



Validation of the Entrepreneurial Behaviour Scale among Vocational College Students in China, Using Exploratory Factor and Reliability Analysis

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ABSTRACT

Aim: The significance of entrepreneurial behaviour among college students lies in its ability to not only generate a wide range of job opportunities and make a substantial contribution to the economy, but also to maintain societal stability. There is a scarcity of research on college students' entrepreneurial behaviour, particularly in vocational colleges. One possible reason for this is the lack of reliable tools to effectively measure entrepreneurial behaviour in vocational college students. This study aimed to investigate the validity and reliability of the entrepreneurial behaviour scale through a pilot study conducted among vocational college students in China. **Methods:** This scale, which measures entrepreneurial behaviour, consists of three dimensions: entrepreneurial activities, overcoming failures, and proactive behaviour. It was adapted from established scales that have been extensively used in academic research.

For this pilot study, a total of 118 students from vocational

colleges in Shandong Province, China, were engaged through an online survey using random sampling.

Results: An exploratory factor analysis (EFA) was used to validate items within each construct, employing factor loading. Internal consistency was assessed through Cronbach's alpha. The EFA results validate the validity of the instrument's structure, demonstrating that each item had a factor loading above 0.5 and fell within its respective construct. In addition, the scale demonstrates strong internal consistency, as evidenced by a Cronbach's alpha value that surpasses the threshold of 0.7. **Conclusion:** Therefore, this scale is considered a reliable tool for evaluating the entrepreneurial behaviour of vocational college students. It is adequate and appropriate for future research in this area within the vocational college setting.

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Introduction

Entrepreneurship is a vibrant pursuit that involves replacing established practices with fresh, independent, and disciplined approaches (Diandra & Azmy, 2020). Engaging in entrepreneurship can bring about a sense of personal fulfilment and joy, acting as a driving

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factor for entrepreneurs to persevere through difficult ventures that can make a beneficial contribution to society (Wiklund et al., 2019). In the context of China, the remarkable economic transformation can be largely credited to the promotion of entrepreneurship (He, Lu, & Qian, 2019). According to Roomi, Saiz-Alvarez and Coduras (2021), entrepreneurship plays a crucial role in addressing unemployment, particularly for college graduates, by generating new job opportunities. Promoting entrepreneurial activities among college students in China has become a crucial goal for the state (Gao & Qin, 2022).

The primary focus of entrepreneurial education in Chinese colleges is to improve students' comprehension, mindset, and skills in entrepreneurship (Wang, 2021). The study conducted by Lee, Cortes and Joo (2021) highlights the importance of identifying and motivating college students who are interested in entrepreneurship. The research suggests that by doing so, we can greatly enhance their chances of achieving success in their business ventures. This finding has significant implications for the advancement of society and the economy. In a study conducted by Sun, Shi and Zhang (2023), it was found that both extracurricular activities and attending the curriculum played a significant role in developing students' entrepreneurial mindset. Participating in entrepreneurial education has been shown to improve college students' understanding of entrepreneurship, develop their belief in its feasibility, and ultimately increase their interest in pursuing entrepreneurial endeavours (Gianiodis & Meek, 2020).

However, according to a study by Lu, Song and Pan (2021), despite numerous initiatives to promote student participation in entrepreneurship, there has been no significant rise in the number of college students involved in entrepreneurial activities in China. Many college students in China have expressed a desire to start their own businesses, but only a small number of students actually pursue entrepreneurship (Wu & Tian, 2022). In addition, despite students' strong enthusiasm for entrepreneurship, the success rate consistently stays below 10% (Yang, 2022). The number of college graduates with entrepreneurial skills is insufficient to meet the demands for economic and social development in China (Mei & Symaco, 2022).

It is important to emphasise that the importance of entrepreneurship lies in the actual entrepreneurial behaviour exhibited (Adeel, Daniel, & Botelho, 2023). Entrepreneurs bring their entrepreneurial vision to life by leveraging their unique knowledge, assets, prospects, or innovations (Kong, Zhao, & Tsai, 2020). According to Yang (2022), college students engage in entrepreneurial behaviour by undertaking activities to establish their own independent enterprises. The dynamic capabilities of a college can be greatly impacted by entrepreneurial behaviour, as highlighted by Liao and Maulana Suprpto (2024). Although the importance of entrepreneurial behaviour is widely recognised, there has been a lack of research conducted on this topic in the field of vocational education. Only two studies have been published in the past five years (Alshurideh et al., 2022; Wen et al., 2020). There is a noticeable gap in the existing research that has focused on measuring entrepreneurial behaviour within the realm of vocational education.

There is a limited amount of research available on the entrepreneurial behaviour of vocational college students due to a lack of reliable assessment tools. In the realm of Chinese vocational colleges, entrepreneurial behaviour can be characterised by three dimensions: engaging in entrepreneurial activities, learning from setbacks, and displaying proactive behaviour. The ongoing research seeks to validate and evaluate the scale of entrepreneurial behaviour among students in vocational colleges in China. This study aims to make a valuable contribution to the development of a comprehensive scale for assessing entrepreneurial

behaviour among vocational college students in China. This is extremely important as it can address the current lack of a standardised method for assessing the entrepreneurial behaviour of students in vocational colleges in China. The findings suggest that this instrument is adequate and suitable for further research in the field of entrepreneurial education.

Furthermore, a pilot study is carried out in this research to guarantee that the survey gathers accurate data and that the items are easily understood, clear, and suitable for future larger-scale investigation (Fraser et al., 2018). EFA and Cronbach's alpha were used to assess the validity and reliability. According to Hair et al. (2019), it is recommended to have a minimum of 100 samples for conducting EFA when considering the sample size. In addition, Barlett, Kotrlik and Higgins (2001) proposed that in order to account for factors like time constraints and budget limitations, an extra 10 to 30 percent of the sample size is required. As a result, a total of 130 respondents were initially considered for this research. However, after the screening procedure, 12 respondents were excluded, leaving a final sample size of 118 for this pilot study. There is a scarcity of existing literature on pilot studies that specifically examine entrepreneurial behaviour. This research seeks to enhance our understanding of the assessment of the validity and reliability of the entrepreneurial behaviour scale by conducting a pilot study.

Literature Review

Higher Education in China

The strong connection between Chinese higher education and China's reform and opening-up policies has been evident since their inception in 1978 (Xiong, Yang, & Shen, 2022). Wu and Tian (2022) categorize Chinese higher education institutions into two main groups: ordinary higher education and higher vocational education. Traditional higher education institutions place a strong emphasis on fostering and improving their students' research abilities (Postiglione, 2020). Fu et al. (2022) emphasised the significant contribution of higher vocational education institutions to the higher education system. Higher vocational institutions place a strong emphasis on admitting students who possess highly practical skills that can effectively meet the demands of society (Li & Islam, 2021). However, according to Ling, Chung and Wang (2023), Chinese higher vocational education faces several challenges despite its rapid development and numerous strengths.

Entrepreneurial Education

Entrepreneurial education involves providing students with knowledge about entrepreneurial concepts, rather than offering direct guidance on business management (Secundo, Del Vecchio, & Mele, 2021). In their study, Solomon and Fernald (1991) discovered significant advancements in the field of entrepreneurial education, which have occurred over the past several decades. Entrepreneurial education is a highly practical field that is deeply rooted in the real world of business and closely tied to the business environment (Bayar et al., 2022). In the realm of Chinese higher education, entrepreneurial education plays a vital role in moulding students' entrepreneurship by enhancing their skills and knowledge in this field. This, in turn, encourages them to actively participate in entrepreneurial endeavours (Gao, Yang, & Ye, 2022). In a recent study conducted by Wu and Tian (2022), it was found that placing a strong emphasis on entrepreneurship in vocational colleges has significant advantages in terms of improving employment standards and strengthening the overall economy.

Entrepreneurial Behavior

Exploring entrepreneurial behaviour is a topic that has been extensively studied in different research fields, including psychology and economics (Adeel et al., 2023). According to De Bernardi and Pedrini (2020), the motivation for entrepreneurial behaviour is largely influenced by the emotions and importance that entrepreneurs attach to certain activities in their surroundings. In a recent study conducted by Schmidt et al. (2022), it was discovered that a multitude of factors have a substantial impact on entrepreneurial behaviour. These factors include family background, genetics, professional expertise, and the economic environment. Studying the impact factors on entrepreneurial behaviour helps policymakers identify important elements for a better national entrepreneurship strategy and also supports the economic growth of the country (Bayar et al., 2022). However, when it comes to colleges, there have been numerous studies focused on entrepreneurial projects and models. However, there is a noticeable gap in research regarding the factors that influence entrepreneurial behaviour (Yang, 2022).

Entrepreneurial Behaviour in Higher Education

Regarding college students, they consistently exhibit purposeful and intentional entrepreneurial behaviour, albeit with slight variations compared to other entrepreneurs (Lihua, 2022). It is crucial for higher education institutions to prioritise entrepreneurial behaviour, as it has the potential to drive economic development, create jobs, and boost incomes (Hammond, 2019). An in-depth understanding of the factors that influence college students' entrepreneurial behaviour is essential in order to improve the effectiveness of educational and entrepreneurial programmes (Cui, 2021). According to Yang (2022), college students face various situational factors in entrepreneurship that are influenced by society, government, and colleges. This research offers valuable guidance for implementing entrepreneurial activities within higher education institutions. Chinese colleges, including vocational colleges, have a limited emphasis on studying the factors that influence entrepreneurial behaviour (Cai et al., 2022; Li & Jiao, 2021).

Methodology

Respondents

The present research validates the use of a pilot study to assess the entrepreneurial behaviour scale in higher vocational education. Data was collected in the Shandong province of China from 118 respondents using an online survey tool called Questionnaire Star. The tool offers a range of online questionnaire services and has a strong reputation in China (Gao & Qin, 2022). The data was selected using a random sampling method. This study includes a sample of vocational college students who have received entrepreneurial education. The findings derived from the gathered demographic information are succinctly presented in Table 1. The pilot sample revealed that 44.9% of participants were male (53), while the remaining 55.1% were female (65). The majority of respondents chose to major in economics and management (68, accounting for 57.6%), while a significant portion of participants were science and technology majors (35, comprising 29.7%).

The majority of respondents had limited or no prior business experience. In terms of experience, 13 respondents had a moderate level of experience, while 3 respondents had a

more extensive level of experience. Regarding educational levels, the data about the progression of respondents' grades showed that respondents were currently at different stages of their academic pursuits. This is in line with the fundamental criteria for inclusion in this study. A total of 28 freshmen, 48 sophomores, and 14 juniors participated in the study. The freshmen accounted for 23.7% of the total, while the sophomores represented 40.7% and the juniors comprised 11.9% of the participants. In addition, a number of recently graduated students (28, accounting for 23.7%) were also included in this study, as they may pursue entrepreneurial endeavours after completing their academic journey. In terms of age, the majority of respondents fall within the 18- to 20-year-old range, making up 61% of the total.

Table 1

Demographic Information for the Profile Data

Demographic variables		Frequency	Percent
Gender	Male	53	44.9
	Female	65	55.1
Major	Science & Technology	35	29.7
	Economic & management	68	57.6
	Culture & History	5	4.2
	Arts	5	4.2
	Others	5	4.2
Previous Business Experience	No experience	46	39.0
	Little experience	56	47.5
	Moderate experience	13	11.0
	Extensive experience	3	2.5
Grade Level	Freshman	28	23.7
	Sophomore	48	40.7
	Junior	14	11.9
	Graduated	28	23.7
Age	18 to 20 years old	72	61.0
	21 to 22 years old	25	21.2
	More than 22 years old	21	17.8

Instrument

This study examines the dimensions of the entrepreneurial behaviour scale, which include entrepreneurial activities, overcoming failure, and proactive behaviour. This scale was derived from earlier instruments created by Escrig-Tena et al. (2022), Osofsky (2019), and Shirokova, Osiyevskyy and Bogatyreva (2016). Prior to conducting the current study, the researcher successfully completed the content validation stage by employing the content validity index (CVI) for the entrepreneurial behaviour scale. Five experts from three vocational colleges in Shandong province of China were selected to evaluate the instrument, offer feedback, and confirm the appropriateness of items for assessing entrepreneurial behaviour. After this phase, the researcher made adjustments to the items based on the feedback provided by the expert panel. The measurement of entrepreneurial activities consisted of 9 items, while each of the other two dimensions had 7 items, respectively. The study employed a 7-point Likert scale, with responses ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). For more in-depth information about this instrument (refer to Appendix 1).

Data Analysis

The present research utilised SPSS version 26 for construct validation through a pilot study. According to Ličen et al. (2023), construct validity is crucial in determining how accurately a scale measures the intended constructs and captures the necessary information for evaluation. Statistical methods such as EFA and Cronbach's alpha were used to analyse the data. An exploratory factor analysis (EFA) was used to determine the suitability and accuracy of the items used to assess the concepts within the research setting. In addition, it is important to assess the data using the Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test of Sphericity prior to analysing the results of the EFA. The suitability for conducting EFA was determined by the statistical significance of Bartlett's test (i.e., a p-value below 0.05) and a KMO value exceeding 0.6 (Huck, 2012; Pallant, 2007; Tabachnick & Fidell, 2013).

The factor loadings are the key measure of EFA. In their study, Hair et al. (2010) found that when factor loadings exceed the threshold of 0.5, it suggests that the item accurately represents the construct or dimension being measured. Internal consistency is a measure of how well the items in a study align with the intended construct (Sekaran, 2003). The values of Cronbach's alpha, which range from 0 to 1, indicate higher levels of reliability as they approach 1 (Fisher, 2010). Kline (2011) proposed that in order to ensure the reliability of the scales, it is recommended to have a Cronbach's coefficient value of at least 0.7. Corrected Item-Total Correlation (CITC) and Cronbach's Alpha if Item Deleted (CAID) were also utilised to assess the suitability of the items. According to De Vaus (2013), items with a CITC value below 0.4 should be excluded. In relation to CAID, the value of each item was found to be lower than the overall value, indicating a strong internal consistency among the items that correspond to each of them (Garson, 2013).

Results

Exploratory Factor Analysis Results

According to Table 2, the KMO measure of sample adequacy yielded a value of 0.911, which is higher than the recommended cut-off value of 0.60. The Bartlett's test revealed that the instrument used was highly suitable for the study. This result suggests significant relationships among the variables examined in the sample. In addition, the instrument's significance level below 0.001 makes it a strong contender for dimensional analysis, given its consistently low significance values. Therefore, the data collected was suitable for additional factor analysis.

Table 2

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.911
Bartlett's Test of Sphericity	Approx. Chi-Square	1576.874
	df	253
	Sig.	< 0.001

According to Table 3, the factor solution in the EFA analysis successfully captured all 23 items related to entrepreneurial behaviour. These items should be included in the analysis because their communalities exceeded the cut-off value of 0.3, as recommended

by [Tabachnick and Fidell \(2013\)](#). Furthermore, the EFA process revealed the discovery of three dimensions within entrepreneurial behaviour, each with eigenvalues greater than 1. Together, these dimensions accounted for 22.570%, 20.049%, and 18.760% of the total variance. The cumulative variance of 61.379% satisfies the standard threshold of 60% ([Hair et al., 2019](#)). The measurement items for entrepreneurial activities were validated by component 1, with loadings ranging from 0.684 to 0.739 for items EB1 to EB9 (nine items). The dimension of overcoming failure was represented by component 2, which had 7 items (EB10 to EB16) with loadings between 0.709 to 0.775. Component 3 confirmed that proactive behaviour was characterised by items EB17 to EB23 (seven items) with loadings ranging from 0.644 to 0.798. All items were retained as they met the criteria outlined by [Hair et al. \(2010\)](#).

Table 3

EFA Results

Item	Component			Communalities
	1	2	3	
EB1	0.726			0.540
EB2	0.685			0.557
EB3	0.692			0.551
EB4	0.701			0.642
EB5	0.684			0.554
EB6	0.739			0.614
EB7	0.712			0.622
EB8	0.730			0.637
EB9	0.718			0.578
EB10		0.775		0.659
EB11		0.709		0.638
EB12		0.741		0.604
EB13		0.768		0.615
EB14		0.741		0.603
EB15		0.757		0.668
EB16		0.749		0.673
EB17			0.646	0.589
EB18			0.730	0.616
EB19			0.680	0.615
EB20			0.798	0.673
EB21			0.754	0.598
EB22			0.780	0.678
EB23			0.644	0.594
Eigenvalue	5.190	4.611	4.315	
% of Variance	22.570	20.049	18.760	
Cumulative %	22.570	42.619	61.379	

Cronbach Alpha Results

The values for Cronbach's alpha in [Table 4](#) indicate high reliability for the three dimensions: entrepreneurial activities (0.907), overcoming failure (0.902), and proactive behaviour (0.894). The results showed that all three dimensions demonstrated a high level of internal consistency, exceeding the acceptable threshold of 0.7. In addition, the CITC values for all items were above 0.6, meeting the required threshold of 0.4. Based on CAID's findings, it was observed that the values of individual items consistently remained lower than the overall value. This indicates a strong internal consistency among the items that correspond to each specific item.

Table 4*Reliability Results*

Item	Mean	Std. Deviation	CITC	CAID	Cronbach's Alpha	N of items
Entrepreneurial Activities						
EB1	4.36	1.702	0.624	0.900	0.907	9
EB2	4.56	1.593	0.670	0.897		
EB3	4.35	1.555	0.657	0.898		
EB4	4.23	1.630	0.724	0.893		
EB5	4.01	1.677	0.661	0.898		
EB6	3.94	1.726	0.680	0.896		
EB7	4.14	1.696	0.714	0.894		
EB8	3.57	1.727	0.730	0.893		
EB9	4.16	1.773	0.683	0.896		
Overcoming Failure						
EB10	3.96	1.676	0.730	0.885	0.902	7
EB11	4.13	1.482	0.722	0.887		
EB12	4.03	1.666	0.684	0.890		
EB13	3.92	1.680	0.684	0.891		
EB14	4.24	1.600	0.681	0.891		
EB15	3.86	1.759	0.737	0.884		
EB16	3.70	1.716	0.741	0.884		
Proactive Behavior						
EB17	4.24	1.523	0.662	0.882	0.894	7
EB18	4.38	1.496	0.690	0.879		
EB19	4.19	1.554	0.694	0.878		
EB20	4.15	1.550	0.717	0.875		
EB21	4.17	1.543	0.657	0.882		
EB22	4.05	1.611	0.751	0.871		
EB23	4.10	1.661	0.680	0.880		

Discussion

This study aimed to evaluate the accuracy and consistency of the entrepreneurial behaviour scale by conducting a pilot study with vocational college students in China. An EFA was used to validate the items within each construct, and the internal consistency was assessed using Cronbach's alpha. The findings clearly establish the scale's validity for research in vocational education. All the items in the scale showed satisfactory factor loading within their respective constructs. In terms of the factor structure, the EFA results revealed three factors (entrepreneurial activities, overcoming failure, and proactive behaviour) that corresponded with the initial study on entrepreneurial behaviour. In addition, the Cronbach's alpha values for the three subscales and the overall scale were above 0.80, which indicates a high level of reliability as it surpasses the threshold of 0.7.

Evaluating student performance is crucial in vocational education, especially when it comes to measuring their achievements. This scale has been validated to help vocational college students confidently evaluate their entrepreneurial behaviour. Using this tool, individuals can pinpoint areas that need improvement and take steps to make positive changes. In addition, the scale helps instructors identify areas where students may need improvement and assess their comprehension of entrepreneurship. For those interested in this field, it would be beneficial to thoroughly review the entire document, as it provides valuable guidance on approaching quality improvement. This approach offers vocational

college students' valuable practical insights into participating in entrepreneurship, promoting a more inclusive approach to evaluating entrepreneurial behaviour. In addition, it has the potential to reduce the current dependence solely on expert perspectives.

Regarding the role of the three dimensions that have been identified. The important contributions of entrepreneurial activities have played a vital role in the economic transformation and upgrading of China (Yin et al., 2019). Engaging in entrepreneurial activities in the context of vocational education can provide students with valuable experience and improve their overall abilities. In a recent study by Gao et al. (2022), it was discovered that the inclusion of entrepreneurial education can greatly increase students' engagement in entrepreneurial endeavours. Embracing resilience and taking initiative, which were also seen as crucial aspects of entrepreneurial behaviour, encompassed a variety of actions that entrepreneurs could exhibit when recognising opportunities, developing ideas, and obtaining resources to seize those opportunities (Edú Valsania, Moriano, & Molero, 2016; Escrig-Tena et al., 2022).

This research has successfully validated the research instrument for evaluating students' entrepreneurial behaviour in vocational education through a pilot study. Fraser et al. (2018) proposed that publishing more pilot studies could promote the sharing of knowledge and improve subject recruitment and intervention delivery. The items of this scale are adequate and appropriate for further investigation on a broader scale. The results suggest that students who demonstrate a greater inclination towards entrepreneurship are more likely to start their own businesses. The findings have important implications for higher education institutions, curriculum developers, policymakers, and other researchers. They provide valuable insights into identifying the entrepreneurial behaviour needed to address the issue of unemployment among vocational college graduates. In addition, the scale used in this study has been validated and can be used as a tool to measure various factors that may influence entrepreneurial behaviour.

This study has some limitations regarding the sample size and the distribution of questionnaires. One limitation to consider is that the data is collected from a single province in China, which may impact its applicability to other regions. Further research efforts could expand the scope by studying students from various countries and regions. In addition, the inclusion of qualitative research methods could enhance the findings. In addition, this study focused exclusively on students who had received entrepreneurial education, while disregarding other students. Lastly, because this study is a pilot, the research relies on a relatively small sample size. Future studies should aim to include a larger and more diverse sample to conduct a thorough analysis.

Conclusion

This study aimed to validate and assess the entrepreneurial behaviour scale by conducting a pilot study with vocational college students in Shandong province of China. The scale was derived and adjusted from prior research on entrepreneurial behaviour, and its validity and reliability were established through EFA and Cronbach's alpha values. This validated scale for measuring entrepreneurial behaviour has practical value for application among vocational college students in China. It fills a gap in the higher vocational education context, where there is currently no specific scale for measuring entrepreneurial behaviour. In addition, the validation of this scale contributes to the advancement of knowledge by enhancing the current body of literature, confirming its reliability and validity in measuring entrepreneurial behaviour.

in higher vocational education. It is important to recognise the importance of modifying existing instruments to suit various applications. As a result, this pilot study is anticipated to encourage additional efforts, promoting the wider adoption of this questionnaire in different settings or the creation of new tools designed specifically for evaluating entrepreneurial behaviour in vocational education or higher education.

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Data Availability Statement

The corresponding author can furnish the supporting data for this study if needed.

Competing Interests

The authors declare that they do not have any competing interests.

Authors' Contributions

Each author played an equal role in conceiving and designing this study.

Contribution/Originality

This research has confirmed the practical usefulness of a scale for measuring entrepreneurial behaviour among vocational college students in China. It addresses the lack of a specific scale for measuring entrepreneurial behaviour in the higher vocational education context.

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Appendix 1

Research Instrument of Entrepreneurial Behavior

Code	Item
Dimension: Entrepreneurial Activities	
EB1	I know how to discuss product or business idea with potential customers, and I have tried in my entrepreneurial projects
EB2	I know how to collect information about markets or competitors, and I have attempted in my entrepreneurial projects
EB3	I can write a good business plan
EB4	I have started product/service development in my entrepreneurial programs
EB5	I have started marketing or promotion efforts in my entrepreneurial programs
EB6	I have purchased material, equipment, or machinery for my entrepreneurial programs
EB7	I have attempted to obtain financial support from others
EB8	I am able to register my company
EB9	I will try to sell products or services
Dimension: Overcoming Failure	
EB10	I will look for new investors in the event of a setback
EB11	I will make adjustments to the plan in the event of failure
EB12	I won't give up in the face of setbacks
EB13	I will explore other opportunities if I encounter failure
EB14	I will devise fresh approaches to tackle challenges in case of failure
EB15	I will seek advice from others when encountering failure
EB16	I will devise solutions to overcome challenges when I encounter failure
Dimension: Proactive Behavior	
EB17	I actively tackle problems
EB18	Whenever something goes wrong, I immediately search for a solution
EB19	Whenever there is a chance to get actively involved, I take it
EB20	I proactively take the lead without hesitation, even others may not
EB21	I seize opportunities promptly to achieve my objectives
EB22	I usually do more than I am asked to do
EB23	I am good at in generating ideas, especially when it comes to creativity

EB: Entrepreneurial Behavior