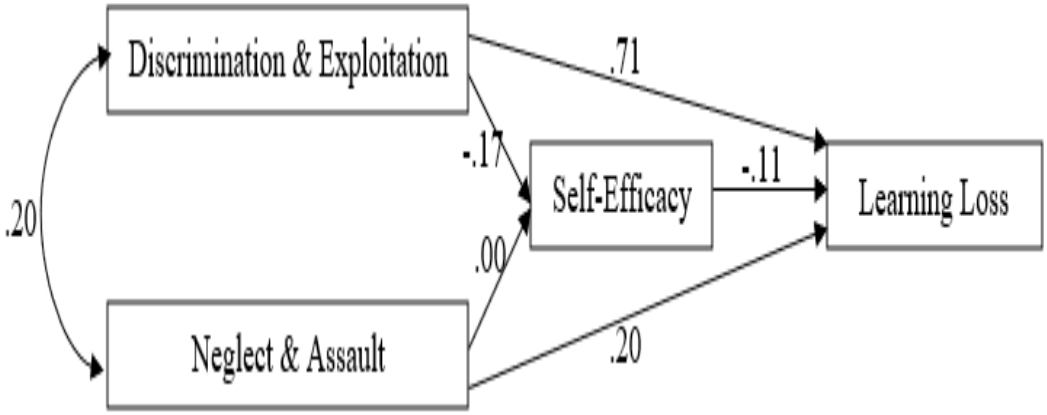

Figure 2: Partial mediation of self-efficacy on the relation between abuse and learning loss

Discussion

This study aimed to examine how adult students' self-efficacy and mathematics learning were affected by the abuse and neglect they received. Consequently, we explored the mediation effect of self-efficacy between adult abuse and mathematics learning. The analysis has revealed that abuse and neglect against adults are not peculiar to social work activities (Asiamah et al., 2021) but also relate to the education sector as adult students experience abuse and neglect between 36% and 40% of the time. This revelation could explain why adult students lost about 15% of their mathematics learning. Chesebro and McCroskey (2000) explained that negative self-perceptions and emotions impede adult students' learning. Interestingly, adult abuse and neglect accounted for more than half of the factors that might affect their learning. The results significantly indicate that increasing adult abuse and neglect such as insults, deceptions, harassment and extortions decreased mathematics learning. Adult learners should be actively involved in discovering and generating their knowledge to be interested in mathematics learning. They make a lot of mistakes because of this. Mathematics instructors, on the other hand, may use these errors to boost students' self-esteem, offer constructive feedback, and provide adaptive support without being intimidating, all of which can help students chart new learning paths.

Moreover, the data further revealed that adult students suffered more discrimination and exploitation than abuse and assault. In the Ghanaian context, people honour age, and culture frowns on people who undermine adults. This orientation could explain why the adult students were least abused and assaulted. Regardless, because adult learners find mathematics difficult to study (either by default or by the creation of mathematics instructors), they are vulnerable to the vulgarises of unscrupulous mathematics instructors who may demand cash or in-kind from these weak learners in exchange for a grade. The procedures set in place by the organizing and awarding institution, on the other hand, make it impossible for these students to pay their way. As a result, people feel exploited when they realize they have been short changed since their expectations were not met. Relating to the self-efficacy of adult students in coping with mathematics learning hassles and stress, Jameson and Fusco

(2014) claimed that adult learners have lower self-confidence in their skills because they regard themselves as less competent and inexperienced in the academic setting. This study showed that adult students had a strong level of self-efficacy. Consequently, we assume that adult students' enthusiasm to study mathematics and life experiences in teaching mathematics and meeting deadlines as reckoned in literature (Cho & Kim, 2018; Musau, 2018) might explain their self-efficacy.

Furthermore, the discrimination and exploitation of adult students was the only form of adult abuse and neglect that affected their self-efficacy. Nonetheless, since the effect of discrimination and exploitation was significantly small, factors other than discrimination and exploitation which were not explored in this study may be responsible for determining about 98% of adult students' self-efficacy in mathematics learning. The results further suggest that the more adult students are discriminated against and exploited in mathematics instruction, the less efficacious they become. Put together, adult abuse and neglect (proxied by discrimination and exploitation) and self-efficacy largely influenced mathematics learning among adult students. Another significant result of this study was that the self-efficacy of the adult students was robust to marginally reduce the level of learning loss occasioned by adult abuse and neglect. Indeed, having a high level of self-efficacy is indicative that the individual views difficult situations as just another task to accomplish, and the individual heals faster from disappointments and defeats. Consequently, adult learners pursuing higher education in mathematics should be aware that they will be subjected to some level of abuse and neglect at the hands of certain mathematics educators. They can, nevertheless, attain success in mathematics learning if they have good self-confidence. Besides, adult learners must be undaunted with learning mathematics, be self-motivated to accomplish mathematical tasks, deal with unexpected learning events based on coping capacities, and spend time and money on productive learning initiatives in the face of probable abuse and neglect.

Conclusion

The study established that adult students were abused some time, they lost some of their mathematics learning but had a strong level of self-efficacy. It also established that increasing adult abuse decreased their mathematics learning and reduced their efficacy to study mathematics. Although the adult students' self-efficacy marginally reduced the level of learning loss which was perhaps occasioned by adult abuse, a partial mediation result was established. Mathematics instructors should strive to minimise abusive learning environments to promote mathematics learning gains and self-efficacy among adult students. This is because mathematics is widely recognized as a problem area, and most students, regardless of their age, have a fear of it (Arigbabu et al., 2012), mathematics educators must create a receptive mathematics learning environment rather than abusing the few students who have chosen to do mathematics at the higher level.

One important limitation of this study was the study's inability to pilot the adapted abuse and neglect scale. Nonetheless, correspondence between the scale developers and we was robust to ensure validity was not compromised. Nevertheless, future studies should endeavour to pilot such an instrument. Additionally, the selection of participants in this study was voluntary to students purported to be at least 25 years. No verification to authenticate the students' claims were followed. Participants might have been economical with their ages. Future studies can take stringent measures to verify the ages of participants. Furthermore, mathematics in this study was taken as an object. We did not conduct an in-depth appreciation of any of the students' efficacy or abuses; rather, a generic view was applied, hence using the learning loss scale to estimate the mathematics learned.

Recommendation

Mathematics instructors should refrain from using slurs and delegatory comments in class, in keeping with our Ghanaian tradition. This is because such inclinations lower learners' morale and diminish their self-efficacy in mathematics learning.

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