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Enhancing Motivation of Electrical and Mechanical Engineering Technology Education Students with Acceptance and Commitment Therapy*

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The essence of studying electrical and mechanical engineering technology is to acquire relevant skills for production of goods and services. Students of electrical and mechanical engineering technology in various universities in Nigeria are not well motivated and this can be seen in their poor learning outcomes and quality of skills acquired while in schools. Various studies have been conducted on how various teaching methods can be used to enhance the motivation of students studying electrical and mechanical engineering technology education, however no research on how acceptance and commitment therapy can be used to enhance motivation of electrical and mechanical engineering technology education students and this study therefore becomes necessary. This is because students need to be motivated to acquire relevant skills for producing goods and services while in school and after graduation. The study was carried out in all three universities that offer Electrical and Mechanical Engineering Technology education in south-western Nigeria. The Academic Motivation Scale was used to select participants who scored low into the study. The intervention consisted of 6 weeks acceptance and commitment therapy and placebo treatment. Self-report questionnaire was used as data collection for the study. Mixed Model Repeated Measures (MMRM), independent-samples two-tailed t-tests, chi-square and process macro were used for data analysis in the study. The result of the study indicated that participants in the treatment group recorded gains in motivation across different time points when compared to the participants in the control group. Also, self-efficacy moderated the effect of acceptance and commitment therapy on motivation. The current study suggests that acceptance and commitment therapy can be used to enhance the motivation of electrical and mechanical engineering technology education students.

Keywords: acceptance and commitment therapy; motivation; self-efficacy; undergraduates; mechanical and electrical technology education

1. Introduction

The role of engineering technology in modern society is crucial and every effort is expected to be put in place by stakeholders, schools and governments to make it acceptable by everyone. The best way to make this acceptable by everyone is to make it easy and friendly among students of tertiary institutions. For example, students study engineering/technology in order to design, create or develop new products to solve societal problems through scientific approaches. Technology is the process of producing goods and services. Students need to be motivated in order to acquire relevant skills for producing goods and services while in school and after graduation. They also need to be motivated to make their visions and purpose of studying engineering courses such as electrical and mechanical technology realizable. A lot of steps had been taken, various therapies and teaching methods have been used to motivate engineering and technology students but to researchers, no positive and everlasting outputs have been recorded. Hence there is need to try acceptance and commitment therapy for enhancing students motivation in electrical and mechanical engineering technology. Motivation is a major factor in teaching and learning process. It is seen as a mechanism behind achievement and performance of students in various studies. Students tend to perform or achieve better when they are well motivated. In the learning environment, motivation directs and sustains the academic behavior of students in achieving their goals. For students to achieve or perform better in their chosen courses, they must genuinely accept the offer and strongly committed to it for better output. What maintains, enhances and strengthens person's behaviors is called motivation [1]. Motivation according to [2] is an internal state or condition that activates, guides and maintains or directs behavior. Student motivation therefore can be seen as powering learners to achieve high levels of academic performance and overcoming barriers in order to change. Motivation equally gives students the drive to achieve the goals and objectives set for them by their parents, teachers, the institutions and the

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society at large. Students' motivation can be positive or negative, progressive or situational motivation. Motivation is one of the most important factors in education especially when talking about the learning abilities, performance and achievement of students in their respective studies. Also, an important factor that stimulates the learning ability and interest of students; if a student is properly motivated then it is expected that the learning ability and interest of the students will increase, and it can thus lead to an improvement in the students' academic performance. Students motivation therefore can be categorized into two namely; intrinsic motivation and extrinsic motivation.

Intrinsic motivation refers to motivation that is driven by an interest or enjoyment in the task itself, and exists within the individual rather than relying on any external pressure [1]. In other form, intrinsic motivation occurs according to [3] when a student enjoys an opportunity to learn and is eager to participate in the learning process without thinking of any external reward, this type of motivation is called intrinsic motivation. Intrinsic motivation is usually associated with high educational achievement and enjoyment by student's evaluation theory. Students of electrical and mechanical engineering technology are likely to be intrinsically motivated if they: attribute their educational results to factors under their own control, believe they can be effective agents in reaching desired goals and, are interested in mastering a topic, rather than just rote-learning to achieve good grades. If a motivation is not intrinsic, it will be extrinsic. Extrinsic motivation comes from outside of the individual. Extrinsic motivation is a tendency to carry out activities for external rewards, which can be physical or psychological in nature [4]. The most common extrinsic motivations are rewards like money and grades, attention, popularity, favourism, coercion and threat of punishment. When both motivation is given to students, there is tendency they will put more interest in their learning activities better and have good self efficacy belief.

Many studies have been carried out on the impact of motivation on students learning academic performance. According to [5] the level of students' motivation in a particular subject, study or class is reflected in the extent of the students participation in that subject or class. A student that is perceived to have high motivation will be more actively involved in the study, class or learning process. Motivation generally according to [6] also improves the academic performance of students. Motivation has been tested and reported in medical education and other fields [7]. This concept, however, has not been tested in Electrical and Mechanical Engineering Technology education and this creates a wide gap to be filled by this study. Our study, therefore, adds to the literature on aspect of Electrical and Mechanical Engineering Technology education.

Studying motivation particularly in Electrical and Mechanical Technology education is important because according to the examiner's report of the [8] there is an increase in the poor performance of students in Electrical and Mechanical Engineering Technology Education. For example, academic performance of electrical and electronic engineering technology students in electrical workshop practices, mechanical workshop practices, thermodynamic and electrical installation and maintenance practices was not encouraging. Experience shows that more than $\frac{3}{4}$ of the students in these courses had low grades and this is worrisome. In a developing country like Nigeria different factors can be attributed to be the cause of this poor performance, lack of proper equipment and facilities, along with well trained teachers and instructors has been identified by [9] as a cause of students poor academic performance in Electrical and Mechanical Engineering Technology education while the derogatory attitude towards Electrical and Mechanical Engineering education in Nigeria is also seen as a cause [10]. Nigerians have imbibed the culture of showing respect only to those with white collar jobs in the society, parents do not want their children to attend technical colleges because it is perceived as a form of inferior or second rate education. This stigma and misconception was caused because it was perceived by the society that white collar jobs pay better and is more dignifying. This stigma attached to Electrical and Mechanical engineering Technology education, can lead to lack of motivation among students of Electrical and Mechanical engineering Technology education. It is therefore important to enhance the motivation of Electrical and Mechanical Technology education students with Acceptance and Commitment Therapy (ACT). We searched and we did not see any, that studied the effect of ACT on motivation of Electrical and Mechanical Engineering Technology education and our study will fill this gap.

The aim of this study is thus to determine the impact of Acceptance and Commitment Therapy on motivation among Mechanical and Electrical Engineering Technology students. Acceptance and commitment therapy is a form of cognitive behavior therapy. ACT is an empirically based psychological intervention that uses acceptance and mindfulness strategies mixed in different ways with commitment and behaviour change strategies to increase psychological flexibility [11]. According to [12], ACT teaches mindfulness skills to help individuals live and behave in ways consistent with personal values while developing psychologi-

cal flexibility. It utilizes an eclectic mix of metaphor, paradox, and mindfulness skills, along with a wide range of experiential exercises and values-guided behavioral interventions [13]. It was designed to promote full and vital living with openness to difficult thoughts and feelings in the service of value-directed actions [14]. The approach was originally called comprehensive distancing. ACT teaches people to notice, accept and embrace their thought, feelings and conditions, learn to live with it and move on. ACT has proven effective with a diverse range of clinical conditions: depression, OCD, workplace stress, chronic pain, the stress of terminal cancer, anxiety, PTSD, anorexia, heroin abuse, marijuana abuse, and even schizophrenia [13]. ACT suggests that a person can take action without first changing or eliminating feelings, rather than fighting the feeling attached to a condition, a person can observe oneself as having the feeling. Acceptance and commitment therapy suggests that instead of choosing to change, the most effective approach may be to accept and change. On this note, ACT can be used to enhance students' motivation and to accept and change in their situation.

The goal of ACT is to help individuals consistently choose to act effectively in the presence of difficult events or conditions. ACT can help electrical and mechanical engineering technology identify their personal values and to take action on them, thus providing more vitality and meaning to their life in the process and also improving their psychological flexibility. Rather than focusing on changing psychological events such as low self-esteem directly, ACT seek to change the function of low self-esteem and the student's relationship to it through strategies such as mindfulness, acceptance, or cognitive defusion [15]. In using ACT, a more fulfilled life can be attained by overcoming negative thoughts and feelings like low motivation, among students of electrical and mechanical engineering technology. ACT commonly employs six core principles: cognitive defusion, acceptance, contact with the present moment, observing the self, values, and committed action. ACT has more recently been applied to remove feelings like depression, anxiety and low self-esteem among children and adolescents [16].

The application for ACT is broad; and they are previous evidence based in literature detailing the effectiveness of ACT. In contrast with Dialectical Behavior Therapy, Mindfulness-Based Cognitive Therapy and Mindfulness-Based Stress Reduction, ACT can be used with individuals, couples and groups, both as brief therapy or long term therapy, in a wide range of clinical populations; it allows the therapist to create and individualize their own mindfulness techniques, or even to co-create them with clients [13].

A study carried out by [17] shows that ACT is effective against depression. The treatment was also found to address generalized anxiety disorder [18], social phobia [19], self-compassion [20] and work-site stress [21]. It was observed that treatment periods were 12 sessions or less, and when ACT was compared to other treatment protocols, it emerged better or comparable in most cases. However, no research on the effect of ACT on motivation is known to the researchers therefore this research stands to fill the gap. Empirical studies have shown that self-efficacy is an important factor in school achievement [22]. Self-efficacy is defined as people's beliefs about their abilities to produce designated levels of achievement that exercise influence over events that affect their lives [23]. Self-efficacy can operationally be looked at as people's beliefs in their capabilities to exercise control over their own functioning and over events that affect their lives [24]. Beliefs in self-efficacy, according to [24], affect life choices, level of motivation, quality of functioning, resilience to adversity and vulnerability to stress and depression. [25] maintained that compared with students who doubt their learning abilities, those who possess a sense of efficacy for certain tasks participate more readily, work harder, persist longer when they run into difficulties, and achieve at a higher level. Students are reluctant to participate in activities they believe will lead to negative outcomes. This may explain why some students drop out of school or programme and even when they remain in school or programme, they avoid examinations and other learning activities, since they believe that they cannot make good grades outcomes. It is therefore important to determine the effects and the extent ACT can enhance the self-efficacy beliefs of Mechanical and Electrical Technology education students.

1.1 Theoretical Framework

This study is supported by the relational frame theory (RFT) [26] and acceptance and commitment therapy theory (ACTT). The RFT represents the theoretical foundation of ACT [27], and postulates that the human mind uniquely possesses the ability to create bidirectional links between things. In other words, the human mind can form an arbitrary relation between stimuli [28]. These associationsare also called cognitive fusion, which makes individuals more controlled by language representations and less mindful of present experiences. This situation makes internal/external events to represent the presently occurring events via language representations [29, 30]. Hence, the theory premised that the building block of the human mind is language in

relation to higher cognition. Acceptance and commitment therapy theory does not define unwanted emotional experiences as symptoms or problems. It instead works to address the tendency of some to view individuals who seek therapy as damaged or flawed and aims to help people realize the fullness and vitality of life [31]. This fullness includes a wide spectrum of human experience, including the pain inevitably accompanying some situations [12]. Both theories relevant to this study in that the effective use the ACT helps to eradicate or reduce the conflict between fear and accepting present experiences, as relates to human language.

2. Methodology

2.1 Procedure

Researchers visited three Universities that offered Electrical and Mechanical Engineering Technology education in South-west Nigeria between June and August 2019 to inform them about the research and explain the intervention program. A total of 169 Electrical and Mechanical Engineering Technology education students agreed to participate in the study. Before the screening took place, the researchers explained the aims of the study to the students. The students were then screened to determine those who met the inclusion criteria for the study. The inclusion criteria include: students must be 18 years or above; student must be fluent in English; must be readily available to partake in intervention sessions. Another major criterion for inclusion was that participants must score within a set value for low motivation on the Academic Motivation Scale (AMS), this is to enable the intervention to be tested on those for whom it was most relevant. The Academic Motivation Scale (AMS) was administered to students as a preliminary survey, the scale has a score that can range from twenty-eight to one hundred ninety six. A high score on the scale indicates high motivation while a low score indicates low motivation. Participants who scored below ninety-eight on the Academic Motivation Scale (AMS) was assumed to possess low motivation, this is according to [32].Volunteers who did not meet all the inclusion criteria were excluded from the study. However, six students did not partake in the study because they were below 18 years when we administered the preliminary survey, thus they did not meet the inclusion criteria and were excluded from the study. Therefore, the final number of students who were eligible for the study was 143 Electrical and Mechanical Engineering Technology education students. Eligible participants were enrolled and randomized into treatment groups or control group by the researchers. A simple randomization procedure was carried out using random allocation software, version 1.0 to assign the participants randomly to the intervention and control groups [33].

This random assignment produced a total of 71 participants for the Acceptance and Commitment Therapy intervention program and 72 participants for the control group. The participants were asked to provide written informed consent to participate in the study. The acceptance and commitment therapy intervention was conducted by 2 guidance and counselling doctoral students who had received at least 3 semesters of practicum training in ACT and at least 1 year of experience using ACT with individual clients. One of the authors served as co-leader for all the workshops. The control group was administered placebo treatment.

The group meetings were scheduled twice a week for 6 consecutive weeks. A follow-up meeting was conducted at an additional time points (2, and 4 months after the final session). Each session lasted for 60 minutes each. The researchers made sure that the participants attended the sessions by sending reminder messages to them a day before the meeting. The copies of questionnaire were completed by all the participants in the two groups at 3 time points: at baseline, and after 2 and 4 months. The copies of questionnaires were given to the participants at each time point, who were asked to complete and return them directly to the researchers.

2.2 Measures

2.2.1 Motivated Strategies for Learning Questionnaire

The Motivated Strategies for Learning Questionnaire (MSLQ), [34] was adopted for this study. It is a self-report questionnaire that assesses students' motivational orientations and different learning strategies, which they used in a particular academic course. The motivation scale was used to measure the intrinsic and extrinsic motivation variable, specifically: intrinsic and extrinsic goal orientations. The intrinsic goal orientation consisted 4 items while the extrinsic goal orientation was also made up of 4 items. Students were asked to rate themselves on a 7-point Likert scale from 1 – not at all true of me to 7 – very true of me. The score from each scale was computed by taking the mean of the items that made up the scale. In this study, we only utilized the motivation section, specifically the sections on intrinsic and extrinsic goal orientation motivation which consisted of 8 items. The Motivated Strategies for Learning Questionnaire has demonstrated internal consistency of 0.74 for intrinsic goal orientation and 0.62 for extrinsic goal orientation. In the current study internal

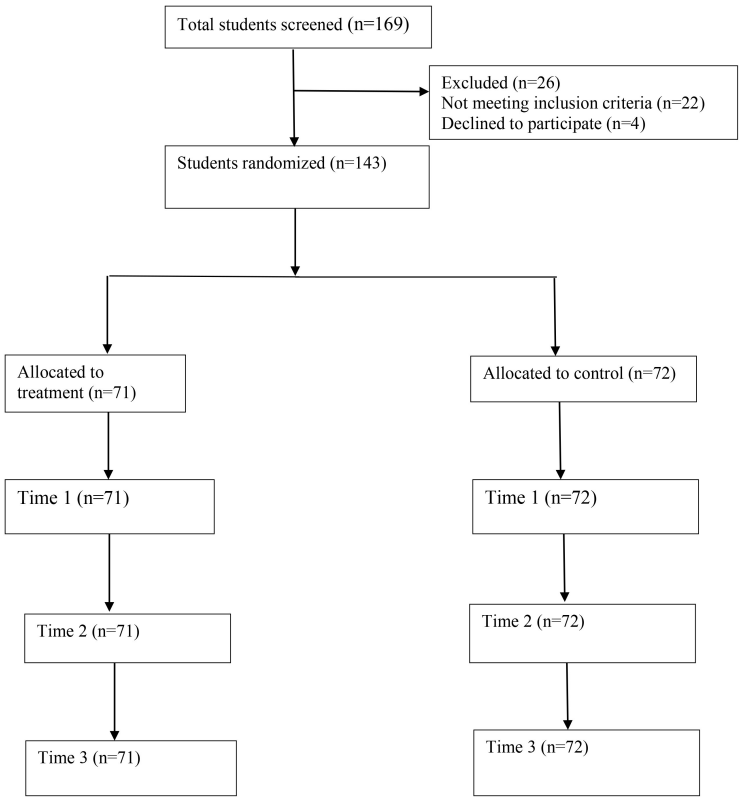

Fig. 1. Participant flow.

consistency for intrinsic goal orientation was 0.76 while the internal consistency for extrinsic goal orientation was 0.67.

2.2.2 Academic Self-Efficacy Scale

Academic Self-efficacy Scale (ASES) was used by the researchers to help determine the students' perceived self-efficacy level in performing some academic tasks. The questionnaire consisted of 40 items on self-efficacy for psychomotor achievement. The responses were rated on a 5 Likert type rating scale structured as follows: Exactly true (1 point), Nearly true (2), Neutral (3), Nearly false (4) and Exactly False (5). The students were asked to indicate their degree of self-efficacy by checking a number from 1 to 5 against any of the above stated options of response ratings. The Academic Self-efficacy Scale was developed by [35]. For the scale, higher scores indicate higher levels of academic self-efficacy belief. The reported Cronbach's alpha coefficient was 0.79. The Cronbach's alpha coefficient was found as 0.77 for the current instrument.

2.3 The Intervention

In line with the RFT model, the ACT protocol was harmonized [36], ACT package developed by [37, 38] and the six core therapeutic processes of ACT for our intervention. Therefore, we organized the intervention in phases and in the form of group counseling. At each phase, we integrated the services of counseling psychologists. The psychologists performed the basic treatment by following the six core processes of ACT. The intervention manual contained therapeutic techniques focused on defusion from poor self-motivation, building self-motivation and improving self-motivation through self-efficacy. To achieve defusion from poor self-motivation, the participants were made to understand that control is the problem, also the uselessness of attempts to suppress or change poor self-motivational thoughts was high-lighted using the Chocolate Cake Exercise [39]. Defused acceptance of poor self-motivational thoughts was then presented as an alternative using different exercise like leaves on a stream exercise. Participants were asked to imagine writing their thoughts on leaves flowing down a stream and to watch for times when they fuse with thinking and lose the image of the stream. Other technique like thanking the mind for that thought was also used to achieve defusion of self-as-content from negative poor self-motivation [38].

Experiential exercises were included to build self-motivation through self-perspective taking. Participants were taken through the Little Kid Exercise [38], the participants were asked to imagine themselves as they were as small Children walking through their childhood homes and asking their Parents for what they want most from them psy-

Summary of the ACT intervention program

Duration	Session	Activities
Weeks 1–2	Sessions 1–2	Introduction, and explanation of the whole exercise by the therapist. Familiarization by the therapists. Establishment of rapport by the therapist, so as to create a good climate for discussion to assure participants of confidentiality. Participants are given homework.
Weeks 3–4	Sessions 3–7	The therapist followed the six score therapeutic process of ACT. Demonstrating awareness of negative perception about their amotivation to participants. Participants were encouraged to allow negative thoughts, feelings, emotions and perceptions about their motivation to come and go without struggling with them. They discussed Focus on creative hopelessness by telling the participants that escape or avoidance thoughts are unnecessary. Also participants were taught that control is the problem to achieving defusion from poor self-motivation. The chocolate cake exercise was used to highlight the uselessness of attempts to suppress negative thoughts. Use of leaves on a stream exercise was presented as an alternative for cognitive defusion, also thanking the mind for that thoughts was used for cognitive defusion, the participants were told to thank their minds for any negative thoughts on motivation and move on. Participants are given assignments.
Weeks 5–6	Session 8–12	The participants were encouraged to demonstrate willingness to focus on the present and move ahead. They were told to gain full acceptance of negative perceptions, thoughts and emotions about their poor motivation. Build self-motivation through self-perspective taking. Understanding how to observe self as a context was also discussed. The participants are taken through mindfulness exercise designed to have them access their transcendent self. They were taught how to focus on self-efficacy as a value using the Stand and Declare exercise. Focus on preventing relapse and evaluation of participants level of commitment during the intervention based on their contributions and responses during group discussion and completion of homework. Participants are given homework. Conduction of posttest assessment.
Follow-up		Conducting follow-up at 2 and 4 months and follow assessment

chologically. Then, the participants were guided to imagine their adult selves meeting their childhood selves, giving them what they feel their childhood selves need or could benefit from, thus they can visualize themselves achieving and fulfilling goals, making commitments and ensure they fulfill it, therefore enacting a value of self-motivation. The ACT protocol equally focused on self-efficacy as a value, since one's belief in their self-efficacy will lead to better motivation. Participants were guided in the Stand and Declare Exercise; participants were made to make public declarations such as having more belief in their self-efficacy.

2.4 Data Analysis

The data was analyzed using mean and standard deviation for outcome variable at each time point. P-values for between-condition, independent-samples two-tailed t-tests and Chi-square were reported as well. Mixed Model Repeated Measures (MMRM) was used to examine the effects of the intervention program. The partial eta square (η^2p) was also indicated as a measure of the effect size, while the Mann-Whitney U test was used to compare changes along the treatment and control groups. PROCESS in SPSS was employed to substantiate the multiple moderation analysis that gives room for estimating specific indirect effect, which is a limitation from the use of AMOS [40]. SPSS version 22.0 (IBM Corporation, Armonk NY, USA) for Windows(R)/Apple Mac(R) was used for the analysis. All the results were considered significant at $P \leq 0.05$.

3. Results

Table 1 shows the mean age of participants in the treatment group and control group. The mean age of participants in the ACT group was 21.04 ± 3.06 years, while the mean age of respondents in the control group was 21.33 ± 3.94 years, there was no significant difference among the age of the two groups, $P = 0.601$. A total of 143 participants were selected to participate in the study, the treatment group comprised of 58 (81.7%) male students and 13 (18.3%) female students, while the control

Table 1. Participant characteristics

	ACT N (%)	Control N (%)	X^2	Sig.
Male	58 (81.7%)	64 (88.9%)	0.164	0.685
Female	13 (18.3%)	8 (11.1%)		
First Year	22 (30.9%)	20 (27.8%)	1.262	0.738
Second Year	19 (26.8%)	16 (22.2%)		
Third Year	12 (16.9%)	15 (20.8%)		
Fourth year	18 (25.4%)	21 (29.2%)		
Age (M ± SD)	21.04 ± 3.06	21.33 ± 3.94	0.462*	0.601

X^2 = Chi-Square, M ± SD = mean and standard deviation of students age, * t-test.

Table 2. Means, standard deviations, and between-condition comparisons of outcome variable at each time point

Measure	Duration	Treatment	N	M ± SD	95% CL	Significance	η^2p
Motivation	Time 1	ACT		11.87 ± 3.59	10.90–12.84	0.543	0.004
		Control		11.41 ± 3.57	10.27–12.55		
	Time 2	ACT		33.00 ± 4.24	31.93–34.07	0.000	0.642
		Control		22.36 ± 3.54	21.09–23.62		
	Time 3	ACT		41.39 ± 4.15	40.12–42.66	0.000	0.640
		Control		28.79 ± 5.40	27.30–30.29		

η^2p = effect size, CI = confidence interval, M = mean, N = number of participants, SD = standard deviation, ACT = Acceptance Commitment Therapy.

Table 3. Effect of ACT on motivation: Moderating role of students self-efficacy

			CI	
Family Support	β	SE	LL	UL
Interaction	–1.393***	0.135	–1.66;	–1.13
Low	8.779***	0.707	–10.18;	–7.38
Neutral	10.172***	0.636	–11.43;	–8.91
High	22.705***	1.075	–24.85;	–20.56

Note: CI: Confidence Interval, LL: Lower Limit, UL: Upper Limit, ***: p < 0.001, ΔR^2: 0.1404, R^2: 0.887; Interaction: ACT*students self-efficacy.

group was made up of 64 (88.9%) male students and 8 (11.1%) female students, there was no significant difference between them P = 0.738, X^2 = 1.262.

Table 2 shows the outcomes for the participants in the treatment group and control group over the various time periods. There was no significant difference in the motivation scores between the undergraduate students in the treatment (11.87 ± 3.59) and control group (11.41 ± 3.57) F (1, 92) = 0.374, P = 0.543, η^2p = 0.004, at the baseline (Time 1) stage.

The post-treatment stage (Time 2) revealed a significant increase in the motivation scores among Electrical and Mechanical Engineering Technology education students in the treatment group (33.00 ± 4.24) compared to students in the control group (22.36 ± 3.54), F (1, 92) = 163.290, P = 0.000, η^2p = 0.642. The follow-up stage (Time 3) indicated that there was a significant increase in motivation scores among students in the treatment group (41.39 ± 4.15) in contrast to those in the no-treatment control group (28.79 ± 5.40), F(1,92) = 161.870, P = 0.000, η^2p = 0.640.

An MMRM analysis was used, it revealed a significant effect for treatment condition (P < 0.0001), time (P < 0.0001) and a significant time by condition interaction F (2,182) = 57.8, P = 0.000, η^2p = 0.388. The MMRM also revealed that the main effect for treatment was significant F (1,91) = 242.87, P = 0.000, η^2p = 0.727. The Mann-Whitney *U* test was performed to examine differences within each group over different time intervals. The post intervention results showed significant increase from Time 1 to Time 2 on the motivation of respondents in the treatment group (U = 65.50, P = 0.000), meanwhile the control group showed no significant improvement in their scores over the same period. Also, the Mann-Whitney *U* test showed significant difference from Time 1 to Time 3 on the motivation of respondents in the treatment group (U = 52.00, P = 0.000).

The P-values for between conditions were reported as well. It was observed from the table that there was no significant between condition differences in scores of respondents motivation at Time 1 (P = 0.543), but there was significant difference at Time 2 (P = 0.000) and Time 3 (P = 0.000). This shows that the treatment group was significantly better than control on their level of motivation, it therefore suggests that the intervention was effective in impacting the variable effectively.

Table 3 shows a significant interaction effect of ACT and self-efficacy on motivation (β = –1.393; SE = 0.134; p = 0.000). The lower level of self-efficacy (β = 8.779; p = 0.000) and higher level of self-efficacy (β = 22.705; p = 0.000) were found significant. However, the effect size (β) at higher level is greater than the effect size at lower level. Hence the effect of ACT on SE is higher on student with high self-efficacy. Therefore, self-efficacy moderates the effect of ACT on student's motivation.

4. Discussion

There is a lack of literature on the effect of interventions on the motivation of Electrical and Mechanical Engineering Technology education students, specifically the effect of ACT on the motivation of Electrical and Mechanical Engineer-

ing Technology education undergraduates. The main purpose of this study was to determine if ACT enhances motivation of Electrical and Mechanical Technology Education undergraduates. The result of the study showed that ACT enhances and significantly improves the motivation of Electrical and Mechanical Engineering Technology education students in the treatment group as compared to the control group at the same post-treatment time points. The motivation of students was significantly improved in the ACT group after the intervention and also after at the follow-up. The present findings support [20] who observed that ACT increases the self-compassion of students. The findings further support [41–42] whose research showed that ACT is effective for obsessive-compulsive disorder.

The result of the study also showed that ACT had more effect in enhancing the motivation of students with higher self-efficacy when compared to students with lower self-efficacy. This showed that self-efficacy moderated the effect of ACT on students' motivation. Although this finding is a new contribution to our study since previous studies on ACT has not considered the moderating effect of self-efficacy, the results have added to the extant literature on the effect of ACT as well as on the relative validity of moderation tests in experimental design [43]. With this finding, our study has contributed to existing knowledge, literature, theory, and practice since there is little or no research on the moderating effect of self-efficacy on the relationship between ACT and motivation in educational institutions.

4.1 Limitations

Involving only Electrical and Mechanical Engineering Technology education students as the population of this study could affect the generality of the findings of the study. It is suggested that future studies should include students from other fields or departments to make the findings more generalizable. Secondly, the sample used in this study could limit its generalizability, it can be assumed by some researchers that the population is too small, but according to [44] one of the most effective ways to achieve representativeness is by randomization, also it is generally suggested by researchers that sample sizes in experimental and trial studies should be manageable. Also, the fact that the ACT intervention was not administered to treatment-seeking population could limit the generalizability of the study to population that is similar with the population used in the study, this is because treatment-seeking individuals might even be experiencing less motivation than the participants in this study. The study was also limited to participants who volunteered for the study, this might also affect generalization of the results. In future studies the effect of ACT on other behavioural traits should be examined.

4.2 Conclusion

The study examined the effect of ACT intervention program on the motivation of Electrical and Mechanical Engineering Technology education students. The findings from the study showed that the intervention/treatment was effective in increasing the motivation of undergraduate students. Therefore, it was recommended that therapists with adequate understanding of ACT strategy should use it to assist undergraduate students of electrical and mechanical Engineering Technology education.

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