

Article

Evaluating the "Post-Course-Competition-Certificate" Collaborative Education Model in Digital-Age Accounting Education: An Empirical Study of Three Applied Universities in Yunnan

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Abstract: Big data and artificial intelligence are reshaping accounting and finance practice, altering both corporate financial management and the competencies expected of accounting roles. Applied universities offering accounting programs must therefore adapt their talent cultivation to the industry's digital transformation. This study evaluates the implementation effectiveness and determinants of the Post-Course-Competition-Certificate (PCCC) model, an approach increasingly adopted in Chinese applied higher education. Based on a survey of 345 valid responses from accounting students at three applied universities in Yunnan Province, we construct an analytical framework around the model's four components-job alignment, curriculum, skills competitions, and vocational certificates-and their integration. The analysis employs reliability testing, descriptive statistics, correlation analysis, multicollinearity diagnostics, multiple linear regression, and ANOVA. The results indicate that the survey instrument has acceptable reliability and that students generally hold a favorable view of the current PCCC model. Among the factors examined, the degree of integration across the four components is the strongest predictor of cultivation outcomes. Job-requirement alignment and curriculum design also exert significant positive effects, whereas the independent contributions of skills competitions and vocational certificates do not reach conventional significance levels. These findings suggest that the effectiveness of the PCCC model in applied university settings depends less on strengthening any single component in isolation than on forging coherent links among job demands, curriculum delivery, competitive practice, and credentialing-so that the model functions as an integrated, synergistic system rather than a collection of separate activities.

Keywords: digital transformation; applied universities; accounting program; Post-Course-Competition-Certificate (PCCC); talent cultivation model

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1. Introduction

The rapid evolution of digital technologies continues to reshape job tasks and competency boundaries within the accounting profession. As big-data analytics, artificial intelligence, cloud computing, and automation become embedded in financial workflows, routine information-processing and rule-based tasks are increasingly handled by technological tools. Accountants are therefore expected to deliver value through data interpretation, business analysis, professional judgement, decision-making and value creation. Such shifts in competency requirements have created pressing demands for curriculum reform in university-based accounting education.

Through employer interviews, Daff found that accounting graduates face rapidly evolving software and information-and-communications-technology requirements in the workplace [1]. While employers hold higher expectations for graduates' technical skills, solid foundational accounting knowledge remains irreplaceable. This suggests that

digital-intelligent accounting education is not merely a matter of adding several technology-oriented courses. Instead, it requires careful balancing of professional knowledge, digital skills and practical employability competencies. Based on an examination of course syllabi, descriptions, and learning objectives across 185 accounting programmes, Moore and Felo similarly observed that data-analytics content is gradually being integrated into accounting curricula [2]. For applied universities that prioritise occupational adaptability and practical competence, a key challenge for accounting and finance talent development lies in translating shifting job-competency demands into concrete training objectives, course content and practical assignments.

Within China's educational context, the Post-Course-Competition-Certificate (PCCC) integrated education framework offers a reform pathway to bridge talent cultivation and labour-market occupational needs. In 2021, the Ministry of Education of China called for integrated development of job-oriented training, coursework, skills competitions and vocational certificates [3]. Subsequently, the Opinions on Promoting High-Quality Development of Modern Vocational Education formally advocated refining the PCCC integrated education mechanism. The policy stresses curriculum development grounded in real-world production and job-post requirements, enhanced practical-competence training, and the incorporation of advanced standards embedded in vocational-skill certificates into institutional talent-development plans [4].

Zeng Tianshan proposed designing curricula around occupational skill standards, enhancing learners' competence through skills competitions, and strengthening integration between coursework and certification systems [5]. Wang Lixin and Li Yulong interpreted the PCCC model as embedding job-post requirements, competition standards and certification criteria into curriculum systems, with particular emphasis on systematic coordination among course objectives, content, teaching resources and implementation mechanisms [6]. Accordingly, the core of the PCCC model is not simply to offer separate job-practice modules, courses, competitions and certification programmes. Rather, it aims to build interconnected operational relationships among these educational components to foster students' occupational competencies.

Drawing on this conceptual foundation, existing scholarship has explored PCCC implementation from perspectives including curriculum design, skills competitions and teaching innovation. Ma Yuxia et al. argued that PCCC-oriented curricula should follow the logic of occupational-competency growth and adopt job-post and work-process orientation to restructure teaching content [7]. Focusing on national vocational-college skills competitions, Zeng Tianshan et al. discussed how competitions advance teaching and learning as part of integrated talent development [8]. Tai Kangfeng and Ren Jiangwei further analysed PCCC-driven teaching reform in terms of logical frameworks, overall design and practical strategies [9]. These studies lay a solid foundation for understanding the concept and implementation pathways of PCCC. Nevertheless, most existing work centres on higher-vocational colleges and relies largely on theoretical interpretation, curriculum design, and practical experience summaries. Few quantitative studies have examined how the individual PCCC components-and their degree of integration-relate to student outcomes, leaving considerable scope for further empirical investigation.

This research gap is especially pertinent to accounting and finance programmes at applied undergraduate universities. On one hand, digital-intelligent transformation demands that universities combine digital skills with accounting expertise, business understanding and comprehensive professional abilities. On the other hand, the practical value of the PCCC model does not stem from any single component in isolation. Its effectiveness hinges on whether job-post requirements are translated into curricula, whether coursework supports competition participation and certificate-related learning, and whether the competency standards embedded in competitions and certificates feed back into classroom instruction. In other words, research should assess not only how well each individual dimension (job-post orientation, coursework, competitions and certificates) is developed, but more importantly, whether effective coordination and integration are achieved across the four dimensions. This research concern aligns with

international accounting-education literature that advocates better alignment between university curricula and occupational-competency demands.

Against this backdrop, this paper collects survey data from accounting and finance undergraduates at three applied universities in Yunnan Province. Building an analytical framework centred on the four PCCC dimensions and their integration, the study takes talent-cultivation outcomes as the dependent variable and explores the relationships between training outcomes and both individual educational components and their level of integration. Specifically, this paper addresses two core research questions. First, what is the current implementation status of each PCCC component and their integration within accounting and finance programmes at applied universities? Second, when all educational components are considered jointly, which factors best explain variations in talent-cultivation outcomes? Based on student survey evidence, this paper aims to provide empirical support for shifting PCCC practice from discrete component construction toward systematic synergistic development for accounting and finance majors amid digital-intelligent transformation.

2. Literature Review

2.1. *Changing Competency Requirements for Accounting Professionals in the Digital Era*

The growing use of digital technologies is reshaping both the nature of accounting work and the competencies expected of accounting professionals. As big data, artificial intelligence, and automation become increasingly embedded in accounting and finance functions, many routine and rule-based information-processing tasks are now performed by digital systems. At the same time, accountants are taking on broader roles in data analysis, business support, and managerial decision-making. Richins et al. argue that big data is unlikely to simply replace accountants; rather, it changes how they create value and places greater emphasis on their ability to process, interpret, and analyze data [10]. Similarly, Moll and Yigitbasioglu show that internet-related technologies continue to reshape the organization of accounting work and the professional roles of accountants [11]. Digital transformation, therefore, involves more than the adoption of new tools; it is also redefining the competency profile of the accounting profession.

These changes have direct implications for accounting education. Based on interviews with employers, Daff finds that information and communication technology skills have become increasingly important for accounting graduates, while a solid grounding in accounting remains essential. Digital competencies should therefore be viewed as an extension of, rather than a substitute for, core accounting knowledge. Tsiligiris and Bowyer identify digital skills, business skills, soft skills, and ethical capabilities as key components of the competency profile required of future accountants, while also highlighting adaptability and continuous learning [12]. From this perspective, preparing accounting students for a digitalized profession requires more than adding courses in software applications, programming, or data analytics; what is needed is a more integrated approach that combines disciplinary knowledge with digital, business, and broader professional competencies.

A similar shift is observable in the Chinese literature. Tang et al. discuss the restructuring of accounting education in response to the widening gap between traditional talent supply and emerging professional demands in the digital-intelligence era [13]. Wang and Niu call for closer integration between accounting knowledge and emerging technologies and propose a curriculum framework for intelligent accounting education [14]. Zhang et al. further examine the types of professionals required in intelligent finance and the corresponding approaches to talent development, while Ma emphasizes the need to combine accounting logic with data analytics, technological application, and strategic thinking [15, 16]. Using survey data, Zhang, Jia, and Shi show that the demand for intelligent finance professionals is changing alongside the development of the digital economy, highlighting the need for universities to better align graduate competencies with evolving workplace requirements [17]. Taken together, these

studies indicate that the digital transformation of accounting education is not merely a technical challenge but also a curricular and pedagogical one. However, most of the Chinese literature remains at the level of conceptual discussion and policy advocacy, with limited empirical work examining how specific educational practices influence student outcomes.

For application-oriented universities, therefore, the challenge of digital transformation extends beyond updating course content. A more fundamental issue is how changing occupational requirements can be translated into curriculum design, practical training, and competency assessment. The integrated "post-course-competition-certificate" (PCCC) approach provides a useful framework for examining how these different elements of talent development can be connected within the educational process. Nevertheless, empirical evidence on the effectiveness of this approach in undergraduate accounting education-particularly in the context of applied universities-remains limited. This study aims to address this gap by examining the implementation of the PCCC model and its relationship with student learning outcomes.

2.2. The "Post-Course-Competition-Certificate" (PCCC) Model: Connotations and Foundational Logic

The PCCC model has emerged as an integrated educational framework grounded in China's vocational education reform practices. In 2021, the Ministry of Education issued a directive calling for the implementation of the National Vocational Education Conference spirit, which proposed exploring the integration of the four components. In the same year, the Opinions on Promoting High-Quality Development of Modern Vocational Education, jointly issued by the General Office of the Communist Party of China Central Committee and the General Office of the State Council, further called for "refining the PCCC integrated education mechanism" and explicitly required that curricula be developed in accordance with actual production and job-post requirements, and that the advanced standards embodied in vocational skill certificates be incorporated into talent development plans.

Scholars have gradually developed a relatively clear understanding of this framework. Zeng Tianshan proposed that curricula should be designed around occupational skill standards, that practical competence should be enhanced through skills competitions, and that the integration between curricula and industry-recognized certification standards should be strengthened. Wang Lixin and Li Yulong further observed that the PCCC model is not a simple combination of four elements, but rather an integration of "post," "competition," and "certificate" requirements into the curriculum, thereby aligning educational objectives, instructional content, and competency development.

From a functional perspective, the "post" component addresses the question of direction-that is, what occupational demands talent development should respond to; the "course" component assumes the primary instructional function, translating occupational competency requirements into curriculum content; the "competition" component reinforces knowledge application through comprehensive tasks and practical scenarios, while also promoting learning and teaching through competition participation; and the "certificate" component provides external benchmarks for instruction and assessment through occupational competency standards. Ma Yuxia et al. proposed that curricula should be organized around the logic of occupational competency development and restructured according to job-post and work-process orientations. Zeng Tianshan, Chen Bin, and Su Min, in their study of national vocational college skills competitions, also demonstrated that competition resources can be further transformed into resources for educational reform.

Thus, the PCCC model is not merely about adding job-practice modules, competitions, or certificates as separate activities. Rather, it seeks to establish connections among occupational demands, curriculum learning, practical training, and competency assessment around a shared set of educational objectives. For applied accounting and

finance programmes, this logic offers a pathway through which digital-intelligent competencies can be integrated throughout the entire talent development process.

2.3. The Integration Mechanism and Synergistic Logic of the PCCC Model

As research has progressed, the focus of discussion has gradually shifted from isolated component development to the articulation and coordination among the four elements. Wang Lixin and Li Yulong emphasized the integration of "post," "competition," and "certificate" requirements into the curriculum. Ma Yuxia et al. discussed curriculum restructuring from the perspective of job-post and work-process orientations. Tai Kangfeng and Ren Jiangwei further analyzed the overall design and implementation strategies for PCCC integration. In this context, "integration" does not refer to adding a new educational component beyond "post," "course," "competition," and "certificate"; rather, it reflects whether genuine articulation has been established among the four elements.

Such articulation is particularly important in the cultivation of digital-intelligent accounting talent. If the competency demands of enterprise job-posts-such as data analytics and intelligent tool application-are not promptly incorporated into the curriculum; if skills competitions remain limited to intensive training for a small number of students; and if certificate preparation remains separate from professional instruction; then even if resources are invested in each component separately, the talent development process may fail to operate as a coherent whole. Conversely, if job-post requirements are translated into course content, if competition tasks are transformed into instructional projects, and if certification standards inform curriculum assessment, then the four components are more likely to converge around shared competency objectives.

Tian Gaoliang et al., in their discussion of intelligent accounting talent development from the perspective of industry-education integration, similarly emphasized the importance of coordination among universities, industries, enterprises, and the various stages of the talent development process [18]. For the PCCC model, therefore, what warrants attention is not only how well each of the four components- "post," "course," "competition," and "certificate"-is developed individually, but also whether effective articulation has been established among them. This is the primary rationale for incorporating "integration" as a distinct analytical dimension in this study.

2.4. Literature Review Summary

Existing studies have examined the implications of digital-intelligent transformation for accounting education from multiple perspectives, including occupational change, curriculum reform, and competency restructuring, and have explored the connotations, curriculum design, competition integration, and course-certificate articulation of the PCCC model. However, as the representative literature reviewed in this paper indicates, most relevant studies remain grounded in vocational institutions, with relatively limited research on applied undergraduate accounting programmes. Moreover, the predominant methodological approaches have been model construction and practical experience summaries, with insufficient quantitative examination of the relationships among the individual components, their degree of integration, and talent cultivation outcomes.

To address these gaps, this study surveys accounting and finance students from three applied universities in Yunnan Province. Integrating "post," "course," "competition," "certificate," and their "integration" into a unified analytical framework, and taking talent cultivation outcomes as the dependent variable, this study examines the relationships between each educational component, their degree of coordination, and cultivation effectiveness. The findings are intended to provide empirical evidence for optimizing the PCCC collaborative education model in accounting and finance programmes at applied universities.

3. Methodology

3.1. Analytical Framework and Model Specification

Drawing on the preceding analysis, this study examines the implementation of the PCCC model across four dimensions: job-post requirement alignment, curriculum and digital-intelligent instruction, skills competition integration, and vocational certificate-course articulation. In addition, "integration" is treated as a distinct dimension reflecting the degree of synergy among the four components, with talent cultivation outcomes specified as the dependent variable. The analysis focuses on two interrelated objectives: first, to examine the relationships between each of the four PCCC dimensions and cultivation outcomes; and second, to assess how the inclusion of the integration dimension affects both the performance of the individual predictors and the overall explanatory power of the model.

Accordingly, two multiple linear regression models are specified:

$$Effect_i = \beta_0 + \beta_1 Post_i + \beta_2 Course_i + \beta_3 Competition_i + \beta_4 Certificate_i + \varepsilon_i \quad (1)$$

$$Effect_i = \beta_0 + \beta_1 Post_i + \beta_2 Course_i + \beta_3 Competition_i + \beta_4 Certificate_i + \beta_5 Intergration_i + \varepsilon_i \quad (2)$$

where Effect denotes talent cultivation outcomes; Post, Course, Competition, and Certificate represent the four PCCC dimensions respectively; Intergration denotes the degree of synergy among the four components; β_0 is the constant term; $\beta_1 - \beta_5$ are the respective regression coefficients; and ε is the random error term.

Model (1) first examines the relationships between the four PCCC dimensions and cultivation outcomes. Model (2) then introduces the integration variable to assess its independent association with cultivation outcomes after controlling for the other dimensions, and to compare the change in model explanatory power.

3.2. Questionnaire Design and Variable Measurement

The questionnaire was developed in accordance with the conceptual framework of the PCCC integrated education model, taking into account the competency requirements of accounting roles in the context of digital-intelligent transformation and the characteristics of talent development in applied university accounting programmes. The questionnaire comprises two main sections: student demographic information and core variable measurement. Demographic information includes grade level, major, prior exposure to digital-intelligent accounting courses, practical work experience, competition participation history, vocational certificate acquisition status, and post-graduation career intentions. Core variables encompass six dimensions-"Post," "Course," "Competition," "Certificate," "Integration," and "Outcomes"-with a total of 31 measurement items.

All core variables were measured using a five-point Likert scale, with responses ranging from 1 ("strongly disagree") to 5 ("strongly agree").

Specifically, the "Post" dimension captures the alignment between programme-level talent development and accounting job requirements as well as industry trends. The "Course" dimension examines the incorporation of digital-intelligent content, curricular articulation, the balance between theoretical and practical instruction, and the timeliness of curriculum updates. The "Competition" dimension focuses on the connection between professional skills competitions and course instruction, along with the support students receive for competition participation. The "Certificate" dimension reflects the degree of articulation between vocational certifications and course instruction, including examination support and credential recognition mechanisms. The "Integration" dimension assesses the overall synergy among the post, course, competition, and certificate components. The "Outcomes" dimension evaluates cultivation results across multiple aspects, including professional knowledge acquisition, practical problem-solving ability, proficiency with digital-intelligent tools, communication and collaboration skills, and workplace adaptability.

Each variable was measured as the arithmetic mean of its constituent item scores. Detailed variable definitions are presented in Table 1.

Table 1. Definition of Key Variables

Variable	Definition	Number of Items	Measurement
Post	Job-post requirement alignment	5	Mean of constituent items
Course	Curriculum and digital-intelligent instruction	6	Mean of constituent items
Competition	Skills competition integration	5	Mean of constituent items
Certificate	Vocational certificate-course articulation	5	Mean of constituent items
Integration	Degree of synergy among the four PCCC components	5	Mean of constituent items
Outcomes	Talent cultivation effectiveness	5	Mean of constituent items

3.3. Sample and Data Collection

The survey targeted accounting and finance students enrolled at three applied universities in Yunnan Province: Baoshan University, Yunnan Technology and Business University, and Lijiang Culture and Tourism College. Separate online questionnaire links were created for each institution, and data were collected anonymously through web-based distribution.

After data cleaning, a total of 345 valid responses were retained. Of these, 127 (36.81%) were from Baoshan University, 103 (29.86%) from Yunnan Technology and Business University, and 115 (33.33%) from Lijiang Culture and Tourism College. The relatively balanced distribution across the three institutions provides a sound empirical basis for subsequent statistical analysis and cross-institutional comparisons.

Data were processed and analyzed using Stata. The analytical procedure comprised four steps: first, internal consistency reliability was assessed for each scale; second, descriptive statistics were computed to profile the overall evaluation levels across dimensions; third, bivariate correlations and multicollinearity diagnostics were examined; fourth, multiple linear regression was employed to estimate the relationships between each educational dimension and talent cultivation outcomes. In addition, one-way ANOVA was conducted to test for cross-institutional differences in student evaluations across all dimensions.

4. Empirical Analysis and Results

4.1. Descriptive Statistics

Descriptive statistics for the six core variables are presented in Table 2.

Table 2. Descriptive Statistics of Key Dimensions

Variable	Mean	SD	Rank
Certificate	4.312	0.701	1
Integration	4.266	0.710	2
Course	4.242	0.714	3
Post	4.197	0.762	4
Outcomes	4.186	0.754	5
Competition	4.158	0.775	6

The "Certificate" dimension has the highest mean score (4.312), suggesting that students hold relatively favourable views of the relationship between vocational certifications and academic learning. "Integration" ranks second with a mean of 4.266, indicating that students generally perceive a moderate degree of articulation among the different components of their programme. The "Course" dimension has a mean of 4.242,

reflecting relatively positive student evaluations of curriculum development and digital-intelligent teaching reforms.

The "Post" dimension has a mean of 4.197, slightly below the course dimension, suggesting that while current instruction has incorporated job-post requirements to a notable extent, there remains scope for further translating these requirements into concrete course content, teaching tasks, and practical activities. The "Outcomes" dimension has a mean of 4.186, indicating that students generally acknowledge the effectiveness of current talent development practices.

Notably, the "Competition" dimension has the lowest mean (4.158) and the largest standard deviation (0.775) among the six dimensions, indicating relatively greater variability in student evaluations of competition integration. As the regression results discussed below further suggest, the competition dimension warrants particular attention as a relatively underdeveloped component of the current PCCC talent cultivation model.

Overall, the mean scores across all six dimensions exceed 4.00, suggesting that the three universities have established a foundation for PCCC-based talent cultivation in their accounting programmes. However, the development of individual components is not entirely synchronous, and the educational function of the competition component, in particular, has yet to be fully realised.

4.2. Reliability Analysis

To assess the internal consistency of the survey instrument, Cronbach's alpha coefficients were calculated for each dimension. Generally, an alpha coefficient of 0.70 or above indicates acceptable internal consistency, while values above 0.80 indicate good reliability (As shown in Table 3).

Table 3. Reliability Analysis of Key Variables

Variable	Number of Items	Cronbach's α
Post	5	0.9516
Course	6	0.9537
Competition	5	0.9441
Certificate	5	0.9454
Integration	5	0.9561
Outcomes	5	0.9595

Note: All Cronbach's α values exceed the conventional threshold of 0.70, indicating satisfactory internal consistency.

The results show that Cronbach's alpha coefficients for all variables range from 0.9441 to 0.9595, well above the conventional threshold of 0.70. The "Outcomes" dimension has the highest coefficient (0.9595), while "Competition" has the lowest (0.9441). All six dimensions demonstrate high internal consistency, suggesting that the scale items reliably measure their respective latent constructs. The questionnaire therefore exhibits satisfactory measurement reliability, providing a sound empirical basis for subsequent correlation and regression analyses.

It should be noted, however, that the alpha coefficients all exceed 0.94, which, while indicating strong internal consistency, also suggests that some items may share considerable variance. This underscores the need to further examine the relationships among variables through correlation analysis and multicollinearity diagnostics in the subsequent steps.

4.3. Correlation Analysis

To examine the bivariate relationships among the key variables, Pearson correlation coefficients were computed. The results are presented in Table 4.

Table 4. Pearson Correlation Matrix

Variable	Post	Course	Competition	Certificate	Integration	Outcomes
Post	1					
Course	0.8324***	1				
Competition	0.8157***	0.8479***	1			
Certificate	0.7702***	0.8327***	0.8482***	1		
Integration	0.7798***	0.8611***	0.8768***	0.9083***	1	
Outcomes	0.7932***	0.8291***	0.8069***	0.8285***	0.8700***	1

Note: N = 345. ***p < 0.001.

All core variables are significantly and positively correlated with one another, with all correlation coefficients significant at the 0.001 level.

Specifically, the correlation coefficients between the four PCCC dimensions and "Outcomes" are 0.7932 (Post), 0.8291 (Course), 0.8069 (Competition), and 0.8285 (Certificate), indicating that each dimension has a strong positive relationship with talent cultivation outcomes. Among these, "Course" exhibits the highest correlation with "Outcomes," suggesting that curriculum and instruction remain a fundamental pillar of cultivation effectiveness.

Notably, "Integration" has the strongest correlation with "Outcomes" among all predictor variables ($r=0.8700$), indicating that the degree of synergy among the four components is closely associated with cultivation effectiveness.

At the same time, the intercorrelations among predictors are also relatively high, particularly between "Certificate" and "Integration" ($r=0.9083$) and between "Competition" and "Integration" ($r=0.8768$). This reflects the inherent interconnectedness of the PCCC components in actual educational practice, but also signals the need to examine multicollinearity in the subsequent regression analysis.

4.4. Multicollinearity Diagnostics

Given the relatively strong intercorrelations among predictor variables, variance inflation factor (VIF) diagnostics were conducted. The results are reported in Table 5.

Table 5. Multicollinearity Diagnostics

Variable	VIF	1/VIF
Integration	8.10	0.1234
Certificate	6.32	0.1581
Competition	5.72	0.1749
Course	5.49	0.1823
Post	3.82	0.2620
Mean VIF	5.89	

The VIF values range from 3.82 to 8.10, with a mean of 5.89. Although "Integration" has a VIF of 8.10, indicating a relatively strong relationship with other predictors, this value remains below the conventional threshold of 10 that would indicate serious multicollinearity concerns. The model therefore does not suffer from severe multicollinearity, and further regression analysis is justified.

It is also worth noting that the relatively high correlation between "Integration" and the other dimensions is not merely a statistical artefact. Rather, it reflects the conceptual nature of integration as a composite indicator of the synergy among the four PCCC components. This high degree of interrelatedness is indicative of the systemic linkages among the four educational components, but it also implies that when interpreting regression coefficients, attention should be paid to the unique contribution of each variable after controlling for the others.

4.5. Multiple Linear Regression Analysis

To further examine the effects of "Post," "Course," "Competition," "Certificate," and "Integration" on talent cultivation outcomes, a multiple linear regression model was estimated with "Outcomes" as the dependent variable and all five dimensions entered simultaneously as predictors. The results are presented in Table 6.

Table 6. Multiple Linear Regression Results

Variable	Coef.	SE	Standardized β	t	p
Post	0.2155	0.0472	0.2177	4.56	<0.001
Course	0.1707	0.0605	0.1614	2.82	0.005
Competition	-0.0205	0.0568	-0.0210	-0.36	0.719
Certificate	0.1090	0.0661	0.1012	1.65	0.100
Integration	0.5179	0.0738	0.4877	7.01	<0.001
Constant	-0.0374	0.1196		-0.31	0.755
R ²			0.7978		
Adjusted R ²			0.7948		
F-statistic			267.46**		
N			345		

Note: Dependent variable: Outcomes. *** $p < 0.001$.

The overall model is statistically significant ($F = 267.46$, $p < 0.001$). The R^2 value of 0.7978 and adjusted R^2 of 0.7948 indicate that the five predictors together explain approximately 79.78% of the variance in talent cultivation outcomes, suggesting strong explanatory power.

Among the individual predictors, "Integration" has the strongest effect on cultivation outcomes, with a coefficient of 0.5179 and a standardized beta of 0.4877 ($p < 0.001$). This indicates that, after controlling for other factors, a higher degree of synergy among the four PCCC components is associated with more favourable student evaluations of cultivation outcomes. Comparing the standardized coefficients across predictors, "Integration" exerts a substantially stronger influence than "Post," "Course," "Certificate," or "Competition." This suggests that strengthening individual components in isolation may be less effective for improving cultivation quality than fostering systematic coordination among them.

"Post" has a coefficient of 0.2155 and a standardized beta of 0.2177 ($p < 0.001$), indicating a significant positive effect on cultivation outcomes. For applied universities, whose fundamental mission is to enhance students' occupational competencies for real-world job positions, integrating enterprise job requirements, professional competency standards, and industry trends into educational objectives and instructional processes remains a critical foundation for quality improvement.

"Course" has a coefficient of 0.1707 and a standardized beta of 0.1614 ($p < 0.01$), confirming that curriculum and instruction remain important determinants of cultivation effectiveness. As the primary vehicle for talent development, the curriculum must effectively integrate digital-intelligent knowledge, disciplinary expertise, and practical competencies in order to translate job requirements into learnable knowledge and skills.

"Certificate" has a coefficient of 0.1090 and a standardized beta of 0.1012, but its p -value is 0.100, failing to reach the 5% significance level. This suggests that, after controlling for "Post," "Course," "Competition," and "Integration," the independent contribution of certifications to cultivation outcomes is not statistically significant. This finding should not be interpreted as indicating that vocational certifications are "without value." The correlation analysis shows that "Certificate" and "Outcomes" have a strong positive correlation ($r=0.8285$, $p<0.001$), indicating a robust overall relationship. However, once "Integration" and other variables are entered into the model, the independent effect of certifications diminishes. This suggests that the educational value of certifications may depend on curricular integration and the broader coordination mechanism, rather than merely the act of obtaining certificates.

"Competition" has a coefficient of -0.0205 and a standardized beta of -0.0210, with a p-value of 0.719, indicating no statistically significant independent effect on cultivation outcomes. This result is consistent with the earlier descriptive finding that "Competition" has the lowest mean score among the six dimensions.

As with the certificate finding, this result should not be interpreted as evidence that competitions have a "negative" effect on talent development. The correlation analysis shows that "Competition" and "Outcomes" are positively correlated ($r=0.8069$, $p<0.001$), suggesting a strong overall association. The non-significant coefficient in the regression model is more likely attributable to the limited reach of competition activities: skills competitions tend to be selective in nature, with participation concentrated among a relatively small group of highly motivated and capable students. If competition training is not effectively linked to regular course instruction, its impact is likely to remain confined to this narrow participant group, making it difficult to generate broad-based educational benefits. Therefore, shifting the role of competitions from "elite participation" toward broader educational impact represents a key challenge for further improving the PCCC talent cultivation model.

In sum, the regression results reveal a clear hierarchical structure: "Integration" emerges as the most important predictor, with "Post" and "Course" constituting the foundational base, while "Competition" and "Certificate" have yet to demonstrate significant independent effects. This suggests that the core of the PCCC model lies less in simply adding more job-practice modules, courses, competitions, or certificates, and more in establishing effective coordination mechanisms among the various components.

4.6. Inter-University Differences

To examine whether student evaluations of the PCCC model differ significantly across institutions, one-way ANOVA was conducted. The results are reported in Table 7.

Table 7. Inter-University Differences (One-way Anova)

Variable	F	p
Post	1.28	0.280
Course	0.71	0.494
Competition	0.85	0.430
Certificate	1.79	0.169
Integration	0.70	0.498
Outcomes	0.02	0.983

Note: N = 345. $p > 0.05$ indicates no statistically significant group differences.

The results show that none of the six dimensions differ significantly across the three institutions. Notably, the F-value for "Outcomes" is 0.02, with a p-value of 0.983, indicating that students from the three universities report nearly identical levels of overall cultivation effectiveness.

In terms of mean scores, student evaluations of cultivation outcomes are 4.187 (Baoshan University), 4.194 (Yunnan Technology and Business University), and 4.176 (Lijiang Culture and Tourism College)-differences that are substantively negligible. For "Integration," the mean scores are 4.324 (Yunnan Technology and Business University), 4.269 (Baoshan University), and 4.210 (Lijiang Culture and Tourism College), but again the differences are not statistically significant.

These findings suggest that the challenges observed in the implementation of the PCCC talent cultivation model are not unique to any single institution but rather reflect common characteristics across the three universities. The consistency of student evaluations across institutions indicates that accounting programme reforms in applied universities under digital-intelligent transformation may face similar structural challenges-namely, how to achieve deeper integration among job requirements, curriculum instruction, skills competitions, and vocational certifications.

4.7. Summary of Empirical Findings

Taken together, the descriptive statistics, correlation analysis, regression results, and inter-university comparisons yield several key findings.

First, overall evaluations of the PCCC talent cultivation model in the three applied university accounting programmes are relatively positive, with all six dimension means exceeding 4.00. This suggests that the universities have established a foundation for reform. Among the six dimensions, "Certificate" receives the highest evaluation, reflecting strong student recognition of vocational certifications.

Second, competitions represent a comparatively underdeveloped component of the current model. The "Competition" dimension has the lowest mean score and fails to exhibit a significant independent effect in the regression model. Although competition participation is correlated with cultivation outcomes at the bivariate level, its educational function has not yet achieved broad-based student coverage.

Third, job-post alignment and curriculum development serve as important foundations for cultivation effectiveness. The regression coefficients for both "Post" and "Course" are positive and statistically significant, indicating that talent development should first establish educational objectives aligned with actual job requirements, and then translate occupational competency demands into instructional practice through curriculum design.

Fourth, "Integration" is the core factor influencing cultivation outcomes. Its standardized beta of 0.4877 substantially exceeds that of the other predictors, suggesting that the degree of synergy among the four components has the strongest explanatory power for cultivation effectiveness. This finding provides direct empirical support for shifting the PCCC model from a focus on component development toward systemic coordination.

Fifth, the absence of significant inter-university differences indicates that the observed issues are common across institutions. Therefore, optimisation strategies should not be confined to isolated institutional reforms but should instead address the broader mechanisms of accounting talent development in applied universities.

5. Discussion

5.1. *The Role of Integration in the PCCC Model*

One of the clearest findings of this study concerns the role of integration. In the full regression model, integration has the largest standardized coefficient ($\beta = 0.4877$, $p < 0.001$). The explanatory power of the model also increases after integration is included. This indicates that students who perceive stronger connections among job requirements, curriculum, competitions, and certification also tend to report better talent cultivation outcomes.

This result is broadly consistent with the original logic of the PCCC approach. Wang and Li argue that the model should not treat job requirements, competitions, and certificates as activities outside the curriculum. Instead, these elements need to be incorporated into curriculum objectives, content, and implementation. Tai and Ren similarly emphasize the overall design and coordination of the four components. In this sense, the present findings provide empirical support for an idea that has so far been discussed mainly at the conceptual and practical levels: the value of PCCC may depend not only on the development of individual components, but also on how well they are connected.

This issue is particularly relevant to accounting education under digital transformation. New workplace requirements, such as data analysis and the use of intelligent accounting tools, change relatively quickly. If these requirements are not reflected in the curriculum, while competition activities and certificate preparation remain separate from regular teaching, the different components may coexist without forming a coherent learning experience. Tian et al. make a similar point in their discussion of an intelligent accounting talent ecosystem, where collaboration among universities, industry,

enterprises, and different stages of talent development is treated as an important part of the cultivation process.

Integration should therefore not be understood as a fifth educational activity added to the other four components. It is better viewed as the extent to which the existing components are connected around common competency goals. For universities implementing the PCCC model, this distinction matters: having courses, competitions, certificates, and industry-related activities in place does not necessarily mean that an integrated talent cultivation system has been established.

5.2. Job Alignment and Curriculum as the Basic Links

Job alignment and curriculum remain significantly associated with talent cultivation outcomes after the other dimensions are controlled for. This result is consistent with the practical orientation of applied accounting education. Changes in accounting work first appear in the workplace, but they can affect students only when they are translated into programme objectives, course content, and learning activities.

Previous accounting education research supports this interpretation. Daff found that employers expect accounting graduates to possess stronger ICT competencies, while still regarding sound accounting knowledge as essential. Tsiligiris and Bowyer likewise identify digital, business, soft, and ethical skills as important for future accountants. These findings suggest that universities need to follow changes in occupational requirements without reducing accounting education to technical training alone.

The curriculum is the main channel through which such changes enter formal education. Wang and Niu, in their work on intelligent accounting education, argue for closer integration between accounting knowledge and emerging technologies and propose a corresponding curriculum structure. The significant association between the Course dimension and cultivation outcomes in this study is consistent with that argument. Adding a few technology-related subjects is unlikely to be sufficient if digital competencies remain separated from accounting knowledge and practical business problems.

The results therefore point to a relatively straightforward relationship between job alignment and curriculum. Job requirements provide information about the competencies graduates are expected to develop, while the curriculum translates those requirements into learning experiences. Both are necessary if PCCC reform is to move beyond a collection of separate activities.

5.3. Competition and Certification: Value Depends on Connection

Competition and certification show a different pattern. Both are strongly correlated with talent cultivation outcomes in the bivariate analysis, but neither has a statistically significant independent coefficient in the full regression model. Given the relatively high correlations among the PCCC dimensions, these results need to be interpreted carefully.

For competition, the finding does not mean that skills competitions are educationally ineffective. Zeng et al. explicitly discuss the role of high-level competitions in promoting teaching and learning and argue that competition standards and resources can contribute to educational reform. The issue is therefore less about whether competitions are useful than about how their educational value reaches ordinary students.

If competition activities remain separate from regular teaching, their benefits may be concentrated among students who participate directly. By contrast, competition cases, tasks, standards, and business scenarios can be incorporated into classroom teaching and practical projects. In that form, competition resources become part of the curriculum rather than a parallel activity. The non-significant coefficient found here may therefore reflect the limited independent contribution of competition once its overlap with curriculum and integration is taken into account.

The Certificate dimension deserves similar caution. It records the highest mean score among the six dimensions, showing that students generally attach considerable importance to vocational and professional certification. However, its independent coefficient is not statistically significant in the full model. This suggests that positive

attitudes towards certificates do not necessarily translate directly into stronger perceived cultivation outcomes.

Zeng emphasizes course-certificate integration, particularly the alignment between certificate standards and curriculum content. This provides a useful way of interpreting the present result. Certificates may contribute more to student development when the competencies they represent are incorporated into teaching and assessment. If certificate preparation operates as an additional activity outside the curriculum, its educational contribution may be less apparent.

The findings for competition and certification therefore should not be read as arguments for reducing either component. They point instead to a need to reconsider how both are connected with regular teaching. Their educational value may lie less in participation or credential acquisition itself than in the extent to which competition and certification requirements are translated into broader learning opportunities.

5.4. Similar Evaluations Across the Three Universities

The ANOVA results show no statistically significant differences among the three universities on any of the six dimensions. In particular, students report very similar levels of talent cultivation outcomes across the three institutions.

This finding should not be taken to mean that the universities implement the PCCC model in exactly the same way. Nor does it allow the results to be generalized to all applied universities in Yunnan Province. What it does show is that, within the present sample, the overall pattern of student evaluations is relatively consistent across institutions.

This consistency also reduces the likelihood that the main regression results are driven primarily by one university. At the same time, similar quantitative evaluations may conceal differences in curriculum organization, faculty involvement, industry cooperation, or competition and certification practices. A qualitative comparison of the three institutions would therefore provide a useful next step in understanding how similar student perceptions may arise from different implementation arrangements.

5.5. Implications for Research on PCCC-Based Talent Cultivation

Most of the PCCC studies reviewed earlier in this paper have been conducted in vocational education settings and have concentrated on conceptual interpretation, curriculum construction, and implementation strategies. Wang and Li, for example, focus on the connotations and pathways of integrated education, while Tai and Ren discuss the logic and practical design of PCCC-based teaching reform. The present study adds student-level quantitative evidence from applied undergraduate accounting programmes.

A second contribution lies in separating the four substantive components from their degree of integration. The results show that a component can have a strong bivariate relationship with cultivation outcomes but a much weaker independent association once integration and the other components are considered together. This is particularly evident for competition and certification. The distinction between the presence of an educational component and its connection with the wider programme may therefore be useful for understanding PCCC implementation.

The study also places PCCC within the context of digital accounting education. Digital transformation makes the connection between occupational change and university education more time-sensitive. For accounting programmes, the question is no longer only whether digital content has been added, but whether changes in workplace competencies can be reflected consistently in curriculum, practice, and assessment. The PCCC framework offers one way of examining these connections.

6. Conclusion

6.1. Main Findings and Contributions

This study examined the implementation of the Post-Course-Competition-Certificate (PCCC) model in accounting programmes at three applied universities in Yunnan

Province. Based on 345 valid student responses, the analysis considered four substantive dimensions-Post, Course, Competition, and Certificate-together with Integration and student-reported talent cultivation outcomes.

The results show that students generally evaluate the current PCCC practices positively. Job alignment and curriculum are both positively and significantly associated with cultivation outcomes in the full regression model. Competition and certification are positively related to outcomes at the bivariate level, but their independent coefficients are not statistically significant once the other dimensions are taken into account. Integration has the largest standardized coefficient among the predictors, indicating the strongest independent association with cultivation outcomes in the full model.

These findings add to existing PCCC research in two respects. First, the study extends the discussion from its predominantly vocational education setting to applied undergraduate accounting programmes and provides evidence from more than one institution. Second, by treating integration separately from the four substantive components, the analysis distinguishes between the development of individual PCCC activities and the extent to which those activities are connected.

The results should nevertheless be interpreted as associations rather than causal effects. The study shows that stronger perceived integration is associated with more favourable student evaluations of talent cultivation, but it does not establish that increasing integration alone will necessarily produce better educational outcomes.

6.2. Implications for Applied Accounting Programmes

The findings suggest that PCCC reform may benefit from greater attention to the links among existing components rather than continued expansion of individual activities.

Job requirements need to be reflected more directly in curriculum review. As digital technologies continue to change accounting work, employer and industry input becomes useful only when it can influence course content, practical assignments, and competency expectations.

Competition resources can also be used more widely. Cases, datasets, business scenarios, and assessment criteria drawn from competitions can be adapted for regular classroom activities and practical projects. This would allow students who do not participate directly in external competitions to benefit from the skills and standards represented by those competitions.

A similar approach applies to certification. Rather than treating certificates primarily as additional credentials, universities can map relevant certification standards onto course learning outcomes and assessment tasks where appropriate. The aim is not to turn regular courses into examination preparation classes, but to make useful professional standards part of the learning process.

More broadly, the four PCCC components need a common point of reference. Programme teams can use clearly defined competency outcomes to review job requirements, curriculum content, competition activities, and certification standards together. Such coordination may be more productive than allowing each activity to develop separately.

6.3. Limitations and Future Research

This study has several limitations. First, the data are cross-sectional and were collected at a single point in time. The regression analysis therefore cannot establish causal relationships. Longitudinal studies or quasi-experimental designs would be needed to examine whether changes in PCCC implementation are followed by changes in student outcomes.

Second, both the explanatory variables and the outcome variable rely on student self-reports. Common-method effects may therefore contribute to the relatively high correlations observed among the dimensions. Future studies could combine questionnaire data with course performance, certification results, competition records, internship assessments, or employer evaluations.

Third, several predictors are highly correlated, and some VIF values exceed 5. Although they do not reach the conventional threshold of 10 for severe multicollinearity, the overlap among the dimensions makes individual coefficients more difficult to interpret. Further work with larger samples should examine the measurement structure more closely, including the convergent and discriminant validity of the PCCC dimensions.

Finally, the sample is limited to three universities in Yunnan Province. The findings therefore describe the institutions included in this study and should not be assumed to represent all applied universities. Replication in other regions, institutional types, and disciplines would help determine whether the same pattern can be observed elsewhere.

A further direction for research is to examine how integration is created in practice. Quantitative analysis can show that integration is associated with student outcomes, but it cannot explain how curriculum teams, teachers, enterprises, competition arrangements, and certification systems actually interact. Interviews, classroom observations, and institutional case studies could provide a clearer account of the processes through which PCCC integration is achieved-or fails to be achieved.

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