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Fostering Students' Intercultural Competence in Higher Education Through Virtual Exchange: Evidence from a Pilot Study in Hong Kong

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Abstract

Background: Intercultural competence is crucial for employability in a globalized workforce. Virtual exchange, which is seen as an innovative educational pedagogy, offers an alternative to physical exchange, thus effectively enhancing intercultural skills. Previous studies on virtual exchange often had mixed results, small samples, and insufficient control groups. This study enriches the literature by empirically examining virtual exchange with control groups and advancing the understanding of its effectiveness in higher education.

Methods: This research employs a controlled quasi-experimental design, which involved 192 participants from a university in Hong Kong. A total of 124 students participated in virtual exchange projects as the experimental group, while 68 students comprised the control group.

Results: The findings, which were derived from independent sample t-tests and paired sample t-tests, indicate a significant improvement in intercultural competence levels among the virtual exchange group compared with the control group. Furthermore, a significant growth in intercultural competence was observed from preproject to postproject within the experimental group. The enhancement was primarily driven by improvements in self-awareness, exploration, and world orientation.

Implications: The present study underscores the benefit of virtual exchange, which is implemented through Collaborative Online International Learning (COIL), as a valuable tool for fostering intercultural competence in higher education. Despite the study's limitations, its implications suggest that educators can effectively integrate virtual exchange into curricula to promote internationalization and strengthen students' intercultural skills.

Introduction

In light of global crises and the pursuit of UNESCO's Sustainable Development Goals, the demand for international partnerships and collaborations has increased. Developing intercultural competence, which comprises "a set of cognitive, affective and behavioral skills and characteristics that support effective and appropriate interaction" in diverse cultural contexts [1], is crucial for individuals to thrive professionally and personally in today's interconnected world.

The ability to work collaboratively and solve problems in multicultural environments is associated with enhanced employability [2, 3]. This competence is underpinned by the acquisition of relevant knowledge, skills, and attitudes that are necessary for effective intercultural interactions [4]. Intercultural competence has been recognized as a vital element of employability in a globalized workforce [5]. Therefore, educators in higher education have prioritized the integration of global and intercultural perspectives within their teaching objectives, curriculum planning, and education delivery [6]. Virtual exchange, which is an innovative educational

pedagogy leveraging technologies, has been adopted to foster intercultural competencies [7-9]. Its reduced financial and time costs, coupled with enhanced accessibility, have led to its popularization in the post-COVID-19 and digital era when alternatives to physical exchange became necessary [9]. Virtual exchange has been applied across a diverse array of academic disciplines, which range from business to education, healthcare, and language studies [9, 10]. Emerging evidence highlights the benefits of virtual exchange in facilitating intercultural competence [11-15]. However, these studies often face limitations, such as mixed results, small sample sizes, a qualitative focus and the absence of a control group [8, 16].

Therefore, this study enriches the literature by empirically examining the effectiveness of virtual exchange (in the form of collaborative online international learning) in enhancing intercultural competence among higher education students through a quasi-experimental design. We aim to address the growing importance and relevance of virtual exchange in preparing globally competent graduates. The following sections explore the

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literature on intercultural competence and virtual exchange in higher education and present an experimental study conducted in Hong Kong on the enhancement of intercultural competence through virtual exchange.

Intercultural Competence Domains

Intercultural competence has been conceptualized by various scholars [17]. Developing such competence necessitates not only an understanding of different cultures but also social skills and the ability to interpret and manage problems and take action in unfamiliar cultural environments [18]. In this study, intercultural competence is assessed utilizing the Intercultural Effectiveness Scale (IES; [19]) provided by the Kozai Group, which comprises three primary domains: continuous learning, interpersonal engagement, and hardiness. Each domain, which is characterized into two subdomains, reflects the aspects of global competencies that are necessary for thriving in intercultural environments.

Continuous learning involves the motivation to acquire new knowledge and understand behaviors from other cultures. It encompasses assessing individuals' motivation to learn about themselves, including awareness of personal strengths and weaknesses (self-awareness), as well as exploring different ideas, values, norms, situations, and behaviors and learn from mistakes (exploration).

Interpersonal engagement refers to the ability to build strong relationships with people from new cultures. It includes gauging an individual's interest in other cultures and their ability to adapt (world orientation) as well as their likelihood of initiating and maintaining positive relationships with people from other cultures (relationship interest).

Hardiness is the psychological competency to manage stressful experiences in intercultural contexts. It includes positive regard, which is the tendency to maintain an accepting and positive view of other cultures, and emotional resilience, which is the ability to cope with challenging emotional experiences.

Intercultural Competence Development in Virtual Exchange

The meta-analysis conducted by Zhang and Zhou [20] revealed that intercultural competence can be effectively cultivated through various immersion and pedagogical strategies, including overseas immersion, culturally based teaching materials, inquiry-based learning, and integrated intercultural programs [20, 21]. Notably, overseas immersion, such as overseas study programs and international internships, has been shown to enhance intercultural competence significantly [22]. Virtual exchange can leverage digital technologies, thus offering an alternative means to address certain limitations that are associated with physical exchange, including financial concerns and accessibility challenges [23]. This inclusive approach ensures that students have opportunities to acquire intercultural competencies regardless of their background and resources.

Virtual exchange, which refers to online intercultural interactions and collaborations with counterparts from diverse cultures or geographical regions, is integrated as a component of educational curricula [24]. This concept is also known as telecollaboration in foreign language learning contexts and global virtual teams in business fields. Collaborative online international learning (COIL) represents a relatively new and

popular form of virtual exchange, which emphasizes learning through social interaction and collaboration [8]. In this study, we employ virtual exchange in the form of COIL to examine its effectiveness on the development of intercultural competence across academic disciplines within higher education.

Unlike other virtual exchange initiatives, COIL involves educators and students from varied backgrounds and institutions to engage in joint online tasks or activities with cocreated and shared learning outcomes [8]. It provides students with authentic learning experiences within their home institution in online settings. Prior studies on large-scale virtual exchange initiatives in Europe and North America demonstrated that such exchange could enhance students' foreign language proficiency, intercultural competence, digital competence, and soft skills, including active listening, critical thinking, and collaboration [12, 16, 25, 26]. The process can be explained through intergroup contact theory [27, 28] and social exchange theory [29]. Intergroup contact theory posits that interactions between individuals from different social groups can reduce prejudice [30] and enhance competencies, such as empathy, perspective taking, knowledge, and trust [31]. Meanwhile, social exchange theory suggests that engagement in social interactions may provide students with satisfaction, knowledge, and social benefits, thus enhancing intercultural understanding [29, 32].

Objective of Current Study

Although research into virtual exchange and COIL is crucial, current studies predominantly focus on case studies and exploratory, qualitative evaluations of their impact [33, 34]. Limited empirical research has assessed and compared the effects of virtual exchange on intercultural competence development using control groups [35, 36].

This study utilizes a quasi-experimental design to enrich the literature on virtual exchange and addresses the calls from Rienties et al. [16] and Zak [23] for further empirical research on virtual exchange involving control groups. It investigates the effectiveness of such exchanges in fostering intercultural competence across academic disciplines. We hypothesize that individuals who engaged in COIL exchange (experimental group) will demonstrate greater growth in intercultural competence than those in control group.

Hypothesis 1 (H1): Students who participate in COIL exchange will exhibit a greater increase in intercultural competence levels than students who do not participate in virtual exchange.

Hypothesis 2 (H2): Students who participate in COIL exchange will show significantly higher levels of intercultural competence at the postproject than at the preproject.

Methodology

Study Design and Participants

A quasi-controlled experimental design was employed to test our hypotheses. The current study forms part of an institution-wide initiative that advocates the implementation of virtual exchange at our university in Hong Kong. It included nine collaborative online learning projects, which were facilitated by the institution's Virtual Exchange Centre and conducted between 2023 and 2025. These projects spanned various disciplines, such as art and language, business studies, communication studies, and health science. Each project involved pairing a class from the institution with a class from an overseas higher education institution. Partner institutions were located in Canada, the

Netherlands, the Philippines, Palestine, and the United States.

Each COIL exchange commenced with an ice-breaking session, which was followed by engaging students in weekly discussions and synchronous and asynchronous exchanges on online platforms (e.g., Zoom, email, Moodle, Flip, and Padlet). These exchanges occurred once a week for a minimum of three weeks and focused on topics relevant to students' fields of study.

The data collection was in two stages. Initially, at the preproject stage, students completed an online survey to measure baseline intercultural effectiveness before the virtual exchange project period. Upon the completion of the project (postproject), students within the experimental and control groups were invited to complete the same survey again to assess any changes.

A total of 192 students (Female, 58.9%) from our university in Hong Kong participated in the study with informed consent obtained from all participants. Of these, 124 students (64.6%) participated in virtual exchange (experimental group), while 68 students (35.4%) were within the control group. The demographics of participants are detailed in Table 1.

Table 1. Demographic Characteristics of Participants.

Total Sample (N = 192)			
Variables	Levels	n	%
Gender	Male	78	40.6
	Female	113	58.9
	Others	1	0.5
Age	Age Under 20	70	36.5
	Aged 20–29	121	63.0
	Aged 30 or Above	1	0.5
Virtual Exchange Experimental Group (n = 124)			
Variables	Levels	n	%
Gender	Male	52	41.9
	Female	71	57.3
	Others	1	0.8
Age	Age Under 20	19	15.3
	Aged 20–29	104	83.9
	Aged 30 or Above	1	0.8
Control Group (n = 68)			
Variables	Levels	n	%
Gender	Male	26	38.2
	Female	42	61.8
Age	Age Under 20	51	75.0
	Aged 20–29	17	25.0
Source(s): Authors' own work			

Measures

The IES, which was provided by the Kozai Group, was used to assess participants' development in intercultural competencies. This scale comprises 52 self-reported items that are rated on a seven-point Likert scale (ranging from 1 = strongly disagree to 7 = strongly agree). The IES consists of three primary dimensions

of intercultural competencies that are each characterized by two subdomains: (1) continuous learning, which includes self-awareness and exploration; (2) interpersonal engagement, which comprises world orientation and relationship development; and (3) hardiness, which includes positive regard and emotional resilience. An overall IES score was computed by incorporating all subdimensions. A high score indicates high levels of intercultural competence.

Identifier questions (i.e., student number) and participants' demographics were included in the pre- and postproject surveys to ensure that paired responses could be matched effectively.

Results

Our study examined the effectiveness of virtual exchange on the development of students' intercultural competence. This investigation involved comparing the experimental group (students who participated in virtual exchange) with a control group (students who did not participate in virtual exchange) as well as assessing changes that are relative to baseline levels. All statistical analyses were conducted using SPSS version 29 [37]. Based on the skewness and kurtosis coefficients, the data demonstrated an approximately normal distribution (ranging within ± 2 for skewness and ± 7 for kurtosis), as suggested by Hair et al. [38], thus permitting the use of parametric tests.

Between-group Comparison

H1 posits that students who participate in virtual exchange COIL initiatives will exhibit a greater change in intercultural competence levels than those who do not participate. This hypothesis was tested by conducting an independent sample *t*-test. The test compared the mean score change, which was calculated as the difference between preproject and postproject IES scores, between the experimental group (students who participated in the virtual exchange) and the control group (students who did not participate).

Table 2 presents the means and standard deviations of pre- and postproject intercultural effectiveness scores along with the mean change in scores (computed as postproject score minus preproject score).

The results from the independent sample *t*-test, which compared the overall IES score change (SC) between the virtual exchange experimental group and the control group, revealed that the experimental group ($M_{SC} = 0.14$, $SD = 0.41$) reported a significantly higher change in overall IES score than the control group ($M_{SC} = -0.03$, $SD = 0.37$, $t(190) = 2.88$, $p < 0.01$), thus supporting H1. The difference in overall IES mean score change was considered to have a small to moderate effect size ($d = 0.43$).

Further analyses were conducted on the subdomains of each dimension. In terms of *continuous learning*, the score change in the experimental group ($M_{SC} = 0.25$, $SD = 0.60$) was significantly greater than that of the control group ($M_{SC} = -0.01$, $SD = 0.69$, $t(190) = 2.68$, $p < 0.01$, $d = 0.40$). Similar patterns were observed in both subdomains: *self-awareness* ($M_{SC-Experimental} = 0.27$, $SD = 0.64$ vs. $M_{SC-Control} = -0.03$, $SD = 0.80$; $t(190) = 2.88$, $p < 0.001$, $d = 0.43$) and *exploration* ($M_{SC-Experimental} = 0.23$, $SD = 1.08$ vs. $M_{SC-Control} = 0.01$, $SD = 0.70$; $t(190) = 2.10$, $p = 0.02$, $d = 0.32$). The effect size of score change in continuous learning, self-awareness, and exploration is considered small to moderate according to Cohen's d (0.32–0.43).

Table 2. Means and Standard Deviations of Pre- and Postproject Intercultural Effectiveness Scale and Mean Change in Intercultural Effectiveness ($N = 192$).

IES Dimensions Subdomains of Dimensions	Experimental Group ($n = 124$)						Control Group ($n = 68$)					
	Preproject		Postproject		Change		Preproject		Postproject		Change	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Continuous Learning ^a	5.00	0.76	5.25	0.72	0.25***	0.60	4.91	0.84	4.90	0.84	-0.01	0.69
Self-awareness ^a	4.79	0.78	5.06	0.75	0.27***	0.64	4.78	0.90	4.74	0.87	-0.03	0.80
Exploration ^a	5.20	0.83	5.43	0.78	0.23***	0.70	5.03	0.87	5.05	0.90	0.01	0.70
Interpersonal Engagement ^a	4.11	0.80	4.40	0.70	0.29***	0.61	3.80	0.79	3.78	0.72	-0.01	0.54
World Orientation ^a	3.39	1.11	4.00	1.16	0.62***	1.08	3.10	1.20	3.15	1.25	0.04	0.92
Relationship Interest	4.76	0.91	4.80	0.83	0.04	0.73	4.50	0.93	4.42	0.81	-0.07	0.77
Hardiness	4.03	0.68	3.96	0.72	-0.06	0.67	3.81	0.60	3.75	0.60	-0.06	0.51
Positive Regard	3.83	0.74	3.69	0.86	-0.15*	0.87	3.73	0.79	3.70	0.79	-0.03	0.65
Emotional Resilience	4.22	0.91	4.24	0.87	0.02	0.82	3.88	0.72	3.79	0.79	-0.09	0.65
Overall IES Score ^a	4.40	0.54	4.54	0.51	0.14***	0.41	4.17	0.57	4.14	0.49	-0.03	0.37
Note(s): SD, Standard deviation; Statistical significance of score change between pre- and postproject within subject, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Statistical significance of difference in mean score changes between experimental group and control group ^a $p < 0.05$.												
Source(s): Authors' own work												

Regarding *interpersonal engagement*, the experimental group ($M_{SC} = 0.29$, $SD = 0.61$) reported significantly greater score gains in the levels of interpersonal engagement than the control group ($M_{SC} = -0.01$, $SD = 0.54$, $t(190) = 3.50$, $p < 0.001$, $d = 0.53$). Specifically, a significant difference in the score change between the experimental group and the control group was observed in the subdomain of *world orientation* ($M_{SC-Experimental} = 0.62$, $SD = 1.08$ vs. $M_{SC-Control} = 0.04$, $SD = 0.92$; $t(190) = 3.69$, $p < 0.001$, $d = 0.56$), thus exerting a medium effect. However, no significant difference between the two groups was observed in *relationship development*: experimental group ($M_{SC} = 0.04$, $SD = 0.73$) and control group ($M_{SC} = -0.07$, $SD = 0.77$, $t(190) = 1.03$, $p > 0.05$, $d = 0.16$).

In terms of *hardiness*, no significant difference between the two groups was observed ($M_{SC-Experimental} = -0.06$, $SD = 0.67$ vs. $M_{SC-Control} = -0.06$, $SD = 0.51$; $t(190) = -0.00$, $p = 0.50$, ns). Similarly, no significant differences between groups were observed in both subdomains: *positive regards* ($t(190) = -0.95$, $p > 0.05$) and *emotional resilience* ($t(190) = 0.98$, $p > 0.05$).

Within-subject Comparison

H2 was tested by conducting a paired sample t -test to compare preproject and postproject IES scores among students who participated in the virtual exchange. The results confirmed a statistically significant increase in the overall IES score after participation in the virtual exchange with preproject scores ($M_{preproject} = 4.40$, $SD = 0.54$) compared with postproject scores ($M_{postproject} = 4.54$, $SD = 0.51$, $t(123) = 3.90$, $p < 0.001$, $d = 0.35$). This outcome suggests an improvement in students' overall intercultural effectiveness following the virtual exchange project. H2 was supported. No significant changes were found in the control group's IES scores ($p > 0.05$).

Specifically, students reported significantly higher levels of continuous learning in the postproject period ($M = 5.25$, $SD = 0.72$) than in the preproject period ($M = 5.00$, $SD = 0.76$, $t(123) = 4.59$, $p < 0.001$, $d = 0.41$). Similar patterns were observed in its two subdomains: self-awareness ($M_{preproject} = 4.79$, $SD = 0.78$

vs. $M_{postproject} = 5.06$, $SD = 0.75$; $t(123) = 4.71$, $p < 0.001$, $d = 0.42$) and exploration ($M_{preproject} = 5.20$, $SD = 0.83$ vs. $M_{postproject} = 5.43$, $SD = 0.78$; $t(123) = 3.74$, $p < 0.001$, $d = 0.34$).

With regard to interpersonal engagement, the paired t -test revealed a significant growth in interpersonal engagement score ($M_{preproject} = 4.11$, $SD = 0.80$ vs. $M_{postproject} = 4.40$, $SD = 0.70$; $t(123) = 5.37$, $p < 0.001$, $d = 0.48$). A significant increase was also observed in world orientation in the postproject period ($M = 4.00$; $SD = 1.16$) compared with the baseline ($M = 3.39$, $SD = 1.11$, $t(123) = 6.36$, $p < 0.001$, $d = 0.57$). However, no significant improvement was found in the subdomain of relationship interest ($t(123) = 0.64$, $p > 0.05$).

Interestingly, no significant change was observed in participants' hardiness dimension in the postproject period ($M = 4.03$, $SD = 0.68$) than in the baseline and preproject period ($M = 3.96$, $SD = 0.72$, $t(123) = -1.02$, $p < 0.05$). Notably, no significant difference was found in emotional resilience ($t(123) = 0.17$, $p > 0.05$). A marginally significant decrease in positive regard was observed following the participation in the virtual exchange ($t(123) = -1.86$, $p = 0.065$, $d = -0.17$).

Discussion

Intercultural competence is crucial for students' global competitiveness and employability as future leaders. Previous studies often lacked control or comparison groups and yielded mixed results [8, 16, 35]. This pilot study addressed this gap by assessing the impact of virtual exchange on intercultural competence. It compared students who participated in the COIL exchange with those who did not. Results empirically support the hypothesis that engaging in virtual exchange, such as COIL, enhances students' intercultural competence compared with those without such experience, which is consistent with the findings from prior research [8, 11-13, 15].

This study highlights the significant benefits of virtual exchange in self-awareness, exploration, and world orientation, which underscores its role in strengthening student's global mindset. These outcomes can be explained by student

engagement in collaborative learning activities that are focused on cultural differences. Virtual exchange facilitates cross-cultural interactions to promote reflection on cultural similarities and differences, thereby enhancing students' understanding of personal values and diverse ideas, values, and norms. Students gain exposure to other cultures through international peer interactions, thus improving their adaptability and understanding.

However, the benefits of virtual exchange on relationship development, positive regard, and emotional resilience were less apparent. No notable differences were observed between the experimental group and the control group as well as between pre- and postvirtual exchange. This outcome may be attributed to the limited duration of virtual exchange because developing and maintaining cross-cultural friendships typically require extended engagement. Additionally, cultural differences in communication styles and lack of motivation can lead to misinterpretations and reduced trust [39]. Consistent with previous studies, no significant growth in hardiness was observed possibly because of its dispositional nature [12, 40]. Students face several challenges, such as time zone differences, language barriers, and cultural disparities, which can evoke negative emotions, such as frustration and disappointment [41]. This scenario can potentially affect positive regard and stunt growth in relationship development and emotional resilience.

Implications

This study holds some implications for educational practices concerning virtual exchange. Virtual exchange appears to be a promising educational method to foster global competence within higher education settings. This pilot study supplements prior research [8, 12] and examines the positive impact of virtual exchange and COIL on individual development. Nurturing a global mindset and perspective is a key outcome of virtual exchange [9] and is strongly linked to enhanced employability. Thus, our findings provide support that virtual exchange is an effective pedagogical practice that is beneficial for developing the intercultural competence of students. Such exchange sparks interest in continuous learning about diverse cultures and boosts students' motivation to adopt a global perspective and adaptability to unfamiliar environments. Therefore, educators in the higher education sector should incorporate international perspectives into courses and academic curricula to equip students with intercultural competence, which is a vital element of employability that can provide students to engage with overseas peers [24].

Often, physical study abroad programs are only available to a small group of students because of financial, travel, visa, and scheduling constraints. Virtual exchange offers an accessible and inclusive alternative for the development of intercultural competence in higher education. Educators and practitioners should focus on building partnerships with overseas educational institutions to codevelop virtual exchange programs. Moreover, educators should address potential communication challenges, such as language proficiency and varied communication styles, through preparatory workshops that equip students with the necessary skills. These solutions can facilitate effective cross-cultural interactions and foster world orientation. Finally, continuous feedback collection from students and international partners is crucial to assess and refine virtual exchange practices. This approach ensures that the practices align with the educational objectives and maximize their pedagogical impact.

Limitations and Conclusion

Despite significant findings on the development of intercultural competence through virtual exchange, several limitations of this study merit consideration. First, we acknowledge that sample randomization is highly difficult in real settings of teaching deployments. Virtual exchange arrangements are subject to the mutual agreement between course teachers and the virtual exchange team, varying teaching needs across disciplines and subjects, and the availability of administrative support.

Second, reliance on self-reported data from Hong Kong Chinese students may introduce social desirability bias. Future research can employ behavioral and cognitive tasks, such as intercultural scenario-based questions [42], for objective assessment. In addition, the four-week duration of virtual exchange projects may be insufficient for building strong relationships with overseas peers or deeply understanding partner cultures, thus affecting dispositional attitudes, such as hardiness and emotional resilience. Nonetheless, the study demonstrated improvements in continuous learning and world orientation. Future research should explore varying engagement durations in synchronous and asynchronous exchanges.

This study acknowledges these limitations to emphasize the effectiveness of virtual exchange in fostering intercultural competence and the continuing advantage of virtual exchange in the holistic development of graduates in the post-COVID-19 era. Future studies are encouraged to investigate the long-term effects of prolonged virtual exchange experiences.

Conflict of Interest

All authors declared that they have no conflicts of interest.

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