Pathways in Digital Entrepreneurship Education: from Digital Readiness to Digital Adoption

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Abstract. The introduction of "Emergency Distance Education" and Chat GPT has accelerated the pace of digital entrepreneurship education. From the expected value theory, the driving path of digital entrepreneurship education is graphically explained from the motivation of digital Readiness to the value of digital application. Based on this theoretical model, the study distributed self-assessment questionnaires to 329 entrepreneurship teachers at a Chinese university, and applied structural equation modelling (SEM), mediation effect test and other methods for statistical analysis. The results of the study showed that digital cognition was significantly and positively correlated with digital teaching implementation (β=0.935,$p<0.01$), digital cognition was significantly and positively correlated with digital academic evaluation (β=1.161,$p<0.05$), digital will was significantly and positively correlated with digital teaching implementation (β=1. 666,$p<0.01$), and digital instructional design was significantly and positively correlated with digital collaborative teaching (β=0.456). and digital instructional implementation was significantly and positively correlated with digital collaborative education (β=0.489,$p<0.01$). In addition, digital instructional design, digital instructional implementation, and digital academic assessment fully mediated the driving path of digital entrepreneurship education. Therefore, educational institutions should provide entrepreneurship teachers with more practical opportunities for digital applications in the future, strengthen the digital Readiness of intervention entrepreneurship teachers, and improve the digital competence of entrepreneurship teachers.

Keywords: digital entrepreneurship education; entrepreneurship teachers; digital Readiness; digital applications; driving pathways

1 Introduction

Teaching entrepreneurship effectively, motivating students to become entrepreneurs, and helping them develop entrepreneurial skills and competencies have become major concerns in the field of innovation and entrepreneurship education.[1] Entrepreneurship is widely advocated as a driver of innovation and economic growth. Digital entrepreneurship is emerging as a response to current technological and digital challenges.[2] The main themes of digital entrepreneurship are creativity and innovation, proactivity, self-efficacy and resilience, strategic planning and evaluation, problem-solving, decision-making, and transformational leadership.[3] Existing research shows that digital entrepreneurship education significantly impacts students' innovation intentions.[4] There is a positive relationship between

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entrepreneurship education and digital government building.[5] When analysing entrepreneurial intentions, entrepreneurship education and AI development should also be considered.[6] Additionally, digital readiness and digital application are digital literacy skills necessary for teachers.[7] Teachers require digital readiness to use digital technology effectively and educational organisations with higher levels of digital readiness will determine student achievement.[8] Digital entrepreneurship promotes the development of a digital economy, eases employment pressure, and diversified teaching activities using digital technology directly affect students' entrepreneurial willingness. Based on the above, this study establishes an evaluation model of digital entrepreneurship education based on the expected value theory, drawing on the research results of Xin, B. et al.[9] Structural equation modelling (SEM), mediation effect testing, and other methods are applied to explore how digital contributes to entrepreneurship education.

2 Research models and hypothesis

2.1 Research models

Expected Value Theory is a highly influential theory in the field of motivational psychology. This theory proposes that the type of activity or purpose with which an individual engages is connected to their beliefs, values, and emotions, which in turn predict success in education and employment.[10]In terms of motivation to pursue success (Mas) and motivation to avoid failure (Maf) with regards to digital entrepreneurship education, it is necessary for teachers to be digitally aware of critical readiness and to improve students' communicative competence.[11] Additionally, they should regulate students' perceived value and trust, increase satisfaction, address emotional interactions in teaching, and use digital technologies to achieve collaborative education. [12][13] Based on this, the theoretical study model is presented, as shown in **Figure 1**.

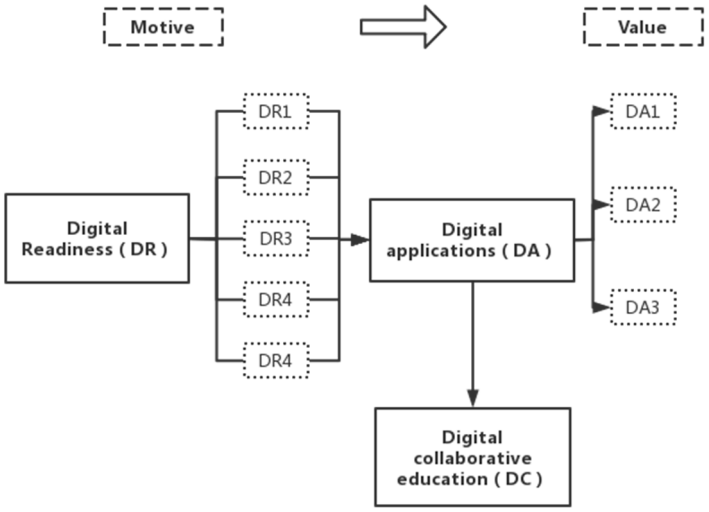

Fig. 1 Proposed research model based on expected value theory

2.2 Hypothesis

It has become an industry consensus that renewing and innovating the education system through data resources is essential for teachers to be digitally competent enough to meet their educational needs and achieve high-quality educational goals [14] due to the significant impact of COVID-19 on the education sector. Expected value theory suggests that relevant incentives and the need to develop the digital economy strengthen the motivation to carry out high-quality digital entrepreneurship education for success and weaken the motivation to avoid failure. Based on this, the following hypotheses are proposed:

Hypothesis 1: There is a significant positive relationship between digital readiness (DR) and digital adoption (DC).

Teachers are gradually accelerating the adoption rate of collaborative learning methods by focusing on developing team skills and utilizing the increasing popularity of digital media. By balancing the learning environment and methods, teachers are guiding students towards sustainable learning and interactions, which contributes to their overall development. [15] Currently, students are under pressure to develop their digital entrepreneurial skills and innovative mindset. Additionally, it is important for teachers to actively engage in moral and mental health education through digital media to reduce students' tendency to avoid failure. Therefore, the following hypotheses are proposed:

Hypothesis 2 states that there is a positive and significant correlation between digital application (DA) and digital collaborative cultivation (DC).

It is worth noting that nurturing has limitations in enhancing teachers' digital competence, which is evident from the challenges faced during the "emergency distance learning" period. Therefore, it is crucial for teachers to be resilient in learning to enhance their digital competence. In conclusion, the study finds that digital adoption plays a mediating role in the relationship between digital readiness and digital co-cultivation (DR→DA→DC).

2.3 Data sources

The study employed open coding to gather data through a questionnaire. The questionnaire included a description, basic details concerning the respondents, their knowledge of digital entrepreneurship education, digital applications, and digital collaborative parenting. The measurement scale was based on the standards proposed by the Chinese Ministry of Education concerning teachers' digital literacy, as well as past research findings on digital entrepreneurship education. To ensure the authenticity and validity of the study results, a self-test questionnaire was compiled, using a 7-point Likert scale. The questionnaire received responses from 329 teachers who participated in digital entrepreneurship training. **Table 1** illustrates the composition of the measurement scale and the descriptive statistics results.

Table 1. Measurement scale composition and descriptive statistics results

The first dimension	The second dimension	Three dimensions	Mean	SD
DR Digital Readiness	DR1.Digital cognition	Dr1. understand the value of digital technology in economic and social and educational development	4.483	1.664

		Dr2. Recognize the opportunities and challenges for pedagogy posed by the development of digital technology	4.641	1.765
	DR2. Willingness to digitize	Dr3. Willingness to actively learn and use digital resources	4.675	1.801
		Dr4. Motivation to carry out educational digital practices, explorations and innovations	4.547	1.765
	DR3. Digital Will	Dr5. Overcoming Difficulties and Challenges Encountered in the Practice of Digital in Education	4.596	1.829
	DR4. Satisfaction with digital applications	Dr6. Increase satisfaction with online teaching and learning	4.416	1.720
		Dr7. actively propose measures to improve online teaching and learning	4.319	1.710
	DR5. Data Thinking	Dr8. Prioritize data for decision-making	4.483	1.664
		Dr9. Enhancement of data competence	4.641	1.765
DA Digital Applications	DA1. Digital Instructional Design	Da1. Conducting a learning situation analysis	4.693	1.835
		Da2. acquire, manage and produce digital educational resources	4.529	1.693
		Da3. Designing digital teaching and learning activities	4.398	1.686
		Da4. Create a blended learning environment	4.432	1.557
	DA2. Digital Teaching and Learning Implementation	Da5. Use of digital technology resources to support the organization and management of teaching and learning activities	4.416	1.746
		Da6. use digital resources to optimize the student teaching process	4.495	1.738
		Da7. Individualized instruction using digital resources	4.565	1.701
	DA3. Digital Academic Evaluation	Da8. Selection and utilization of data collection tools	4.693	1.835
		Da9. apply data analysis models for academic data analysis	4.529	1.693
		Da10. visualize and interpret academic data	4.584	1.689
DC Digital Collaborative Education	DC. Digital Collaborative Education	Dc1... Digital Literacy Development for Students	4.611	1.767
		Dc2. using digital technology resources for moral education	4.766	1.733
		Dc3. using digital technology resources for mental health education	4.581	1.821

The questionnaire demonstrated good reliability (Cronbach's alpha coefficient value for the model was 0.975, which is greater than 0.9) and the square root of the average variance extracted (AVE) of the factors exceeded the Pearson correlation coefficient values of the other factors. The questionnaire also exhibited good discriminant validity , as illustrated in **Table 2**.

Table 2. Distinguishing validity: Pearson's correlation and AVE root value

	DR1	DR2	DR3	DR4	DR5	DA1	DA2	DA3	DC
DR1	0.853								
DR2	0.694	0.812							
DR3	0.612	0.753	0.709						
DR4	0.770	0.637	0.668	0.875					
DR5	0.660	0.722	0.691	0.723	0.908				
DA1	0.746	0.758	0.742	0.726	0.751	0.820			
DA2	0.695	0.702	0.636	0.668	0.664	0.839	0.834		
DA3	0.725	0.714	0.682	0.684	0.701	0.837	0.751	0.804	
DC	0.725	0.738	0.682	0.706	0.730	0.912	0.877	0.810	0.829

Note: The diagonal numbers are the root values for this factor AVE

3 Findings

The results of the structural equation modelling (SEM) analysis confirmed hypothesis 2 and mostly rejected hypothesis 1. Table 3 displays the regression coefficients of the path nodes, which should be examined alongside the P-values with standardised path coefficients to ascertain whether there is a direct linear impact of the path (X→Y). Simultaneously, the significance test ($P<0.05$) was conducted to determine whether there existed a significant relationship between the model variables. Additionally, if there is statistical significance, it implies that there is a significant relationship between the variables. This can be analysed in-depth by examining the standardised path coefficients on the level of impactful efficiency.

Table 3. Table of regression coefficients of the model

X → Y	NS	β	SE	Z	P
DR1→DA1	7.132	7.266	17.440	0.409	0.683
DR2→DA1	-0.199	-0.199	0.195	-1.018	0.308
DR3→DA1	-8.680	-8.450	26.488	-0.328	0.743
DR4→DA1	-0.193	-0.207	1.464	-0.132	0.895
DR5→DA1	2.564	2.854	7.406	0.346	0.729
DR1→DA2	0.920	0.935	0.059	15.498	0.000***
DR1→DA3	1.082	1.161	0.431	2.508	0.012**
DR2→DA3	-0.278	-0.293	0.226	-1.231	0.218
DR3→DA3	0.501	0.514	0.347	1.444	0.149
DR4→DA3	-0.425	-0.481	0.154	-2.760	0.006***
DR5→DA3	-0.019	-0.022	0.127	-0.147	0.883
DR2→DA2	-0.074	-0.073	0.203	-0.366	0.714
DR3→DA2	1.752	1.666	0.364	4.810	0.000***
DR4→DA2	-0.333	-0.349	0.240	-1.384	0.166
DR5→DA2	-0.421	-0.458	0.224	-1.879	0.060*
DA1→DC	0.444	0.456	0.198	2.241	0.025**
DA2→DC	0.466	0.489	0.112	4.140	0.000***
DA3→DC	0.076	0.074	0.127	0.602	0.547

Note: ***, **, * represent 1%, 5%, and 10% significance levels, respectively.

As shown in **Table 3**, digital cognition was significantly positively correlated with digital teaching implementation ($\beta=0.935, p<0.01$), digital cognition was significantly positively

correlated with digital academic evaluation (β=1.161,p<0.05), digital application satisfaction was significantly negatively correlated with digital academic evaluation (β=-0.481,p<0.01), digital will was significantly positively correlated (β=1. 666,p<0.01), Data Thinking was significantly negatively correlated with Digital Teaching Implementation (β=-0.458,p<0.1), Digital Instructional Design was significantly positively correlated with Digital Collaborative Parenting (β=0.456,p<0.05), and Digital Teaching Implementation was significantly positively correlated with Digital Collaborative Parenting (β=0.489,p<0.01).

Table 4. Summary of Mediation Effects Test Results

Intermediary path	c Total effect	a*b mediating effect value	a*b (P-value)	a*b (95% BootCI)	c' Direct effect	Test Conclusion
DC→DA1→DR	1.392	0.7	0.000***	0.482 - 0.907	0.182	Fully intermediated
DC→DA2→DR	1.392	0.141	0.072*	0.002 - 0.311	0.182	Fully intermediated
DC→DA3→DR	1.392	0.369	0.000***	0.231 - 0.511	0.182	Fully intermediated

Note: ***, **, * represent 1%, 5%, and 10% significance levels, respectively.

Principal Component Analysis (PCA) was used to reduce the sample data and examine the effect of digital applications on the driving path of entrepreneurship education, as a mediating variable. **Table 4** displays that digital instructional design, digital instructional implementation, and digital academic assessment completely mediated the examined variables.

4 Conclusions

Developing digital cognition, digital will, and digital application is crucial for the advancement of digital entrepreneurship education. Teachers must improve their digital cognition through practice, and then implement digital collaborative education. This means carrying out various forms of moral and spiritual education activities through digital means. Using data thinking to carry out relevant teaching activities is also essential, and it is the future focus of digital entrepreneurship education to explore how teachers can use data thinking to enhance student satisfaction. Furthermore, teachers need to act with social responsibility within the confines of data thinking, by acknowledging the opportunities that digital technology brings to pedagogy, while continuously addressing the associated risks and challenges.

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