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ENTREPRENEURSHIP EDUCATION AND ENGINEERING STUDENTS' ENTREPRENEURIAL INTENTIONS: THE MEDIATING ROLES OF ENTREPRENEURIAL SELF-EFFICACY AND ATTITUDE

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Abstract
Drawing on insights from the theory of planned behaviour and social cognitive career theory, this study empirically examines the serial mediating effect of entrepreneurial self-efficacy (ESE) and entrepreneurial attitude on the relationship between entrepreneurship education (EE) and entrepreneurial intentions (EIs). This study adopted a quantitative approach and survey research design. Data were collected from 248 engineering students in the Federal Polytechnic, Idah, Kogi State, Nigeria, using a self-reported questionnaire. The study performed serial mediation analysis using the Hayes-PROCESS Macro. Findings show that EE enhances students' ESE, entrepreneurial attitude and EIs. Results also indicate that ESE and entrepreneurial attitude individually and sequentially mediate the association between EE and EIs. The study concludes that ESE and entrepreneurial attitude are mechanisms through which EE positively affects EIs. The results have implications for EE curriculum developers.
Keywords. Entrepreneurship education, entrepreneurial attitude, entrepreneurial intentions, entrepreneurial self-efficacy.

Introduction

One of the social problems facing many developing countries, such as Nigeria, is youth unemployment and its associated problems. A high percentage of youths are unemployed. In Nigeria, for example, the youth unemployment rate is 42.5% (Korter, 2023). The most worrisome is graduate unemployment, about 36.26% (Otache, 2022). To further complicate the issue, Nigeria's higher education institutions (HEIs) annually graduate thousands of students into the already congested labour market (Otache, 2022). Job openings are less than job applicants, suggesting issues with paid employment. Interestingly, the only alternative to paid employment is self-employment (i.e., entrepreneurship) (Otache et al., 2021).

Many developing countries have employed different strategies to tackle the problem of youth and graduate unemployment. One of the strategies employed is the organisation of entrepreneurship training programmes aimed at equipping the youths with the entrepreneurial knowledge and skills needed to start and manage entrepreneurial ventures. For example, in Nigeria, we have the Youth Enterprise with Innovation (YouWin) and the Youth Entrepreneurship Support Program (YES-P) (Ogamba, 2018; Omeje et al., 2020). Similarly, many developing countries have made entrepreneurship education (EE) compulsory in all their HEIs. In this regard, all undergraduate students, irrespective of their chosen fields, must take some EE courses before graduating. The introduction of EE into the curricula of HEIs is meant to address the menace of graduate unemployment. EE prepares students for entrepreneurial careers. It is believed that students exposed to EE are significantly more likely to develop a

strong inclination to start a new business than those not exposed to EE (Otache et al., 2019). Also, EE enables students to develop positive attitudes toward entrepreneurship and boosts their confidence to start a new business.

Several studies have explored the relationship between EE and students' entrepreneurial intentions (EIs) (Bae et al., 2014). However, the findings are inconsistent. Some studies have reported a positive relationship between EE and EIs (Otache et al., 2022; Otache et al., 2019; Soomro & Shah, 2022). Others have established a negative link between them (Oosterbeek et al., 2010; von Graevenitz et al., 2010). Even among the studies that reported a positive relationship between EE and EIs, the mechanisms underlying the relationship are yet to be fully understood (Otache et al., 2022). Moreover, the inconsistency in the findings regarding the relationship between EE and EIs implies that a third variable intervenes in the relationship (Pham & Le, 2023). Against these backdrops, this study draws on insights from the theory of planned behaviour and social cognitive career theory to explore the serial mediating effect of entrepreneurial self-efficacy (ESE) and entrepreneurial attitude on the relationship between EE and EIs among engineering students.

This study enriches the existing literature on EE and EIs by providing empirical evidence of the serial mediating effect of ESE and entrepreneurial attitude on the relationship between EE and EIs. The relationship between EE and EIs may be direct and positive; however, this study demonstrates that ESE and entrepreneurial attitude could serve as mechanisms through which EE positively influences EIs. Also, the study integrates the theory of planned behaviour with social cognitive career theory to understand the impact of contextual factors such as EE on EIs through ESE and entrepreneurial attitude. The study increases our understanding of the relationship between EE and EIs.

Theoretical and hypotheses development

The theory of planned behaviour (TPB)

Ajzen's (1991) TPB is one of the popular theories many scholars have used to explain intentional behaviours in different contexts. The theory directly links intention to behaviour and further argues that intention is a function of *attitude towards behaviour* (ATB), *subjective norms* (SN) and *perceived behavioural control* (PBC). ATB is an individual's "disposition to respond favourably or unfavourably to an object, institution, or event." SN refers to an individual's perception that "reference people" would support or not support the decision to perform a specific behaviour. PBC refers to the extent to which an individual can perform certain behaviours. The more positive the ATB, SN and PBC are, the stronger the individual's intention to perform the behaviour.

Many entrepreneurship scholars have applied the TPB to explain an individual's entrepreneurial intentional behaviour. Thus, in this study, ATB is the extent to which an individual holds a positive or negative personal evaluation of engaging in an entrepreneurial venture. SN means an individual's perception that the people in their environment would support or condemn their decision to become an entrepreneur. It is an individual's perceived social influences or pressure to perform or not perform an entrepreneurial activity. PBC means how easy or difficult it is to successfully establish and manage an entrepreneurial venture. It concerns people's confidence in their ability to set up a business. Several studies have shown that positive attitudes towards entrepreneurship, positive subjective norms on entrepreneurship and positive perceptions of one's ability to undertake entrepreneurial actions predict students' EIs (Otache et al., 2019).

Social cognitive career theory (SCCT)

Lent et al.'s (1994) SCCT has its roots in Bandura's (1986) social cognitive theory. Entrepreneurship scholars see SCCT as a comprehensive theoretical framework for understanding entrepreneurship since becoming an entrepreneur is considered a career option (Pham & Le, 2023). The three building blocks of SCCT are self-efficacy, outcome expectations, and personal goals (Otache et al., 2022). Self-efficacy is the extent to which a person is confident in their ability to perform a particular behaviour (Santos & Liguori, 2019). Outcome expectations refer to a person's beliefs about the outcomes of performing a specific behaviour. Personal goals refer to a person's intention to undertake a particular activity. According to SCCT, an individual's career intention or interest is influenced by the interaction of contextual, individual and behavioural factors (Pham & Le, 2023). The theory argues that contextual factors improve individuals' self-efficacy and expectation outcomes and affect their career interests or choices (Okolie et al., 2021; Pham & Le, 2023). SCCT incorporates personal interests, values, abilities, learning experiences and environmental factors that affect career development (Santos & Liguori, 2019).

Overall, this study draws insights from the theory of planned behaviour and social cognitive career theory to explain the relationship between EE and EIs and the mediating role of ESE and entrepreneurial attitude in this relationship. The study argues that contextual factors such as EE improve students' ESE and entrepreneurial attitudes and increase their EIs. The extant literature acknowledges that EE equips students with entrepreneurial knowledge and competencies to become entrepreneurs (Otache et al., 2019). Accordingly, students will be interested in EE if they understand that the entrepreneurial knowledge and competencies acquired would increase their ESE and entrepreneurial attitude and the likelihood of becoming entrepreneurs after graduation.

Hypotheses development

EE and EIs

According to Gerba (2012) defined EE "as the structured formal conveyance of entrepreneurial competencies, which, in turn, refers to the concepts, skills and mental awareness used by individuals during the process of starting and developing their growth-oriented ventures" (p. 227). Also, Liñán (2004) defined EE as "the whole set of education and training activities – within the education system or not – that try to develop in the participants the intention to perform entrepreneurial behaviours, or some of the elements that affect that intention, such as entrepreneurial knowledge, desirability of the entrepreneurial activity, or its feasibility" (p. 166). Similarly, Ramayah et al. (2012) defined EE "as the collection of formalised teachings that inform, train and educate learners who are interested in setting up a business" (p. 69). These definitions imply that EE prepares students for entrepreneurial careers. EE influences students to develop positive attitudes towards entrepreneurship and increases their entrepreneurial capacity.

Additionally, human capital refers to the stock of knowledge, experiences, attitudes, competencies and behaviour embedded in a person. In entrepreneurship and EE contexts, human capital refers to the entrepreneurial knowledge, skills, attitudes and competencies required to start a venture. Human capital theory argues that people have varying skills and knowledge that have values. It suggests that education develops skills and competencies that enable people to be productive (Lee, 2019). Generally, education enhances human capital. This implies that EE improves the value of entrepreneurial human capital and, by extension, increases students' EIs (Jafari-Sadeghi & Biancone, 2018). EE equips students with the entrepreneurial knowledge and competencies that stimulate their interest to start a new business, and EI is essential in the

entrepreneurial process. Starting an entrepreneurial venture is considered an intentional and planned behaviour. The higher the EE, the more entrepreneurially inclined students become. Moreover, previous studies have shown that students exposed to EE are significantly more likely to develop higher EIs than those not (Otache et al., 2019). Based on the above premise, it is hypothesised that:

H1: EE will be positively associated with students' EIs.

The mediating role of ESE

Some level of ESE is required throughout the entrepreneurship process, from opportunity recognition to establishing and managing an enterprise. ESE is an essential cognitive antecedent of entrepreneurial intention and behaviour. In SCCT, self-efficacy is vital in predicting career intentions or interests (Schjoedt et al., 2017). Self-efficacy is an individual's belief in their ability to take action to accomplish specific tasks or goals (Hoang et al., 2020; Pham & Le, 2023). Individuals with high self-efficacy tend to demonstrate strong commitment when faced with challenging tasks (Hoang et al., 2020; Pham & Le, 2023). Self-efficacy determines how an individual perceives and reacts to situations which strongly relate to intentional behaviours (Pham & Le, 2023). In entrepreneurship, ESE refers to the belief that an individual has in their ability to undertake entrepreneurial activities (Schjoedt et al., 2017). Fundamentally, starting a business is an intentional behaviour involving many challenging tasks. Thus, an individual with a high ESE is significantly more likely to have a higher intention to start a new business. Moreover, research evidence suggests that ESE positively affects students' EIs.

Furthermore, according to SCCT, learning experience primarily influences an individual's self-efficacy (Pham & Le, 2023). An individual's self-efficacy can be developed through learning and experience, suggesting that EE can develop students' ESE. EE offers students an opportunity for a learning experience that enhances their ESE. Indeed, EE courses allow students to participate in real-life business projects, allowing them to experience mastery (Pham & Le, 2023). Students' ESE and entrepreneurial capacity will increase from recorded successes and failures. In light of SCCT, this study argues that contextual factors such as EE enhance students' ESE, and a high level of ESE influences their EIs. Based on the above premises, this study hypothesises that:

H2: ESE will significantly mediate the relationship between EE and students' EIs.

The mediating role of entrepreneurial attitude

Generally, an attitude refers to an individual's disposition (favourable or unfavourable) towards an object, an event, or a person (Yousaf et al., 2020). It drives individuals to behave positively or negatively in response to their inner feelings. According to Ajzen's (1991) TPB, attitude strongly predicts intention. The more positive individuals' attitudes towards a behaviour, the more likely they perform it. Attitude towards entrepreneurship is the extent to which an individual has a positive or negative evaluation towards entrepreneurial behaviour (Yousaf et al., 2020). People with positive attitudes towards entrepreneurship will likely develop the inclination to start a business. After all, possessing an entrepreneurial attitude is meaningless if people do not want to become entrepreneurs.

In addition, EE can instil positive attitudes towards entrepreneurship in students (Yousaf et al., 2020). The entrepreneurial knowledge and competencies acquired through EE can make students develop positive attitudes towards an entrepreneurial career (Arshad et al., 2016). Therefore, this study argues that entrepreneurial attitude will likely mediate the relationship between EE and students' EIs. This suggests that a higher EE would lead to a more robust

development of entrepreneurial attitudes, consequently increasing students' EIs. Moreover, previous studies have demonstrated a positive link between EE and students' EIs and between entrepreneurial attitudes and EIs (Otache et al., 2019), suggesting that entrepreneurial attitude could mediate the relationship between EE and EIs. Based on the above premises, the following hypothesis is formulated:

H3: Entrepreneurial attitude will significantly mediate the relationship between EE and students' EIs.

The serial mediation role through ESE and entrepreneurial attitude

It has been argued that people value themselves positively when they believe in their capacity to manage business operations (Arshad et al., 2016). According to Ajzen (1991), "attitudes develop reasonably from the beliefs people hold about the object of the attitude." This means people's beliefs affect their attitudes (Arshad et al., 2016). Self-efficacy improves individuals' attitudes towards work (Yousaf et al., 2020), and individuals with higher self-efficacy will be interested in their tasks (Arshad et al., 2016).

Additionally, ESE is a belief based on knowledge, which results in a positive attitude towards starting a new business (Arshad et al., 2016). This means that ESE enhances individuals' entrepreneurial attitudes, stimulating them to develop an inclination to start a business. Research evidence suggests that ESE is significantly associated with entrepreneurial attitude (Mykolenko et al., 2022; Yousaf et al., 2020), indicating that they are potential serial mediators. Besides, previous studies have established a positive link between ESE and entrepreneurial attitude (Arshad et al., 2016; Yousaf et al., 2020). Moreover, EE enables students to develop positive entrepreneurial attitudes (Yousaf et al., 2020) and the confidence to start a new business (Pham & Le, 2023). Therefore, this study argues that ESE and entrepreneurial attitude would serially mediate the relationship between EE and EIs. This suggests that EE would first affect students' ESE, and a high ESE would make students develop strong entrepreneurial attitudes, which, in turn, will lead to the development of stronger EIs (Mykolenko et al., 2022; Yousaf et al., 2020). Based on the above discussion, the following hypothesis is formulated:

H4: ESE and entrepreneurial attitude will sequentially mediate the relationship between EE and EIs.

Conceptual framework

This conceptual framework (Figure 1) illustrates the hypothesised relationship between the study variables. First, EE is hypothesised to have a direct positive impact on students' EIs. Second, ESE and entrepreneurial attitude are hypothesised to individually and sequentially mediate the relationship between EE and EIs.

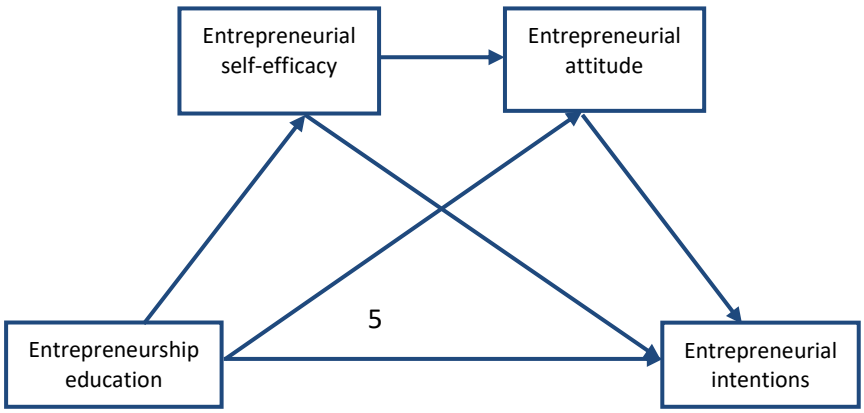

Fig. 1. Conceptual framework

Methods

Sample and data collection

The study sample comprised final-year engineering students at the Federal Polytechnic, Idah, Kogi State, Nigeria. The students took entrepreneurship courses for two semesters. The study used a simple random sampling to select the students. The student lists obtained from the institution served as the sampling frame. The population of the students is 650. Applying Yamane's (1963) formula, the study's sample size is 248. Of the 248 students, 211 (85%) were male, while the remaining 37 (15%) were female. Their average age was 24.

This is a cross-sectional study. Thus, the study adopted a cross-sectional survey research design. A self-reported questionnaire was used to collect data from the students. The questionnaire was administered in a classroom setting. The students were informed about the purpose of the study, which was for research purposes only. The authors assured the students of the confidentiality of the information provided and the anonymity of their identities. They were also told that their participation was voluntary.

Variables and measures

This study adopted previously validated scales to measure the variables using a five-Likert scale, where 1 means *strongly disagree*, and 5 means *strongly agree*.

- *EI*. The instrument developed by Liñán and Chen (2009) was used to measure EI. It consisted of five items (e.g. "I am determined to start my own business in the future").
- *EE*. The scale developed by Lorz (2011) was used to measure EE. It comprised five items (e.g., "I have acquired the skills, knowledge, and competencies needed to start, develop, and manage a new business").
- *ESE*. The instrument developed by Schjoedt et al. (2017) was used to measure ESE. It consisted of three items (e.g. "My skills and abilities will help me start a business").
- *Entrepreneurial attitude*. The scale developed by Liñán and Chen (2009) was used to measure entrepreneurial attitude. It comprised five items (e.g. "Being an entrepreneur implies more advantages than disadvantages to me").

Common method bias

This study performed Harmon's single-factor test to assess the presence or otherwise of common method bias in the collected data (Podsakoff et al., 2003). The results revealed a four-factor solution with eigenvalues greater than 1, explaining 84.03% of the total variance. The first factor accounted for only 26.03% of the variance, less than the critical value of 50% (Podsakoff et al., 2003), indicating no common method bias problem.

Reliability and validity assessment

Cronbach's alpha, composite reliability (CR) and average variance extracted (AVE) values were used to assess the reliability of the instruments. The instruments' alpha, CR and AVE values were higher than the recommended values of 0.70, 0.70 and 0.50 (see Table 1) (Hair et al., 2014), indicating that the instruments demonstrated adequate reliability.

In addition, indicator loading and discriminant validity (DV) were used to measure the validity of the instruments. All indicator loadings exceeded the recommended value of 0.70 (see Table 1) (Hair et al., 2014), suggesting adequate convergent validity. To assess DV, the square

root of the AVE value for each variable must be greater than the correlations of that variable with other variables. The results showed that the square root AVE values for all the variables exceed correlations with the other variables, indicating adequate DV (see Table 2 for the correlations among the variables).

Table 1.
Reliability and validity of instruments

Variables	Indicators	Indicator Loadings	Cronbach's α	CR	AVE	DV
EI	EI1	0.80	0.82	0.85	0.68	0.83
	EI2	0.77				
	EI3	0.79				
	EI4	0.82				
	EI5	0.75				
	EI6	0.81				
EE	EE1	0.88	0.89	0.92	0.66	0.81
	EE2	0.79				
	EE3	0.84				
	EE4	0.75				
	EE5	0.82				
ESE	ESE1	0.77	0.85	0.88	0.67	0.82
	ESE2	0.80				
	ESE3	0.89				
EA	EA1	0.86	0.90	0.93	0.70	0.84
	EA2	0.79				
	EA3	0.81				
	EA4	0.77				
	EA5	0.82				

Notes: EI = entrepreneurial intention, EE = entrepreneurship education, ESE = entrepreneurial self-efficacy, EA = entrepreneurial attitude, CR = composite reliability, DV = discriminant validity

Results

Descriptive statistics and correlation coefficients

Table 2 shows the descriptive statistics and correlations among the variables. EE is positively associated with EI (b = 0.309, p <0.01), ESE (b = 0.353, p <0.01) and EA (b = 0.408, p <0.01). Also, ESE (b = 0.399, p <0.01) and EA (b = 0.459, p <0.01) are positively and significantly correlated with EI.

Table 2.
Descriptive statistics and correlation coefficients

Variable	Mean	SD	1	2	3	4
1. EI	3.75	0.39	1			
2. EE	3.86	0.40	0.309*	1		
3. ESE	3.82	0.43	0.399*	0.353*	1	
4. EA	3.85	0.36	0.459*	0.408*	0.382*	1

Notes: n = 248, *p <0.01(two-tailed), EI = entrepreneurial intention, EE = entrepreneurship education, ESE = entrepreneurial self-efficacy, EA = entrepreneurial attitude

Direct and indirect effects

The study performed mediation analysis using the Hayes' (2013) PROCESS macro v3. The study applied Model 4 of the PROCESS and the bootstrapping method (5,000 resamples) to test the hypothesised relationships. The hypothesised relationships were deemed significant if the confidence interval excluded zero.

The study tested the direct effect of EE on students' EIs. The results (Table 3) showed that the effect of EE on students' EIs was positive and significant (b = 0.643, t = 4.315, p = .000). The model explained 46% of the variation in students' EIs. Based on the findings, H1 is supported.

The study also tested the mediating effect of ESE and entrepreneurial attitude on the relationship between EE and EIs. The results (Table 3) indicated that ESE had a positive and significant effect on EIs (b = 0.398, t = 4.061, p = .000) and significantly mediated the relationship between EE and EIs (b = 0.139, class interval (CI) = 0.09-0.71), thus, H2 is supported. Also, entrepreneurial attitude had a positive and significant effect on EIs (b = 0.457, t = 3.515, p = .000) and significantly mediated the relationship between EE and EIs (b = 0.186, CI = 0.07-0.80); therefore, H3 is supported. Additionally, ESE and entrepreneurial attitude were positively and significantly associated (b = 0.380, t = 3.141, p = .000). Further examination of the results revealed that the relationship between EE and EIs was sequentially mediated by ESE and entrepreneurial attitude (b = 0.061, CI = 0.30-0.87); thus, H4 is supported. It was a complimentary partial mediation because the direct and indirect effects were statistically significant (Nitzl et al., 2016).

Table 3.
Results showing direct, indirect and total effects

Paths	Estimates	SE	CI (95%)	
			Lower	Upper
Direct effects				
EE→ESE	0.350	0.081	0.04	0.73
EE→EA	0.406	0.122	0.02	0.66
EE→EIs (i.e. the c' path)	0.251	0.105	0.04	0.58
ESE→Eis	0.398	0.098	0.03	0.57
EA→Eis	0.457	0.130	0.05	0.56
ESE→EA	0.380	0.121	0.04	0.78
Indirect effects				
EE→ESE→Eis	0.139	0.043	0.09	0.71
EE→EA→Eis	0.186	0.046	0.07	0.80
EE→ESE→EA→EIs	0.061	0.019	0.30	0.87
Total effect				
EE→Eis	0.643	0.149	0.55	1.03

Notes: EE = entrepreneurship education, ESE = entrepreneurial self-efficacy, EIs = entrepreneurial intentions, EA = entrepreneurial attitude, CI = confidence interval, SE = standard error.

Discussion and conclusions

This study empirically investigated the relationship between EE and engineering students' EIs and the mediating roles of ESE and entrepreneurial attitude. As hypothesised, this study validates the positive relationship between EE and students' EIs, and thus H1 is supported. The results mean that students exposed to EE will likely develop strong EIs. These results are consistent with previous studies (e.g. Hoang et al., 2020; Otache et al., 2019) that reported a positive link between EE and EIs in Vietnam. The findings demonstrate that EE equips students with the entrepreneurial knowledge and skills which increase their intention to start a new business (Otache et al., 2019).

The results show that ESE positively impacts EIs and significantly mediates the link between EE and EIs, thereby supporting H2. The results suggest that EE enhances students' ESE, and a high ESE increase students' EIs. The result implies that ESE is a mechanism through which EE positively impacts students' EIs. These findings are consistent with previous studies (e.g. Hoang et al., 2020) that established the mediating role of ESE in the relationship between EE and EIs. The findings imply that EE enhances ESE, and a higher ESE leads to stronger EIs (Hoang et al., 2020).

Additionally, the findings show that entrepreneurial attitude positively impacts EIs and significantly mediates the link between EE and students' EIs, thereby supporting H3. This finding suggests that EE enhances students' entrepreneurial attitude, and entrepreneurial attitude, in turn, increases their EIs. In other words, the result means that entrepreneurial attitude is a mechanism through which EE positively influences EIs. These findings are consistent with previous studies (e.g. Arshad et al., 2016; Yousaf et al., 2020), which reported the mediating role of entrepreneurial attitude in the link between EE and students' EIs. The findings mean that EE enables students to develop positive attitudes towards entrepreneurship and consequently increase their intention to start a new business (Otache et al., 2019).

Furthermore, the findings show that ESE and entrepreneurial attitude mediate the relationship between EE and EIs sequentially. These findings agree with previous studies (Mykolenko et al., 2022; Yousaf et al., 2020). The findings mean EE would first positively impact ESE before affecting their entrepreneurial attitude and consequently affect their EIs. Based on the above-discussed findings, this study concludes that EE positively affects students' EIs. The study further concludes that ESE and entrepreneurial attitude serve as mechanisms that help transfer the positive effects of EE to EIs. Overall, EE contributes to the development of EIs and does so through ESE and entrepreneurial attitude.

Implications

Policy and practical implications

The study's findings have implications for EE curriculum developers. This study demonstrates that EE enhances students' ESE, entrepreneurial attitudes and EIs. The study further demonstrates that ESE entrepreneurial attitudes help transfer EE's positive effects to EIs. Thus, there is a need to enrich the current EE curriculum for a more significant impact on students. Specifically, the curriculum should be enriched with more theoretical and practical content. HEIs can also organise a monthly entrepreneurship programme and invite successful entrepreneurs to give talks to the students. This may promote entrepreneurship culture on campus and help students develop a strong entrepreneurial mindset and passion for entrepreneurial careers.

Theoretical implications

The study's findings also have theoretical implications. This study integrates the theory of planned behaviour with social cognitive career theory to validate the impact of EE on students' EIs through the mediating roles of ESE and entrepreneurial attitude. The study enriches the extant literature by providing empirical evidence of the individual and sequential mediating effects of ESE and entrepreneurial attitude on the relationship between EE and EIs.

Limitations and research implications

This study, like the previous studies, has its limitations. First, this study was a single institutional study. Therefore, the generalizability of its findings to all engineering students in HEIs in Nigeria and other countries is limited. Besides, the sample size (n = 248) is small. Future studies should replicate this study's model by extending the study to other institutions in Nigeria and other countries and increasing the sample size to validate the findings presented. Second, this study collected and analysed cross-sectional data and, as a result, may be unable to make inferences regarding the causality between the study variables. Thus, future studies may conduct a longitudinal study to allow for inferences about the cause-and-effect relationship between the variables.

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