

RESEARCH ARTICLE



The Effect of Tertiary Entrepreneurship Course on Students' Career Development Competency: The Case of Technical University Students

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Abstract

This study analyzed the effect of tertiary entrepreneurship courses on the career development competency of Technical University students. For that purpose, after conducting several face-to-face interactions of tertiary entrepreneurship course education for the past students of Bolgatanga Technical University, an empirical analysis was conducted based on 129 questionnaires. The results of the study are as follows. First, in this study, it was found that tertiary entrepreneurship courses had a positive effect on the career development competency of students and also on both the career design and pioneer drive, which are sub-factors of career development competency. Second, after the tertiary entrepreneurship course education was conducted, both entrepreneurship and career development competency were found to have improved, and in particular, the improvement of entrepreneurship was greater than that of career development competency. The study suggests that entrepreneurship education, focused on college students and adults, can be an effective career education program for adolescents in the second cycle system.

KEYWORDS

Entrepreneurship course, Technical University students, Career development, Competency, Bolgatanga

1 | INTRODUCTION

The world as we know it today is no more like the previous. We cannot go back to the old world (Cuomo, 2020)." As the post-corona era is summarized, the "New Normal" to prepare for the new era is no longer limited to the economic field. While we are already living in a new era of the Fourth Industrial Revolution characterized by technological convergence, hyper-connectedness, and superintelligence, the recent coronavirus outbreak has brought us a reality we have never experienced. For young people living in a volatile, uncertain, complex, and ambiguous VUCA (volatility, uncertainty, complexity, and ambiguity) world, the Fourth Industrial Revolution requires a variety of competencies that are far different from those required in the past industrial society (Lee et al., 2018; Saari et al., 2021).

The concept of competencies has shifted from being

discussed for adults to developing competencies for youth since the OECD-DeSeCo (Definition and Selection of Competencies) project, which identified the core competencies students need for life in the 21st century (Salling Olesen, 2023). Recently, 'The Future of Education and Skills: OECD Education 2030', called OECD-DeSeCo 2.0, suggests transformative competencies of knowledge, skills, attitudes, and values that students should have to become more innovative and responsible actors in a future society with increasing uncertainty (Taguma et al., 2023). In Ghana, theoretical and policy studies related to competencies have been actively conducted since the National Entrepreneurship and Innovation Programme (NEIP) and the National Business Plan to promote the development of entrepreneurship by pointing out the need to reorganize

the curriculum from the center of 'knowledge' to the center of 'core competency' (Government of Ghana, 2014).

The future society is in urgent need of human resources with not only basic skills such as literacy and numeracy but also multi-dimensional problem-solving skills, critical thinking and judgment, creativity, communication and collaboration, and decision-making skills that can lead to creative innovation (Loumpourdi, 2024; Lyons & Bandura, 2020; World Economic Forum, 2016). To foster human resources with such diverse capabilities, entrepreneurship is increasingly gaining interest and importance, and systematic and strategic tertiary entrepreneurship course education is needed from a future-oriented perspective (Kamel, 2024; Siemon, 2023; Zhou & Li, 2024). As a result, entrepreneurship education is being approached in terms of youth competency development.

A closer look at the school career education goals and achievement standards of higher institutions in Ghana reveals that entrepreneurship training is a key component and that the components of entrepreneurship and career development competencies are linked (Botha & Obeng-Koranteng, 2022). In addition, while most of the entrepreneurship education in the past only focused on the education of knowledge and skills necessary for entrepreneurship (Acheampong et al., 2024; Biney, 2023a), tertiary entrepreneurship course education is now being conducted for the educational purpose of fostering creative and convergent talents rather than only to start a business (Biney, 2023b).

According to Makransky et al. (2020), the percentage of students participating in career activities has been increasing yearly. The results of the survey on the participation status and satisfaction of challenge (entrepreneurship) and entrepreneurship activities show that the participation rate and satisfaction are high even in the early stages (Smith et al., 2023). However, compared to the quantitative expansion of tertiary entrepreneurship course education, it is criticized for lacking qualitative internalization and systematicity (Bux & Van Vuuren, 2019). We found that there is a lack of research on the impact of entrepreneurship on youth, especially Technical University students, who are the target of the education policy to foster creative talents, and the effectiveness of entrepreneurship education has been partially verified (Jiatong et al., 2021).

Therefore, this study aims to verify how tertiary entrepreneurship course education, operated as a career experience activity, affects the career development capabilities of Technical University students through face-to-face learning. The specific research questions are as follows: First, what are the effects of tertiary entrepreneurship courses on the career development competencies of Technical University students? Second, what are the changes in

entrepreneurship and career development competencies of Technical University students before and after tertiary entrepreneurship courses?

2. Theoretical Background and Prior Research

2.1 The Concept and Components of Entrepreneurship

The definition of entrepreneurship varies from scholar to scholar, and as a result, there is no generalized definition yet; however, some scholars have defined entrepreneurship (Diandra & Azmy, 2020; Filion, 2021; Ratten, 2023, 2024). Entrepreneurship is a multidimensional and complex concept that can be defined differently depending on which factors are focused on (Yamamura & Lassalle, 2022). The term entrepreneurship is credited to Richard Cantillon, an 18th-century French economist, and has been widely used to emphasize the risk-taking that entrepreneurs experience (Rasadurai & Raju, 2022).

Entrepreneurs and entrepreneurship were popularized by Schumpeter, an Austrian economist who viewed the driving force of economic growth as a process of creative destruction, which is expressed by entrepreneurship (Castro-Valdivia, 2020; Plehwe, 2020). Entrepreneurship is a drive in which an entrepreneur recognizes change and the creation of new and valuable value as an opportunity and continues to challenge it (Drucker, 1985). It is the process of exploring and acting on opportunities to create new value (Baron & Shane, 2005; Dao & Huy, 2023), and it is a process that involves action along with the pursuit of opportunities without being influenced by constrained circumstances (McMullen et al., 2021; McMullen & Dimov, 2013).

Meanwhile, the definition of a tertiary entrepreneurship course is not much different. It is defined as an innovative mindset that seeks to create true value through life experiences to pursue a 'life that is unique to me' as a subject of life (Kim et al., 2020), finding opportunities in one's life, and creating new value for the future (Okoro et al., 2022). Youth entrepreneurship is the ability to seize opportunities and creatively create value (Okolie et al., 2021). Youth entrepreneurship is also "a mindset and behavior that allows youth to pursue their goals by actively seizing the opportunities they are given, regardless of the resources or abilities they currently possess, and it is a drive that can lead to the discovery of their own potential and holistic growth through practice" (Ogbari, 2023).

Miller (1983) defined entrepreneurship as the tendency to pursue innovation in everyday life, take risks, be proactive, and try to outmaneuver competitors. It is categorized into three factors: risk-taking, proactiveness, and innovation. Risk-taking is the willingness to challenge unpredictable outcomes boldly, proactiveness is the ability to seize new opportunities

actively, and innovativeness is the effort to creatively solve problems by pursuing new changes, so it can be judged that "challenge," "opportunity," "creativity," and "problem-solving" are important components of entrepreneurship.

Recent studies have shown that youth entrepreneurship includes career preparation-related behaviors such as innovativeness, proactiveness, risk-taking, career awareness, and career exploration, and also includes autonomy, opportunity discovery, opportunity utilization, creativity, entrepreneurial will, and other skills such as collaborative communication, problem-solving, integrative cognition, efficient behavior, information gathering, entrepreneurship, self-friendship, self-concept, and career decision efficacy (Poggesi et al., 2024).

The literature suggests that entrepreneurship is characterized by a common emphasis on identifying and capitalizing on opportunities, taking risks in the face of uncertainty, taking action, being innovative, creative, problem-solving, and creating social and economic value. The various definitions of entrepreneurship also show that it can be applied to broader areas beyond business and entrepreneurship. Therefore, entrepreneurship, in its truest sense, is a totality of knowledge, skills, and attitudes that are applied in various life contexts (Ranta et al., 2022) and is a necessary competency for all youth.

2.2 Career Education and Career Development Competencies

Career education is an educational activity that supports individuals to plan and prepare for their careers throughout their lives (Jackson & Tomlinson, 2020). This is becoming increasingly necessary in modern society as it helps individuals to enjoy a happy life by choosing a career that suits their aptitudes and interests. Career education enhances fairness and transparency through sound work ethics, and companies and countries improve their competitiveness through rational manpower supply (Lee et al., 2021).

The trend of career education is also changing from presenting career development tasks compartmentalized into stages according to a developmental perspective to fostering career development competencies throughout life (DeCoito & Briona, 2023). The goal of school career education is to develop students' career paths creatively and continuously and to foster their ability to live a happy life as a mature democratic citizen (Nota et al., 2020). To respond to the changes in future society with the Fourth Industrial Revolution, there is a need for 'creative career development' in which students can create their career paths and constantly find new ideas and problem-solving methods rather than accepting the existing job world.

Career development competencies include the knowledge, skills, and attitudes that enable individuals to self-direct and rationally select, prepare, compare, evaluate, and manage careers utilizing a variety of roles and experiences throughout their lives (Bandaranaike & Kimmerly, 2014). It is also a concept that includes both cognitive and non-cognitive competencies that individuals need to develop, design, prepare, and execute their careers throughout their lives so that they can flexibly adapt to rapidly changing job environments and become lifelong career developers who take the initiative and creatively pioneer their careers (Frantz et al., 2022).

2.3 Hypothesis Development and Conceptual Framework

2.3.1 Relationship between DO and CP

The relationship between discovering opportunities (DO) and career planning (CP) is central to career development theory and practice. Opportunities often shape the direction of a person's career, while effective career planning helps individuals identify and seize these opportunities (Oliveira & Araújo, 2022). Krumboltz's Planned Happenstance Theory suggests that career paths are influenced by unplanned events or opportunities that individuals encounter throughout their lives (Krumboltz, 2015). In this context, career planning involves being open to unforeseen opportunities and preparing oneself to take advantage of them.

The theory highlights five skills critical to capitalizing on unexpected opportunities: curiosity, persistence, flexibility, optimism, and risk-taking. Through deliberate career planning, individuals can enhance these qualities and increase the likelihood of recognizing and pursuing opportunities when they arise. Hence, we hypothesize that;

H₁: Discovering opportunities will have a positive and significant relationship with career planning

2.3.2 Relationship between DO and PD

The relationship between discovering opportunities (DO) and pioneering drive (PD) is essential in understanding how individuals and organizations innovate, take risks, and venture into uncharted territories. The literature surrounding this relationship spans entrepreneurship, leadership, innovation, and psychological theories.

The concept of pioneering drive refers to the intrinsic motivation and determination to explore uncharted territories, take risks, and initiate innovative actions in various domains, including business, science, and personal development. Individuals or organizations with a pioneering drive are characterized by their willingness to challenge existing norms, seek out novel

opportunities, and lead in creating transformative changes. This drive is closely related to entrepreneurial spirit, visionary leadership, and pursuing groundbreaking innovations.

According to Lee et al. (2024), if one can discover opportunities, one will have that drive to pursue a career. Therefore, we hypothesize that;

H₂: Discovery opportunities will have a positive and significant relationship with pioneering drive.

2.3.3 Relationship between CR and CP

The relationship between creativity and career planning is a crucial aspect of modern career development (Watson & McMahon, 2024). Creativity influences how individuals approach career planning by enabling them to think outside traditional career paths, identify innovative opportunities, and adapt to changing work environments (Hernández-Acosta, 2024). Conversely, effective career planning can cultivate and channel creativity toward fulfilling and purposeful career outcomes (Li et al., 2021; Salleh et al., 2020).

According to Crimmins et al. (2023), individuals who exhibit creativity are better equipped to navigate the challenges of a dynamic career landscape. Career adaptability involves the ability to cope with career transitions, changes, and uncertainties, and creative problem-solving plays a key role in this process (Lee & Jung, 2021). Individuals who approach career planning creatively are more likely to see beyond conventional solutions and craft unique paths tailored to their interests, values, and evolving circumstances; hence, in this study, we hypothesize that;

H₃: Discovery opportunities will have a positive and significant relationship with career planning.

2.3.4 Relationship between CR and PD

The relationship between creativity and pioneering drive-in career development is a key factor in how individuals navigate non-traditional career paths, embrace innovation, and achieve career success in rapidly evolving industries (Pruthi & Mitra, 2023). This relationship is particularly relevant for individuals who seek to break away from established career norms, take risks, and carve out unique professional trajectories. Creative individuals often take a pioneering approach to career development by creating new career niches, adapting to emerging industries, or crafting portfolio careers (Smirnova & Lukianchuk, 2023). Their pioneering drive pushes them to explore opportunities that align with their creative strengths, even if these paths involve uncertainty or unconventional choices (Koch et al., 2023). Creative professionals typically display a pioneering drive to forge their career paths, often blending freelance work, personal projects, and

collaborations (Berg, 2022). The desire to maintain creative control over their work pushes them to explore non-traditional career models that prioritize autonomy and innovation (Popescu, 2023).

From the above discussions, the study hypothesizes that;

H₄: Creativity will have a positive and significant relationship with pioneering drive

2.4 Conceptual framework

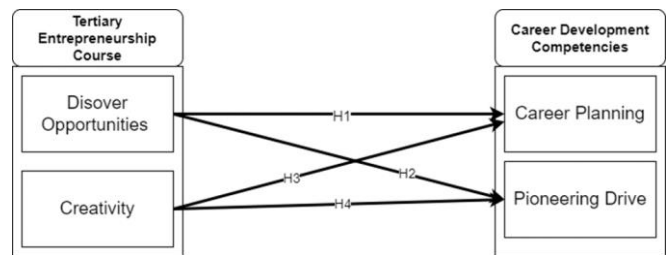


Fig. 1: Conceptual Framework

3 Research Methods and Hypotheses

3.1 Research Subjects and Study Design

A total of 162 past students (both Higher National Diploma students and Bachelor of Technology students) of Bolgatanga Technical University, Ghana, participated in this study. The University was selected because most of the courses they teach have entrepreneurship as one of the core courses for all students. The students' willingness to participate was not considered. The tertiary entrepreneurship course survey was conducted from October 2023 to December 2023.

A single-group pre-post experimental design was used to test whether entrepreneurship education training significantly affected the subjects. The pre-survey was administered online after the first two introductory meetings with students in their first semester. The post-survey was administered offline after the end of the second-semester entrepreneurship classes. The pre-questionnaire was distributed to 162 participants, and 143 copies were returned. Still, after excluding 14 copies that were unsuitable for the study due to missing parts of the questionnaire responses, double responses, or silent responses, 129 copies were analyzed. The general characteristics of the 129 participants selected for this study are shown in Table 1. There were 69 females (54%) compared to 60 males (46%), a difference of 9 (7%).

Table 1: General characteristics of research subjects

		N	%
Gender	Male	60	46
	Female	69	54
Level	Past HND and BTech Students	129	100.0

(N=129) (N=129) HND-Higher National Diploma, BTech-Bachelor of Technology

3.2 Research Tools

Based on the previous studies, this study determined opportunity discovery and creativity as subfactors to measure tertiary entrepreneurship courses, as shown in Table 2, and used questions from Donbesuur et al. (2020) a previous study on opportunity discovery variables, and Rumanti et al. (2023) previous study to measure the creativity variable. To measure career development competence, we used the career development competence questionnaire of the National Association of Colleges and Employers (Outlook, 2007) and 21st Century Youth Competencies Assessment questionnaire with some modifications (Ananiadoui & Claro, 2009).

The two variables, tertiary entrepreneurship course, and career development competence, each comprised two subfactors, each consisting of 31 items: 7 items for opportunity discovery, 6 items for creativity, 12 items for career design, and 6 items for the pioneering drive. The test items were scored on a 5-point Likert scale ranging from not at all (1) to very much so (5), with higher scores indicating higher competencies.

3.3 Organization of the Entrepreneurship Program

The tertiary entrepreneurship course was scheduled in two parts: third-year semesters one and two for the HND program and third-year semester two for the BTech program. The classes were weekly face-to-face interactions with one instructor.

This educational program aims to recognize and cultivate young people's capabilities as future human resources and to help them shape their career paths. The main target of this study is past students of the Bolgatanga Technical University who are now seeking employment. The study was conducted through project-based learning on a topic that can give them interest and interest related to themselves. Project-based learning is a student-centred, inquiry-based pedagogical approach that is gaining attention and widespread use in the field of education because it enables students to acquire knowledge while working collaboratively, solve complex problems, communicate effectively, learn self-directed learning, and improve skills needed in real life, such as creative thinking and critical thinking (Zhang & Ma, 2023). It also utilizes design thinking, which is suitable

for entrepreneurship education and has been actively researched and utilized (Hariyanto et al., 2023).

Based on this, the tertiary entrepreneurship course is summarized as shown in Table 3.

3.4 Analyzing Data

The specific empirical methods used to analyze the data collected in this study are as follows. First, frequency analysis and descriptive statistical analysis were conducted to find out the general characteristics of the participants and the sample. Second, factor analysis and reliability analysis were conducted to measure the validity and reliability of the items. Third, correlation analysis examined the relationship between variables related to opportunity discovery, creativity, career design, and pioneering drive. Fourth, regression analysis was used to examine the effect of the independent variable tertiary entrepreneurship course on the dependent variable career development competence. Finally, to verify the effectiveness of the tertiary entrepreneurship course, a paired sample t-test was used to test the difference between the means of the two variables measured in the same sample. All empirical analyses in this study were tested at the significance level of $p < .05$, and statistical analysis was performed using SPSS 26.0.

4 Findings

4.1 Descriptive Statistics Analysis of Key Variables

In the preliminary assessment, career development competency and entrepreneurship mean values were 3.37 and 3.19, respectively. In the post-test, the mean values of career development competency and entrepreneurship were 3.54 and 3.39, respectively, indicating an overall increase. The increase in entrepreneurship (0.20) was higher than the increase in career development competence (0.17), especially for item 31, "I consistently propose new ideas (0.42)," followed by item 20, "I consistently think of ideas to solve everyday problems (0.37)." Item 29, "I turn my original ideas into realistic results (0.35)." On the other hand, item 2, "I know what I like to do," showed the only significant decrease in the posttest at -0.03, as shown in Table 4.

Table 2: Subfactors and itemization of the instrument

Variable name	Operational definitions	Subfactors	Number of questions
Tertiary entrepreneurship course	The ability to challenge opportunities and create new value through creative and collaborative problem-solving despite future uncertainty and risk.	Discover opportunities	7
		Creativity	6
Career Development Competencies	The ability to proactively plan and prepare for life in order to be proactive in dealing with changing circumstances.	Career Planning	12
		Pioneering drive	6

Table 3: Goals, activities, and expected competencies for entrepreneurship education programs

Time/Sessions	Learning objectives	Specific activities	Competency expectations
HND Semester One			
1 (2 hours)	Theories of entrepreneurship	Discuss examples of current entrepreneurs, their companies, and their importance to both Ghana and global economies	Career Development Competencies
2 (2 hours)	Attributes of an entrepreneur	Research and evaluate the personal attributes and skills that characterize the “successful” entrepreneur.	Career Development Competencies
3 (2 hours)	Entrepreneurship and small business development	Identify and assess sources of support for small businesses and entrepreneurs	Career Development Skills, Youth Entrepreneurship
4 (2 hours)	Entrepreneurship and globalization	Understanding your environment and the world of business around you	Career Development Skills, Youth Entrepreneurship
HND Semester Two			
1 (2 hours)	Developing and managing business ideas	Understanding the dynamic role of entrepreneurship and small businesses	Career Development Competencies
2 (2 hours)	Understanding business development stages	How to organize and manage a small business	Career Development Skills, Youth Entrepreneurship
3 (2 hours)	Enterprise process and functions	How to develop a “blueprint” for a new venture	Youth Entrepreneurship
4 (2 hours)	Business plan development	How to prepare a financial plan, develop strategic marketing plan, develop new product or service	Career Development Skills, Youth Entrepreneurship
5 (2 hours)	Factors of production	Sources of business ideas that will lead to innovative thinking	Career Development Skills, Youth Entrepreneurship
BTech Semester One or Two			
1 (2 hours)	The Entrepreneur: Types and Functions	Sell themselves and their ideas through oral and visual presentation skills;	Career Development Skills, Youth Entrepreneurship
2 (2 hours)	Setting-up of Small-Scale Unit	Find problems worth solving by advancing their individual skills in business development;	Career Development Skills, Youth Entrepreneurship
3 (2 hours)	Character and competence of the entrepreneur	Mobilize people and resources;	Career Development Competencies
4 (2 hours)	Creativity and innovation management	Create value through creativity, presentations and business plans;	Career Development Skills, Youth Entrepreneurship
5 (2 hours)	Marketing Management for Small Business	Develop and cultivate endurance by increasing their awareness and deliberately practice the skills and disciplines	Career Development Competencies

4.2. Validate Reliability and Validity

As a result of the exploratory factor analysis of the independent variables, opportunity identification and creativity, the sub-factors of the tertiary entrepreneurship course, all 7 items of opportunity identification and 6 items of creativity were adopted and extracted into 3 factors. The loadings of the extracted factors were analyzed to explain 64.19%. In addition, Cronbach's α value was used to determine the reliability of the respondents' subjective measurements of the survey items, which is 0.6, the recommended reliability value in the social science field. The reliability analysis for each factor was 0.851 for opportunity identification, 0.783 for problem-solving, and 0.768 for communication skills, which is satisfactory. KMO is to check the correlation between variables, and the higher the KMO value, the better, but in general, if it is greater than 0.5, it can be judged that it is appropriate to conduct factor analysis, and usually social science research problems require a level of 0.5 or higher. In the Bartlett value, if $p < 0.05$, it means that it is appropriate to conduct factor analysis, and the analysis result is $p < 0.000$, so it can be seen to

be satisfactory. The results of exploratory factor analysis and reliability analysis of independent variables are shown in Table 5.

As a result of the exploratory factor analysis of the sub-factors of the dependent variable career development competence, career design, and pioneering drive, 18 items were divided into 6 factors when all items were adopted, and the extracted loading value was 62.72%. However, the items with low commonality were sequentially removed to select the final 14 items and 5 factors, and the loading value of the extracted factors was 66. The reliability values of the sub-factors of career development competence, career preparation, challenge drive, career values, self-exploration, and differentiation attitude are 0.749, 0.665, 0.663, 0.682, and 0.611, respectively, which are all above 0.6, indicating that the reliability level is satisfied. The results of the dependent variable's exploratory factor analysis and reliability analysis are as follows. After removing 4 items (1, 5, 12, and 17) deemed inappropriate among the 31 items in the exploratory factor analysis, 27 items were finally selected. Table 7 shows the items and names of the independent and dependent variables organized by factor.

Table 4: Descriptive Statistics Analysis

Items		N	Preliminary assessment		Post test		
			Mean	Standard deviation	Mean	Standard deviation	
Career Development Competencies	1	129	3.67	1.009	3.91	.765	
	2	129	4.04	.987	4.01	.888	
	3	129	3.52	1.153	3.54	1.046	
	4	129	3.23	1.202	3.53	.961	
	5	129	3.57	.958	3.73	.855	
	6	129	3.33	1.213	3.52	1.016	
	7	129	3.38	1.055	3.53	1.008	
	8	129	4.17	.928	4.22	.800	
	9	129	3.79	.966	4.01	.923	
	10	129	3.70	.973	3.88	.872	
	11	129	2.99	1.115	3.39	1.018	
	12	129	3.25	1.031	3.36	.943	
	13	129	3.11	.752	3.32	.750	
	14	129	2.81	.771	2.93	.802	
	15	129	2.91	1.039	3.12	.857	
	16	129	3.13	1.056	3.37	.993	
	17	129	2.74	1.099	2.99	.897	
	18	129	3.27	.982	3.39	.913	
	Overall Average		3.37	1.02	3.54	0.91	
Tertiary entrepreneurship course	19	129	3.22	.935	3.40	.905	
	20	129	3.05	1.092	3.42	.933	
	21	129	3.12	1.075	3.28	.952	
	22	129	2.94	1.021	3.16	.882	
	23	129	3.07	.962	3.22	.857	
	24	129	3.11	1.025	3.34	.795	
	25	129	3.34	.964	3.46	.839	
	26	129	3.50	1.009	3.57	.818	
	27	129	3.47	.985	3.60	.888	
	28	129	3.64	.855	3.70	.816	
	29	129	2.91	.947	3.26	.929	
	30	129	3.16	.967	3.38	.894	
	31	129	2.92	1.058	3.34	.956	
		Overall Average		3.19	0.99	3.39	0.88

Table 5: Exploratory factor analysis and reliability analysis results of independent variables

Questionnaire number	Component			Cronbach's α
	Factor 1	Factor 2	Factor 3	
31	.828	.103	.073	.851
30	.727	.128	.194	
20	.726	.396	-.061	
22	.717	.411	.018	
29	.665	.146	.375	
21	.569	.141	.245	.783
24	.083	.830	.284	
23	.400	.761	.060	
25	.202	.639	.387	
19	.500	.504	.034	.768
26	.272	.229	.789	
28	-.074	.053	.776	
27	.315	.237	.738	
Eigenvalues	5.636	1.660	1.049	
KMO (Kaiser-Meyer-Olkin)				.861
Bartlett's test for sphericity			Chi-Square	771.412
			dp(p)	78 (.000)

4.3. Correlation Analysis

In this study, Pearson correlation analysis, the most commonly used method, was conducted to

identify the correlation between the sub-factors of tertiary entrepreneurship course, opportunity discovery, and creativity and the sub-factors of career development competence, career design, and pioneering drive. As a result, we found that all variables of career design, pioneering drive, opportunity discovery, and creativity were significant at $p < 0.001$, as shown in Table 8. When looking at the specific correlations, career design showed a significant static correlation with pioneering drive ($r = 0.496$), opportunity discovery ($r = 0.581$), and creativity ($r = 0.551$). Next, pioneering drive showed a significant static correlation with opportunity discovery ($r = 0.620$) and creativity ($r = 0.578$), and the correlation between opportunity discovery and creativity was significant at $r = 0.698$.

4.4. Regression Results

This study conducted a regression analysis to analyze the association between the variables. As a result of the simple regression analysis, the adjusted R^2 was 0.504, indicating that the change in the independent variable, tertiary entrepreneurship course, explains

Table 6: Results of exploratory factor analysis and reliability analysis of dependent variable

Questionnaire number	Component					Cronbach's α
	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	
4	.767	-.056	.245	.147	.008	.749
6	.755	-.025	.156	.244	.089	
11	.712	.260	.014	.369	.042	
10	.663	.144	.017	-.283	.050	
16	.012	.825	.161	.058	.006	.665
18	.050	.742	.277	-.034	-.016	
15	.160	.690	-.365	.104	.079	
9	.056	.190	.825	.077	.006	
8	.150	-.159	.703	.086	.077	.663
7	.194	.275	.593	.095	.019	
2	.021	.008	.115	.889	-.026	
3	.300	.104	.109	.717	.130	
14	.041	-.018	-.126	.188	.854	.611
13	.088	.061	.226	-.107	.829	
Eigenvalues	3.450	1.713	1.548	1.359	1.262	
KMO (Kaiser-Meyer-Olkin)						.655
Bartlett's test for sphericity				Chi-Square		483.630
				dp(p)		91(.000)

Table 7: Questions and names of the final selected factors

Item	Question	Name	Subfactors	Variables
Factor 1	20, 21, 22, 29, 30, 31	Discover opportunities	Discover opportunities	Independent Variables
Factor 2	19, 23, 24, 25	Problem-solving skills	Creativity	
Factor 3	26, 27, 28	Communication skills		
Factor 4	4, 6, 10, 11	Career preparation	Career Planning	Dependent Variable
Factor 5	7, 8, 9	Work values		
Factor 6	2, 3	Self-discovery		
Factor 7	15, 16, 18	Challenge drive	Pioneering drive	
Factor 8	13, 14	Differentiated attitudes		

Table 8: Variable correlation analysis results

Variables	Mean	Standard deviation	Correlation			
			Career Planning	Pioneering drive	Discover opportunities	Creativity
Career Planning	3.736	.586	1			
Pioneering drive	3.226	.557	.496***	1		
Discover opportunities	3.306	.683	.581***	.620***	1	
Creativity	3.470	.623	.551***	.578***	.698***	1

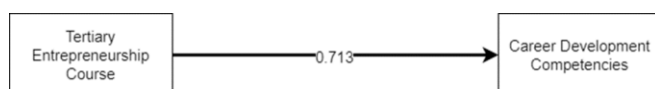
(N=129), *p<.05, **p<.01, ***p<.001

Table 9: Regression analysis results of tertiary entrepreneurship course and career development competencies

Independent Variables	Independent Variables				
	Non-standardized coefficients		Standardization factor	t	p
	B	SE	β		
Constant	1.154	.181		8.367	.000
Entrepreneurship	.601	.053	.713	11.446	.000

R=.713, R² (Adjusted) =.508 (.504), F=131.005***(.000)

*p<.05, **p<.01, ***p<.001

**Fig. 1**

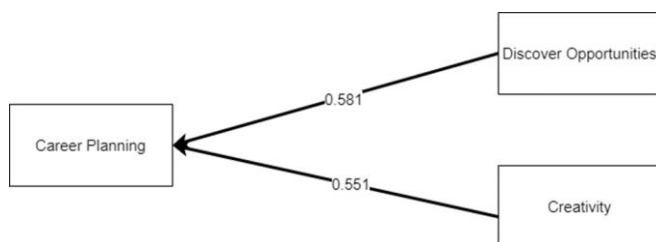
50.4% of the change in the dependent variable, career development competence. The F-value of the regression equation is 131.005 with a significance probability of 0.000, indicating that the regression

equation is significant at a significance level of 0.001. The beta is 0.713, meaning that when tertiary entrepreneurship courses' magnitude increases by 1 unit, career development competence increases by 0.713 units (p<0.001). This result also confirms the works of Akintelu and Adegbite (2024) in their study on the entrepreneurship programmed, intention to start new businesses, and employability skills among University Students. The results are shown in Table 9.

Table 10: Regression analysis results of tertiary entrepreneurship course and career design

Item	Independent Variables	Non-standardized coefficients		Standardization Coefficients	t	p
		B	SE			
Dependent Variable: Career Planning	Constant	2.088	.209		9.985	.000
	Discover opportunities	.498	.062	.581	8.044	.000
	R=.581, R ² (Adjusted) =.338(.332), F=64.707***(.000)					
	Constant	1.938	.245		7.900	.000
	Creativity	.518	.070	.551	7.447	.000
	R=.551, R ² (Adjusted) =.304(.298), F=55.464***(.000)					

*p<.05, **p<.01, ***p<.001

**Fig. 2**

The regression results of the independent variables, opportunity discovery and creativity, which are sub-factors of tertiary entrepreneurship course, and the dependent variable, career design, which is a sub-factor of career development competence, are shown in Table 10. When the independent variable is opportunity discovery, and the dependent variable is career design, the adjusted R² is 0.332, indicating that the change in the opportunity discovery variable explains 33.2% of the career design variable. The F-value of the regression equation is 64.707, with a significance probability of 0.000, indicating that the regression equation is significant. The beta is 0.581, which means that when the opportunity discovery variable increases by 1 unit, the career design variable increases by 581 units (p<0.001).

Next, with creativity as the independent variable and career design as the dependent variable, the adjusted R² was 0.298, indicating that the creativity change explains 29.8% of the change in career design. The F-value is 55.464, with a significance level of 0.000, indicating that the regression is significant. The beta is 0.551, which means that when the creativity variable increases by 1 unit, the career design variable increases by 551 units (p<0.001).

The regression results of the independent variables, opportunity discovery and creativity, and the dependent variable, career development competence, are shown in Table 11. First, when opportunity discovery is the independent variable, and pioneering drive is the dependent variable, the adjusted R² is 0.380, indicating that the change in the opportunity discovery variable explains 38.0% of the change in the pioneering drive variable. The F-value is 79.318, with a significance level 0.000, indicating that the regression is significant. The

beta is 0.620, indicating that a one-unit increase in the opportunity discovery variable leads to a 620-unit increase in the pioneering drive variable (p<0.001). Next, when creativity is the independent variable, and pioneering drive is the dependent variable, the adjusted R² is 0.329, which means that the change in the creativity variable explains 32.9% of the change in the pioneering drive variable. The F-value is 63.757, with a significance level of 0.000, indicating that the regression is significant. The beta is 0.578, which means that when the creativity variable increases by 1 unit, the pioneering drive variable increases by 578 units (p<0.001).

4.5. Difference Analysis

4.5.1. Effect on Entrepreneurship

The pre-and post-training measures of tertiary entrepreneurship course were compared by paired samples t-test, and the mean value of tertiary entrepreneurship course increased by 0.206 from 3.188 before the training to 3.394 after the training, a statistically significant difference (p<0.01). In other words, entrepreneurship education for youth improved tertiary entrepreneurship course (Ogunode & Leah, 2024). Next, the pre-and post-education measures of opportunity discovery and creativity, which are sub-factors of tertiary entrepreneurship courses, were tested using paired samples t-tests. As a result, the mean value of opportunity discovery increased by 0.288 from 3.018 before the course to 3.306 after the course, a statistically significant difference (p<0.01). In the case of creativity, the mean value increased by 0.136 after the course compared to before the course, but the difference was not statistically significant. In other words, it can be seen that entrepreneurship education for youth improves youth's opportunity discovery, but it does not improve creativity (Junça-Silva et al., 2024). The results are shown in Table 12.

4.5.2. Effect on Career Development Competencies

The pre- and post-education career development competence measures were tested with a paired sample t-test. The mean value of career development competence was 3.384 before the education, and the mean value was 3.554 after the education, an increase

Table 11: Regression results of tertiary entrepreneurship course and pioneering drive

Item	Independent Variables	Non-standardized coefficients		Standardization Coefficients	t	p
		B	SE	β		
Dependent variable: Pioneering Drive	Constant	1.555	.192		8.112	.000
	Discover opportunities	.506	.057	.620	8.906	.000
	R = .620, R ² (Adjusted) = .384(.380), F = 79.318***(.000)					
	Constant	1.434	.228		6.287	.000
	Creativity	.517	.065	.578	7.985	.000
	R = .578, R ² (Adjusted) = .334(.329), F = 63.757***(.000)					

*p<.05, **p<.01, ***p<.001

Table 12: Pre-post differences in tertiary entrepreneurship course

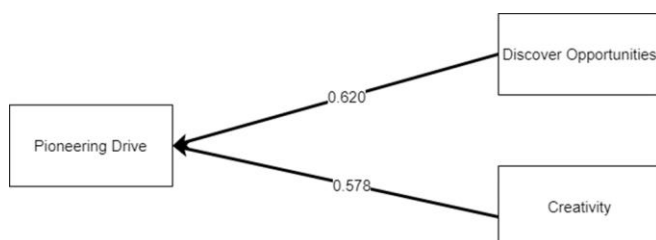
Item		N	Mean	Standard deviation	t	p
Entrepreneurship	Post test	129	3.394	.600	2.775	.006**
	Preliminary assessment	129	3.188	.649		
Discover opportunities	Post test	129	3.306	.683	3.371	.001**
	Preliminary assessment	129	3.018	.778		
Creativity	Post test	129	3.470	.623	1.711	.089
	Preliminary assessment	129	3.334	.666		

*p<.05, **p<.01, ***p<.001

Table 13: Pre-post differences in career development competencies

Item		N	Mean	Standard deviation	t	p
Career Development Competencies	Post test	129	3.554	.506	2.943	.004**
	Preliminary assessment	129	3.384	.499		
Career Planning	Post test	129	3.736	.586	2.289	.024*
	Preliminary assessment	129	3.572	.629		
Pioneering drive	Post test	129	3.226	.557	2.909	.004**
	Preliminary assessment	129	3.047	.557		

*p<.05, **p<.01, ***p<.001

**Fig. 3**

of 0.17, a statistically significant difference ($p<0.01$). In other words, entrepreneurship education for youth improves their career development competence. These results confirm the findings of Sá et al. (2024) They also found that entrepreneurs who had previously participated in entrepreneurship education were more likely to have paid employees.

In addition, for the sub-factors of career development competence, career design, and pioneering drive, the pre- and post-education measures were tested with a paired sample t-test. As a result, the mean value of career design increased by 0.164 from 3.572 before the education to 3.736 after the education, and the difference was statistically significant ($p<0.05$). In the case of pioneering drive, the mean value increased from 3.047 before the program to 3.226 after the program, an increase of 0.179, with a statistically significant difference ($p<0.01$). In other words,

entrepreneurship education for youth improved both career design and pioneering drive (Magasi, 2022). The results are shown in Table 13.

5. Conclusion

This study empirically analysed the effect of tertiary entrepreneurship courses on career development competencies and the changes in entrepreneurship and career development competencies before and after tertiary entrepreneurship course education. 129 past students (both Higher National Diploma and Bachelor of Technology students) of Bolgatanga Technical University, Ghana, participated in this study.

First, tertiary entrepreneurship courses were found to have a positive effect on career development competence, and the sub-factors of career development competence, career design, and pioneering drive were also found to have a positive effect. This result indicates that tertiary entrepreneurship course is meaningful from the perspective of career development, which means that the higher the level of tertiary entrepreneurship, which creates value through life experiences as a subject of life, the higher the career development capability to understand oneself and the environment to plan and prepare for a self-directed life. It is also in line with the study that high school student's participation in

entrepreneurship education activities has a positive effect on career development capability (Li et al., 2023) and the study that entrepreneurship education is a factor that increases students' self-efficacy and career decision self-efficacy (Atmono et al., 2023).

Second, the mean values of both tertiary entrepreneurship courses and career development competencies increased after the entrepreneurship education course, confirming that the course positively impacted tertiary entrepreneurship and career development competencies. In particular, the increase in tertiary entrepreneurship courses was higher than in career development competencies. Among the sub-factors of entrepreneurship, opportunity discovery was twice as high as creativity. These results can be found in discovering problems based on the empathy of design thinking during the course. In other words, identifying and solving opportunities by recognizing daily inconveniences or problems significantly affected opportunity discovery. On the other hand, the low increase in creativity, a combination of individual ability and personality, maybe because the number of interactions within a week was physically insufficient to develop creativity, including problem-solving and communication skills, not just knowledge and skills.

5.1 Significance and Implications of the Study

First, despite the recent proliferation of entrepreneurship education, there is still a lack of research on the effectiveness of entrepreneurship education, especially for Technical University students, and we believe that the results of this study can partially fill this gap. Second, while studies on the effectiveness of entrepreneurship education have mainly focused on adult-level entrepreneurship education and analyzed entrepreneurial intentions and start-ups as measures, this study is significant in that it verifies the effectiveness of entrepreneurship education, opportunity discovery, and creativity tailored to the characteristics and perspectives of adolescents. Third, this study suggests that entrepreneurship education, focused on college students and adults, can be an effective career education program for adolescents in the second cycle system.

5.2 Limitations and Suggestions for Future Research

First, the opportunity discovery and creativity variables, which are sub-factors of tertiary entrepreneurship courses, are part of the entrepreneurship component, and there may be various educational effects and possibilities of other entrepreneurship components as variables. Therefore, in follow-up research, it is suggested that the

effectiveness of various entrepreneurship variables other than the opportunity discovery and creativity variables covered in this study be verified.

Second, this study verified the educational effectiveness of entrepreneurship education for Technical University students. However, this study does not consider the differences in educational effectiveness of personal environmental factors such as gender, age, school type, teaching method, and number of entrepreneurship education participations, which limits the generalizability of the results. In future studies, it is necessary to consider the variables in the design, implementation, and verification of educational programs and to distinguish the differences in effectiveness by considering the environment and demographic variables of the study subjects.

Third, it is difficult to interpret that the experimental group's improvement in career development competencies was due to the entrepreneurship education program alone, as schools offer multiple programs with various topics and forms of career education. Therefore, it is necessary to conduct exploratory research on other factors and verify the effects of the entrepreneurship education program with a control group to compare the changes in career development competencies.

Fourth, as a result of this study, we expect the development of various entrepreneurship education contents that can help youth in their career paths and revitalize entrepreneurship education in public education by broadening the understanding of entrepreneurship education.

Disclosure Statement

The authors reported no potential conflict of interest.

Competing Interests

Authors have no competing interest to disclose.

Authors' Contributions

All authors contributed equally to this study.

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Declarations of Interest

None

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