

An AI-supported Language-Skills-Culture Curriculum in a Sino-South African TVET Program: Mixed-methods Evidence from a Pre-Post Design

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ABSTRACT

China's 2018 national standards for international-student education place quality assurance within universities' regular responsibilities. This study examined learning and participant experience in a six-month digital-trade program for 29 South Africans in China. We used a quantitative-dominant mixed-methods pre-post design: three paired outcome measures were considered alongside a post-program questionnaire and one open item. Chinese achievement increased from $M=62.50$ to 77.37 , $t(28)=9.52$, $p<.001$, $d_z=1.77$. Vocational-task performance increased from $M=64.70$ to 84.94 , $t(28)=10.45$, $p<.001$, $d_z=1.94$. Self-reported adaptation changed from 3.20 to 3.34 , $t(28)=1.66$, $p=.109$. Chinese achievement gain correlated with adaptation change ($r=.453$, $p=.014$). Nineteen participants reported heavy use of AI translation. Ratings of chatbot practice were mixed, and 15 of 26 respondents described VR or digital-twin simulation as game-like and of little business value. In the open item, participants called for real supplier contact and activities linked to South African markets. They also commented on course load and occupational relevance. For curriculum design, the responses point to AI-supported preparation followed by human interaction and work-related tasks.

Keywords: *International TVET, Curriculum integration, AI-supported learning, Vocational transfer.*

1. INTRODUCTION

In 2018, the Ministry of Education of the People's Republic of China issued the Quality Standards for Higher Education of International Students in China (Trial), requiring universities to include international-student education in their quality-assurance systems [1]. In transnational TVET, that responsibility extends to what participants can do with the occupational content they study. They must use a host language that they are still learning to follow instruction, explain products, and respond to unfamiliar workplace expectations.

The present study followed a six-month digital-trade program for South African participants in Hubei, China. The curriculum combined applied Chinese, digital-trade skills, Chinese business culture, and industry-linked activities. In a supplier task, for example, participants read product information, asked for clarification, compared offers, and considered how directly to respond.

These tasks asked them to use classroom language and vocational knowledge in a supplier exchange and then reconsider the decision for South African market conditions.

Short-cycle international programs give learners little time to develop the host language before technical study begins. When language and vocational content are taught separately, their joint use may never be assessed. Integrated tasks let teachers see where language interferes with vocational work and give learners an immediate reason to communicate.

Participants used translation applications to read unfamiliar text and chatbots for additional language practice. Virtual-reality and digital-twin activities provided simulated business situations. The study then considered program-based vocational performance and participants' accounts of tasks completed with less technological assistance.

The present study examines Chinese achievement, vocational-task performance, self-

reported adaptation, and participant evaluations within one transnational TVET cohort. It asks how the three measured outcomes changed and related over six months, and what participants said about applying the curriculum to vocational settings.

2. LITERATURE REVIEW

2.1 *Integrated Learning in Transnational TVET*

The CLIL 4Cs framework organizes integrated learning around content, communication, cognition, and culture [2]. In vocational education, those domains meet in tasks such as supplier comparison and market planning. Language has a defined use in such work. The framework, however, leaves the criteria for competent vocational performance to the particular task and context.

Intercultural communicative competence extends the focus beyond linguistic accuracy to interpretation and action across cultural contexts [3]. During technical exchanges, learners may have to manage hierarchy, disagreement, and turn-taking. Vocational tasks can show how learners apply that judgment during work-related activity.

General scales capture attitudes or perceived readiness across contexts, whereas curriculum tasks assess selected content. The two measures address different aspects of learning and experience.

Yang et al. mapped intercultural work in vocational education across language teaching, technical communication, mobility, technology-supported learning, and international cooperation. They found relatively little evaluation research [4]. Yu and Wong [5] reported gains in oral English and intercultural competence after an eight-week module for Chinese higher vocational students. Their participants and outcome measures differed from those in the present study. Research in Chinese vocational colleges has also linked international students' language learning with daily participation and educational support [6]. Building on this work, the present study examines achievement, adaptation, and participant evaluations in the same cohort.

2.2 *AI-supported Learning and Authentic Transfer*

In language education, generative AI has been used for translation, feedback, dialogue, and self-directed practice [7,8]. Law [7] found that reports

of language-teaching applications often gave uneven accounts of pedagogy and assessment. Lee et al. [8] similarly noted the concentration of evidence in higher education and short interventions, with frequent reliance on self-report. Neither review establishes how tool-based practice relates to vocational interaction when another person changes the pace or wording of the exchange.

Shadiev and Sintawati's review [9] describes interaction, purposeful tasks, and reflection as recurring features of technology-supported intercultural learning. Applied to TVET, translation can help a learner read a supplier message and a chatbot can be used to rehearse questions. The learner can then complete an interactional task with less technological assistance.

2.3 *Host-Language Development and Adaptation*

Cross-cultural adaptation involves psychological adjustment, sociocultural participation, and the ability to manage daily situations [10]. Host-language development can widen access to instruction, local relationships, and workplace interaction, although opportunities to use the language vary. Studies of short-term international students in China have found uneven intercultural sensitivity and effectiveness [11]. Research with African students also describes language barriers, social participation, and institutional support as closely connected parts of the experience [12]. Longitudinal evidence further suggests that adaptation changes with stress, coping, and time in the host setting [13].

Adaptation also depends on experiences outside scheduled instruction [10-13]. A six-month curriculum can directly teach and rehearse Chinese and digital-trade tasks, while daily contact and participation arise across the host setting.

3. CONCEPTUAL FRAMEWORK AND RESEARCH QUESTIONS

In this study, instructional proximity refers to how closely an outcome matched the content taught and rehearsed during the program. Chinese achievement and vocational-task performance were treated as proximal outcomes. Self-reported adaptation was treated as more distal because it also reflected daily interaction and personal experience.

Vocational transfer is used here as a curriculum-design idea: supported rehearsal should lead toward less-supported activity that is relevant to a participant's occupational role. The study examined this idea through program-based vocational-task performance, participant ratings, and open responses.

RQ1. How did Chinese achievement, vocational-task performance, and self-reported adaptation change from pre-program to post-program?

RQ2. How were changes in the three outcomes related?

RQ3. How did participants evaluate curriculum integration and technology-supported learning, and what did their open responses identify as priorities for transfer?

4. METHOD

4.1 Program Context and Participants

The program was delivered at a vocational college in Hubei over six months. It combined applied Chinese with instruction in digital-trade operations, including platform use, marketing, logistics, and project presentation. Cultural content addressed Chinese business practice and workplace interaction. Participants also completed enterprise observation, supplier-oriented tasks, project work, and technology-supported scenario practice.

Tasks centered on products and business decisions. Learners selected products, prepared store content, examined market information, and presented proposals. They used Chinese to clarify information and explain choices. Discussions of negotiation and workplace etiquette brought cultural comparison into the same work. Supplier-oriented tasks and project work required them to apply what they had studied in class.

The cohort comprised 29 South African participants: 9 students, 15 entrepreneurs, and 5 government officials. Seventeen were men and 12 were women. "Table 1" summarizes the cohort.

Table 1. Participant characteristics (N = 29)

Characteristic	Category	n (%)
Gender	Male	17 (58.6)
	Female	12 (41.4)
Age group	19-22 years	5 (17.2)
	23-26 years	10 (34.5)
	27 years or above	14 (48.3)
Occupational group	Student	9 (31.0)
	Entrepreneur	15 (51.7)
	Government official	5 (17.2)

4.2 Measures and Data Collection

Three outcomes were measured before and after the program. Chinese achievement was assessed through the program's internal applied-Chinese assessment, which focused on the language used for program study and digital-trade activities. The pre- and post-program assessments used the same 0–100 scoring framework and were scored by the program's Chinese-language teachers. Vocational-task performance was assessed through digital-trade tasks involving product selection, store content, market information, and project presentation. The pre- and post-program tasks were scored by the

vocational teaching team under the same task-based 0–100 scoring framework. Self-reported adaptation was measured using a program-developed multi-item indicator. Each item used a 1–5 response scale, and the participant-level score was calculated as the mean of the item ratings. Higher scores indicated better perceived adjustment to study, communication, and daily life in the program setting.

At the end of the program, participants completed a questionnaire covering curriculum integration, learning pressure, South African market practice, Chinese business culture, communication

confidence, and technology use. One open-ended question invited participants to describe challenges and recommendations. Twenty-six participants entered text. Thirteen responses named a specific program difficulty, recommendation, or example and were included in the descriptive qualitative analysis.

Closed items were summarized in their original response categories, using the valid number of responses for each item. The open responses were organized by the specific difficulties, recommendations, and examples they described, and were used to interpret the questionnaire distributions.

The college approved the study, and all 29 participants consented to the research use of anonymized learning and questionnaire data.

4.3 Analysis

Paired-samples *t* tests assessed change in the three outcomes. We reported mean gains, 95% confidence intervals, and within-participant effect

sizes (*dz*). Pearson correlations examined the three gain scores. A regression with adaptation change as the outcome included Chinese achievement gain and vocational-task performance gain as predictors. For the Chinese achievement gain coefficient, HC3 standard errors and an estimate adjusted for pre-program adaptation were also calculated. Questionnaire results were reported as valid-response percentages, and open responses were used to interpret those distributions.

5. RESULTS

5.1 Pre-Post Outcomes

Chinese achievement increased by 14.87 points, from 62.50 to 77.37, with a large within-participant effect. Vocational-task performance increased by 20.24 points, from 64.70 to 84.94, also with a large effect. Self-reported adaptation changed from 3.20 to 3.34. The difference was not statistically significant ($p=.109$). Full estimates appear in “Table 2”.

Table 2. Pre-post outcomes

Outcome	Pre <i>M</i> (<i>SD</i>)	Post <i>M</i> (<i>SD</i>)	Gain <i>M</i> (<i>SD</i>)	95% CI	<i>t</i> (28)	<i>p</i>	<i>dz</i>
Chinese achievement (0-100)	62.50 (14.51)	77.37 (16.90)	14.87 (8.41)	[11.67, 18.07]	9.52	< .001	1.77
Vocational-task performance (0-100)	64.70 (6.37)	84.94 (11.73)	20.24 (10.44)	[16.28, 24.21]	10.45	< .001	1.94
Self-reported adaptation (1-5)	3.20 (0.51)	3.34 (0.46)	0.14 (0.46)	[-0.03, 0.31]	1.66	.109	0.31

a Note. Gain = post-program score - pre-program score. Tests were two-sided paired *t* tests.

5.2 Associations Among Changes

Chinese achievement gain correlated with adaptation change ($r=.453$, $p=.014$). The correlations involving vocational-task performance gain were smaller. In the regression, the two gain scores accounted for 21.5% of the variation in adaptation change, $F(2, 26)=3.55$, $p=.043$. The

Chinese achievement gain coefficient was $B=0.0238$ ($p=.020$), and the vocational-task performance gain coefficient was $B=0.0044$ ($p=.575$). Sensitivity analyses yielded $B=0.0238$ ($p=.096$) with HC3 standard errors and $B=0.0176$ ($p=.055$) after adjustment for pre-program adaptation (“Table 3”).

Table 3. Associations with gain in self-reported adaptation

Analysis	Estimate	95% CI	Test	<i>p</i>	Model index
Chinese gain with vocational gain	$r = .151$	[-.228, .491]		.433	
Chinese gain with adaptation change	$r = .453$	[.103, .703]		.014	
Vocational gain with adaptation change	$r = .166$	[-.213, .502]		.389	
Conventional OLS model			$F(2, 26) = 3.55$	.043	$R^2 = .215$; adjusted $R^2 = .154$
OLS: Chinese gain	$B = .0238$	[.0041, .0434]	$t = 2.49$	.020	$\beta = .437$
OLS: Vocational gain	$B = .0044$	[-.0115, .0202]	$t = 0.57$	.575	$\beta = .100$

Analysis	Estimate	95% CI	Test	p	Model index
HC3: Chinese gain	$B = .0238$	[-.0046, .0521]	$t = 1.72$	.096	
Baseline-adjusted: Chinese gain	$B = .0176$	[-.0004, .0355]	$t = 2.02$	.055	

a Note. OLS = ordinary least squares. HC3 = heteroskedasticity-consistent standard error. The baseline-adjusted model included pre-program adaptation.

5.3 Participant Evaluations and Open Responses

Twenty participants (69.0%) rated the integration of Chinese with vocational practice as extremely or relatively helpful. Nineteen of 26 valid respondents (73.1%) described the intensive curriculum as highly demanding. For South African market practice, 14 of 28 (50.0%) chose very or relatively sufficient and 8 (28.6%) chose insufficient. Twenty-four of 29 participants (82.8%) rated their understanding of Chinese business culture as very good or relatively good. Twenty-three of 27 (85.2%) reported improved intercultural communication confidence.

Workplace etiquette was selected as a cross-cultural barrier by 15 of 28 respondents. Negotiation habits and consumer psychology were each selected by 14, and legal regulations by 11.

Nineteen participants reported heavy use of AI translation and 8 reported occasional use. For chatbot practice, 20 of 27 valid respondents reported substantial or slight help, while 7 described it as mechanical or impractical. For VR or digital-twin simulation, 15 of 26 valid respondents described the activity as game-like and of little value for actual business. “Table 4” presents the distributions.

Table 4. Selected post-program questionnaire responses

Item	Valid n	Response distribution, n (%)
Chinese integrated with vocational practice	29	Extremely helpful 4 (13.8); relatively helpful 16 (55.2); average 5 (17.2); little help 4 (13.8)
Pressure from the intensive curriculum	26	Extremely high 9 (34.6); relatively high 10 (38.5); average 5 (19.2); low 2 (7.7)
South African market practice	28	Very sufficient 1 (3.6); relatively sufficient 13 (46.4); average 6 (21.4); insufficient 8 (28.6)
Understanding of Chinese business culture	29	Very good 8 (27.6); relatively good 16 (55.2); average 3 (10.3); confused 2 (6.9)
Cross-cultural barriers (multiple response)	28	Negotiation habits 14 (50.0); consumer psychology 14 (50.0); workplace etiquette 15 (53.6); legal regulations 11 (39.3)
Change in communication confidence	27	Significant improvement 8 (29.6); slight improvement 15 (55.6); no change 4 (14.8)
AI translation use	29	Heavy use 19 (65.5); occasional support 8 (27.6); rare use 2 (6.9)
Chatbot support for speaking and vocabulary	27	Substantial improvement 6 (22.2); slight help 14 (51.9); mechanical or impractical 7 (25.9)
VR or digital-twin simulation	26	Strongly helpful 4 (15.4); some help but limited realism 7 (26.9); game-like/little business value 15 (57.7)

a Note. Percentages use valid n. The cross-cultural barrier item allowed multiple responses.

The 13 substantive open responses were varied, and no single issue dominated. Two participants explicitly requested less simulated interaction: one wanted conversations with Chinese suppliers who spoke quickly and used slang, and another preferred practice in a real market. Several comments asked for closer links to South African business, including payment gateways, China-Africa cases, and B2B vocabulary. Two participants described the combined language and technical workload as difficult. Occupational relevance also appeared in

individual comments: an entrepreneur wanted supplier contacts, while a government official questioned the value of operating an online shop. One participant described reliance on translation applications, and another criticized automated pronunciation grading.

The questionnaire ratings were generally favorable toward curriculum integration, but the open responses also recorded demands for real business contact, South African application, and tasks suited to different occupational roles.

6. DISCUSSION AND PEDAGOGICAL IMPLICATIONS

6.1 *Program-Proximal Gains and Host-Language Access*

Chinese achievement rose by nearly 15 points, and vocational-task performance rose by just over 20 points. Both assessments covered content taught and practiced during the six-month program. Self-reported adaptation changed little and the pre-post difference was not statistically significant. The program results were therefore strongest on the two outcomes closest to instruction.

The two achievement gains can be read through the 4Cs framework [2]. Product decisions and explanations required participants to use subject content and communication together, with cultural judgment entering the business task. The gains are consistent with improvement on work that was directly taught and repeatedly practiced.

Chinese achievement gain was positively associated with adaptation change in the bivariate analysis. This association suggests a useful teaching direction: Chinese practice can be tied to situations participants actually faced, such as asking a supplier to clarify a term or following up after an enterprise visit.

Vocational-task performance gain had little association with adaptation change. Success on a platform task and participation in the host setting were different outcomes in this cohort. A task that asks learners to explain a product choice or respond to a supplier's objection would allow teachers to observe both technical knowledge and communication.

6.2 *AI Support and Authentic Performance*

Participants reported heavy use of AI translation, but ratings of chatbot practice were mixed and VR or digital-twin simulation was often judged unrealistic. The open responses make this difference concrete. One participant wrote that Chinese suppliers 'talk too fast and use slang'. Another called the VR activity 'okay but fake' and asked to practise selling in a real market. For these participants, realism depended on another person's language and response, not on the appearance of the simulation.

Teachers can use translation or chatbot rehearsal before a role-play with unscripted

questions and, where feasible, supplier contact or an assessed project presentation. Technology-supported intercultural research also gives purposeful interaction and reflection a prominent place [9]. Assistance can be reduced as learners begin to clarify information and revise responses themselves.

6.3 *Occupational Fit and Local Application*

The open responses also show why one final task may not suit the whole cohort. An entrepreneur asked for supply-chain contacts, a student asked for South African payment-gateway practice, and a government official questioned the relevance of opening an online shop. Each comment came from one participant, but together they illustrate different uses for the same program.

A shared curriculum core can be followed by role-sensitive application. For example, a supplier negotiation would be more relevant to some participants, while others could examine how a Chinese platform practice fits South African payment systems or regulation. Each task should require learners to explain a vocational decision and account for its cultural setting.

Task difficulty can also be adjusted without changing the curriculum topic. Beginners can work with shorter messages and a narrower decision. More experienced participants can handle incomplete information or time pressure. Assessment can then focus on communication and culturally informed vocational decision making.

7. LIMITATIONS

The study followed one cohort and used program-based assessments. Its pre-post results describe change during this program and cannot isolate the contribution of curriculum integration or AI. The sample was small for regression and occupational-group comparisons, and the open-ended question captured brief comments. Further research with comparison groups and external or delayed performance tasks could examine the curriculum across settings.

8. CONCLUSION

Over the six-month program, Chinese achievement and vocational-task performance increased substantially in this cohort. Self-reported adaptation did not change significantly. Chinese

achievement gain was associated with adaptation change in the bivariate analysis. The clearest progress appeared in the language and vocational work that participants practiced directly.

Participant feedback called for more contact with real suppliers, more work related to South African markets, and tasks that made sense for different occupational roles. AI translation was widely used, while chatbot and simulation ratings were more mixed. Digital tools can support preparation, followed by work that requires human interaction and a vocational decision.

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