Routledge
Taylor & Francis Group

Interactive Learning Environments

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/nile20

Cross-cultural social contexts: a comparison of Chinese and US students' experiences in active learning classrooms

Feng-Kuang Chiang , D. Christopher Brooks & Hui Chen

To cite this article: Feng-Kuang Chiang , D. Christopher Brooks & Hui Chen (2020): Cross-cultural social contexts: a comparison of Chinese and US students' experiences in active learning classrooms, Interactive Learning Environments, DOI: 10.1080/10494820.2020.1855206

To link to this article: https://doi.org/10.1080/10494820.2020.1855206

INTERACTIVE LEARNING ENVIRONMENTS
https://doi.org/10.1080/10494820.2020.1855206

Routledge
Taylor & Francis Group

Cross-cultural social contexts: a comparison of Chinese and US students' experiences in active learning classrooms

Feng-Kuang Chiang [a,b], D. Christopher Brooks [a,c] and Hui Chen[d]

[a]Advanced Innovation Center for Future Education, Beijing Normal University, Beijing, People's Republic of China; [b]Department of Educational Technology, College of Education, Shanghai Normal University, Shanghai, People's Republic of China; [c]EDUCAUSE, Boulder, CO, USA; [d]School of Educational Technology, Beijing Normal University, Beijing, People's Republic of China

ABSTRACT

Active learning classrooms (ALCs) have been demonstrated to have significant and positive impacts on student learning experiences, student learning outcomes, and instructor and student behavior compared to traditional classrooms. The social context of a classroom – levels of student–student and student–instructor interaction – has been demonstrated to partially explain the effects ALCs have on students and instructors. This research is the first attempt to extend social context research beyond the US higher education classroom by comparing levels of social context of Chinese and US students taking courses in ALCs. We find that formal student–instructor relations in the US and China are not the same, that general student–student relations, informal student–instructor relations, and students as instructors are quite similar for Chinese and US students, but that these relationships express themselves at different levels. We believe that some of the variation observed can be attributed to cultural differences but are hopeful that the similarities observed lend themselves to expanding learning space research on social context to other countries and advancing cross-cultural research on learning spaces.

ARTICLE HISTORY
Received 23 November 2019
Accepted 16 November 2020

KEYWORDS
Active learning; learning environments; active learning classrooms (ALCs); social context; student–instructor relations; student–student relations

Introduction

The spaces in which teachers teach and students learn are experiencing a revolution. At least since the 1990s, colleges and universities in many different countries have begun to reexamine the physical learning spaces on their campuses. Driven in part by a contemporary understanding of how students learn that emphasizes student-centered active learning pedagogy (Ambrose et al., 2010; Bernard et al., 2009; Cuseo, 1992; Pascarella & Terenzini, 2005; Prince, 2004), administrators, designers, and faculty are thinking creatively about how to redesign learning spaces to improve the student learning experience. Because early efforts with these active learning classrooms (ALCs) showed promise (Beichner et al., 1999; 2007; Dori et al., 2003; Dori & Belcher, 2005), many more institutions of higher education are now reshaping their learning spaces, considering carefully how best to use those spaces, and studying the effects of their efforts.

Early research on ALCs found that (1) ALC sections of courses often require time for students to acclimate to space before positive results are seen, and (2) ALC sections tend to show the strongest learning gains among the lowest-performing students (Oliver-Hoyo et al., 2004). Research

CONTACT D. Christopher Brooks cbrooks@educause.edu EDUCAUSE, 4845 Pearl East Cir Ste 118, PMB 43761, Boulder, Colorado 80301-6112, USA

at the University of Minnesota (UMN) dating back to 2007 showed that students benefit from taking classes in ALCs, in terms of the quality of their learning experience and the learning outcomes they achieve (Baepler et al., 2014; Brooks, 2011, 2014; Walker et al., 2011; Cotner et al., 2013). Past studies have also demonstrated that ALCs have a significant greater impact on learning outcomes (Brooks, 2011; Byers et al., 2014) and levels of students' engagement in learning than traditional classrooms (Brooks, 2011; Cotner et al., 2013; Kimberly et al., 2016). Furthermore, Brooks (2014) found evidence that controlling for space, course, and instructor, active learning pedagogical approaches produced better results than using a lecture-based one when teaching in an ALC.

Research on ALCs at several other institutions has reinforced these early findings that spaces shape teaching practices and learning outcomes while teasing out nuances in our understanding of factors that impact student learning experiences. For example, Ridenour et al. (2013) found that using active learning techniques in an ALC improved students' problem-solving abilities. Muthyala and Wei (2013) used a quasi-experimental design to compare two different types of ALCs and observed no significant differences in student learning outcomes. McArthur (2015) discovered that the interaction between instructors and the physical spaces has an impact on behavioral, cognitive, and affective learning outcomes. And, using a quasi-experimental design, Soneral and Wyse (2017) found no significant difference in the impact of low- versus high-tech ALCs on student learning outcomes and that analog collaborative writing surfaces proved more important than the digital technologies.

More recently, the study of learning spaces in the United States (US) has expanded considerably to explore a wide range of topics including the process of learning space design demand analysis, teaching usage, and effect evaluation. For example, we are garnering a better understanding the needs of students and faculty as end-users and how taking those preferences into account can improve the experiences of those who use the spaces (Alstete & Beutell, 2018; Hynes & Hynes, 2018). Additionally, research continues to support the mutual reinforcement of learning spaces design, technology selection, and pedagogical approaches (Hacisalihoglu et al., 2018; Lee et al., 2018; Nicol et al., 2018). A sign of a maturing field, efforts are even being made to improve data collection efforts and research methodologies in ALCs (Roman & Uttamchandani, 2018).

Evidence of the impact of ALCs has led to both interest and investments in physical learning environments that facilitate active learning and student interaction around the world. Increased awareness of the utility of ALCs was recognized by educational technology researchers at Beijing Normal University (BNU) who had five traditional classrooms converted into ALC prototype classrooms as part of The Experience Center for the Future of Learning project. Each of these five classrooms were configured in different manners to elicit different kinds of student experiences and to conduce to a host of possible instructor needs. Early evaluation and assessment research on these spaces produced results (Chen et al., 2017; Chiang, 2015; Chiang & Chen, 2017) similar to those of early ALC research studies from the US and elsewhere that showed significant levels of student engagement, improvements in student learning outcomes, and instructor satisfaction. Unfortunately, much of the research on ALCs in China continues to be focused mainly on the impact of ALCs on students' learning (Chiu & Cheng, 2017).

Despite the considerable evidence that ALCs have a significant impact on teaching and learning, we know very little about what mechanisms that change instructor behavior and improve student experiences. That is, what is it about ALCs that lead students to outperform expectations and report a better learning experience? Researchers are only now beginning to understand how different types of classrooms elicit the measurable behavioral, affective, and cognitive differences observed by learning space researchers (Cicuto & Torres, 2016). Understanding this process is paramount if the research in this field is to advance. One of the more promising explanations is the emerging theory of social context.

Social context

In 2012, researchers at UMN began an effort to systematically investigate the manner in which the networks of relationships, known collectively as the "social context" of learning spaces, was altered by ALCs (Baepler et al., 2016). Unlike engagement which tends to focus on the individual student, the social context "consists of the network of inter-relationships in the classroom, between instructors and students as well as among students themselves" (Walker & Baepler, 2017, p. 35). By theorizing the important aspects of student–instructor and student–student relations, researchers aimed to measure those relationships so that we might better understand how they relate to the quality of the student learning experience and with student learning outcomes in ALCs. A key aspect of this investigation was the development of the *Social Context and Learning Environments* (SCALE) survey instrument which was built on conversations with students and faculty members, along with think-aloud protocol interviews with students. Different versions of the survey have now been administered to nearly 4000 students in a variety of classes taught in different sorts of classrooms at three different universities. The researchers who developed the instrument have established the reliability and validity measures of four underlying factors that comprise social context (Walker & Baepler, 2017, 2018).

Two of these factors describe relations between students, and two other factors measure the relations between student and instructor. The dimensions of social context as measured by the SCALE survey are as follows:

- *Student–student (SS) general* relations: The extent to which students work well together, respect one another, are acquainted with each other, etc. Items that comprise this dimension include such statements as "I've learned something from my classmates," "I know something personal about the people sitting near me in class," and "I feel comfortable asking for help from my classmates."
- *Students acting as instructors (SAI)* to other students: The degree to which a student has acted in the role of instructor with respect to his or her fellow students. This dimension includes such items as "The people sitting near me have learned something from me this semester," "I can explain my ideas in specific terms," and "I can help others in this class learn."
- *Student–instructor formal (SI-F)* relations: Describes whether the instructor and students are perceived to be working together to support students' learning. Items from this dimension include "My instructor makes class enjoyable," "My instructor wants me to do well on the tests and assignments in this class," "The material covered by the tests and assignments in this class was presented and discussed in class or online," and "My instructor encourages questions and comments from students."
- *Student–instructor informal* (SI-I) relations: Describes non-class-related aspects of the student–instructor relationship, such as acquaintance, informal chatting, and so forth. The SI-I dimension includes the items "The instructors knows my name," "The instructor is acquainted with me," and "I am acquainted with the instructor." (Walker & Baepler, 2017, 2018)

Research applying social context theory to student learning outcomes suggests that social context may offer at least a partial explanation of the variation in student learning we observe in ALCs and traditional classrooms. First, different types of classrooms (ALCs, traditional lecture halls, etc.) appear to be associated with different levels of social context, confirming our initial hypothesis that the type of learning space in which a class is held has an impact on relations among students and between students and instructors. Second, the different aspects of social context appear to be related to student learning outcomes, which indicates that social context could play a role in explaining how learning spaces shape student learning. Specifically, Walker and Baepler (2018) found that (1) SS relations were negatively and SAI measures were positively

associated with student learning outcomes as measured by grades in both environments; (2) SI-F was correlated positively with student learning outcomes in ALCs, but were unrelated in traditional classrooms; and (3) the SI-I context was found to be unrelated to student learning in both learning environment types.

Research questions

The authors were presented with an opportunity to partner on this project in the 2016–2017 academic year following a brief period of collaboration on learning spaces in Beijing in 2016. Given the consistency and similarity of findings related to the impact of ALCs on student learning experiences and outcomes in the US and China (e.g. improvements in student engagement, student learning outcomes, and instructor satisfaction), the authors proposed to expand on the work on social context developed by colleagues at UMN to include a cross-national, cross-cultural component. Specifically, we were interested in whether or not the initial results produced by the SCALE survey could be reproduced in an international context in which socio-cultural variations in the approaches to pedagogy and higher education are dissimilar. In other words, are the findings produced by UMN researchers particular to instructors and/or institutions in the upper Midwest of the US or could these findings be generalized to other contexts, even to those beyond the Western context in which they were first observed.

Given the nascent aspect to the research surrounding social context and ALCs, we advanced three basic research questions:

1. Are the social contexts in the Chinese classrooms structurally similar or different from classrooms in the US?
2. Are the levels of social context measures in Chinese classrooms similar or different from those in US classrooms?
3. Are the levels of social context measures in Chinese ALCs similar or different from those in traditional Chinese classrooms?

Research methods

The study was designed to be carried out over the course of a calendar year that included two semesters (spring and fall). The first semester was intended to serve as a pilot of a version of the SCALE instrument translated into simplified Chinese. This was an iterative process that involved several rounds of translation and interpretation by the researchers and graduate students at BNU in order to converge on item meaning that closely approximated the original English versions. The second semester was intended to serve as a live test of the impact of ALCs on social context measures in the Chinese classrooms that could be compared with aggregated data collected from US institutions. While the authors were unable to impose controls on a host of factors for this study due to temporal, geographical, and cultural limitations, the physical similarities in the types of active learning spaces and the research on the impact of ALCs on teaching practices and learning outcomes allow for direct comparisons of social context results.

In terms of space, ALCs in the US context "are classrooms that arrange students around tables, each table with a whiteboard mounted on the wall and often with the capacity to project the screen of a student's laptop to the rest of the class" (Baepler et al., 2016). These classrooms tend to lack of a central focal point, arrange the furniture on a single plane, and feature a network of aisles that afford easy access to all students. They are more conducive to more frequent and sustained interactions between instructors and students and create opportunities for students to engage one another more frequently and intensely. Drawing upon theories of learning space design, the eight ALCs at BNU were configured with different layouts to meet the needs of different teaching and learning objectives. The classrooms are rich in digital technologies including

a Surface mobile terminal, interactive electronic whiteboards, and multi-screen interaction (Chiang, 2015). At the same time, the BNU classroom space designs take into account architectural principles, ergonomics, and other elements to create rich media environments and comfortable active learning spaces. Despite these variations, research suggests that there are no significant differences in the impact of different types of ALC configurations on student learning (Muthyala & Wei, 2013).

In terms of research, the impact of ALCs on teaching practices and learning outcomes in the US is well-established (Baepler et al., 2016). Quasi-experimental designs have demonstrated the significant, positive, and independent impact ALCs have on student learning outcomes (Baepler et al., 2014; Brooks, 2011, 2014; Cotner et al., 2013). Furthermore, ALCs have been shown to produce higher levels of engagement, student enrichment, and the overall quality of teaching and learning experiences (Brooks, 2011). Similarly, since the completion of the ALC spaces at BNU, the Future Learning Experience Center has carried out a lot of innovative teaching and research work as an active learning space (Chiu & Cheng, 2017). Another study found that compared with traditional multimedia classrooms, ALCs play significant roles in stimulating motivation, promoting interaction, improving participation, enhancing the emotional experience and creating a learning atmosphere (Chiang, 2015). The cross-cultural similarities in the impact of ALCs on the teaching and learning experiences suggest that comparisons of the social contexts in the classrooms of the US and China are not unwarranted.

Data for this study were collected at BNU in the spring and fall 2016 semesters. In the first semester, 605 BNU students participated in our survey. About half of the respondents (51%) were students taking courses in the ALCs housed in BNU's Experience Center for the Future of Learning; the other half (49%) of surveyed students were taking courses in traditional classroom on the BNU campus. In the second semester, we administered the revised survey to 338 students who took a full-semester course in the BNU Experience Center and 323 students who took courses in traditional classrooms. We used aggregated data previously collected at UMN for our comparisons.

Among our first tasks was the need to establish the validity and reliability of the social context instrument using the BNU data. First, the researchers calculated the average scores of BNU questionnaire data according to the established dimensions of social context questionnaire (Walker & Baepler, 2017, 2018) and then calculated Cronbach's alphas to establish the scale reliability of each dimension. We also conducted exploratory factor analyses in an attempt to establish the construct validity of the Chinese version of the social context instrument. Based on the results of these analyses, we revised the social context items again, especially the translation from English to Mandarin, in preparation for the second round of data collection in fall 2016. We repeated the reliability and validity tests on the fall 2016 data with particular focus on the items which were not loading well on each dimension from the spring pilot data. The results of these tests will serve as the basis for revisions to subsequent versions of the Chinese version of the social context instrument.

Finally, we focused our efforts on an analysis of the BNU and UMN data along the three dimensions – SS, SI-I, and SAI – that lend themselves to the cross-cultural comparisons of interest. First, we calculated the means and standard deviations for SS, SI-I, and SAI dimensions of Chinese students who had been taking courses in the BNU Experience Center. We then conducted a two-sample mean-comparison (*t*-test) on the BNU and UMN data to identify any significant differences between the social contexts in Chinese and American ALCs. Second, we wanted to compare the social contexts scores of BNU students who had been studying in ALCs with those of students who had been studying in traditional classrooms. Again, we deployed a two-sample *t*-test to identify any significant differences in the social context experiences of Chinese students in ALCs and traditional classrooms.

Pilot testing: spring 2016

In the first semester, the authors collaborated to develop a Chinese version of the SCALE instrument for pilot testing at BNU. This was an iterative process that involved several rounds of translation and

Table 1. Scale reliability of pilot SCALE instrument (Chinese version).

	Student–student (SS)	Student–instructor formal (SI-F)	Student–instructor informal (SI-I)	Student as instructor (SAI)	Overall social context (SCALE)
Cronbach's alpha	0.876	0.594	0.887	0.850	0.936

interpretation by the researchers and graduate students at BNU in order to converge on item meanings that closely approximated the original English language versions.

The research team obtained permission from the authors of the instrument (Walker & Baepler, 2018) and consulted with them throughout the process of translating the survey. The questionnaire was translated into Chinese using the Brislin (1970) method. The main translation team consists of four people including a Chinese graduate student in the department of educational technology, a Chinese expert in educational technology, a US scholar engaged in the study of learning space with extensive knowledge about the original English instrument development, and a Chinese-American. The questionnaire was first translated into Chinese by graduate students of the Department of Educational Technology at BNU. After being examined by educational technology experts, the translated Chinese questionnaire was translated back into English by a Chinese American, forming a back-translated version of the social context questionnaire. The comparison documents in Chinese, original English, and retranslated English were sent to US scholars for comparison again. The domestic research team and the US learning space experts discussed the objectionable items in the translation questionnaire one by one through video conference and adjusted the items in manner that was agreeable to form the test version of the Chinese SCALE survey. The authors then administered the instrument to five students who gave feedback and suggestions on various aspects of the items to further refine the translation. All five students were able to complete the questionnaire in 6–7 minutes (on average) and to accurately understand the meaning of the items.

The first Chinese language version of the SCALE instrument was administered at the conclusion of the spring 2016 semester to 605 BNU students. About half of the respondents (51%) were students taking courses in the ALCs housed in BNU's Experience Center for the Future of Learning; the other half (49%) of surveyed students had been taking courses in traditional classrooms on the BNU campus. The results of our reliability and validity tests on the pilot data were mixed. Generally, the scale reliability of the constructs and overall instrument held up well. Three (SS, SI-I, and SAI) of the four dimensions of the translated SCALE instrument returned "good" scale reliability with Cronbach's alphas between 0.80 and 0.90 (see Table 1). The SI-F scale reliability score was, however, poor to questionable (0.594). Despite the weakness of the SI-F dimension, the overall scale reliability of the social context instrument was excellent (0.936).

We also examined the structural validity of the pilot data to understand how well the translated SCALE instrument performed in the Chinese context. Principal component analysis yielded the best factor structure, retaining more items and producing slightly stronger factor loadings. We also performed factor analysis to find out whether or not the US and China versions of the SCALE instruments had the same structure. Using oblique rotation with Kaiser normalization, we found that the structure of the Chinese version of the instrument matched fairly well with the US version. The factors underlying the BNU data were at least moderately correlated, but the SI-F factor remained problematic. Furthermore, the analysis produced five, instead of four, factors with Eigenvalues greater than 1.0. Of these, three were useable factors containing three or more items that matched well the US version of the survey; about three-fifths (0.607) of the variance in the data were explained by the identified factors. Four items (Q13, Q14, Q17, and Q19) failed to load on any of the usable factors with loadings above 0.40. The pilot data suggested that some aspects of the social context in a Chinese classroom were structurally similar to a classroom in the US, but the ways in which the instrument was failing to reproduce the original dimensions indicated that revisions to the instrument would be necessary. This prompted us to revisit the

Table 2. Factor analysis of SI-F items (Chinese version).

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
The material covered by the tests and assignments in this class was presented and discussed in class or online.	0.127	−0.022	**−0.601**	−0.137	−0.094
My instructor wants me to do well on the tests and assignments in this class.	0.246	**−0.429**	−0.125	−0.116	−0.015
Sometimes I feel like my instructor and I are on opposing teams in this class.	−0.039	−0.071	0.013	**0.766**	0.119
My instructor encourages questions and comments from students.	**0.715**	−0.070	0.025	−0.315	0.045
My instructor makes class enjoyable.	0.167	**−0.391**	**−0.367**	**−0.368**	−0.157

items that had failed to load, especially their translation from English to Mandarin, in preparation for the second round of data collection in fall 2016. After adjusting the translation of some items on the instrument, we again randomized the question order to control for possible response biases observed in the pilot data.

Field testing: fall 2016

In the autumn 2016, we administered the revised survey to 338 students who took a full-semester course in the BNU Experience Center and 323 students who took courses in traditional classrooms. The scale reliability of the questionnaire was excellent (Cronbach's alpha = .902) and a comparison of the factor structures between the Chinese and US students matched well on each dimension with the exception of the SI-F one. Indeed, the structure of the SI-F dimension for the Chinese students completely fell apart with the five items loading across four different dimensions, including one ("My instructor makes class enjoyable.") that weakly loads across three separate dimensions (see Table 2).

Our inability to replicate the SI-F factor structure in two successive attempts that included revised interpretations of items from English to Mandarin and a re-randomization of the items has several possible explanations. First, it could be that the SI-F dimension is simply not valid. However, the empirical evidence related to the testing and validation of the instrument during its development in the US suggests otherwise (Walker & Baepler, 2017). Second, systematic response bias from students may have disrupted the measure of the SI-F dimension. This, too, seems unlikely as we obtained similar results for all dimensions using versions of the instrument that were randomized between the first and second iterations. Third, it is possible that the retranslation of the items from English to Mandarin failed again to capture and convey the meaning of items. Yet, our translation of other items seemed to work well (enough) to replicate the other three dimensions without similar problems; moreover, several Chinese native speakers were asked to check the translations, and none flagged the items as problematic. Finally, and most likely, it could be that the formal relationships between student and instructors in the US is fundamentally different than those of Chinese students and instructors. It could be, then, that the instrument is picking up the cultural differences in how instructors and students in China relate to one another is a formal classroom context. Specifically, it is plausible that this difference may be related to the legacy of Confucian approaches to education (Wang, 2013). So, while the structure of social contexts in China and the US are similar in many ways (SS, SI-I, and SAI), our results suggest that the structure of the cultural expectations about the formal relationships between students and instructors in China departs starkly from those observed in the US.

Comparisons: US versus China

Based on the face validity of the UMN dimensions and the validity and reliability tests performed here, we constructed measures for SS, SI-I, and SAI for the BNU students; we have excluded the results of the SI-F as the tests for construct validity failed. The BNU mean for each construct was

Table 3. Social context summary statistics and comparisons of ALC students, China versus US.

	BNU			UMN			
	n	Mean	Standard deviation	*n*	Mean	Standard deviation	*t*
SS	317	3.9397	.57906	358	3.9598	.60061	0.202
SI-I	325	3.5497	.81366	368	4.0255	.62943	−7.586*
SAI	324	3.5448	.71302	367	3.8307	.60781	−4.680*

Note: *$p < .01$.

well-above the midpoint of the five-point Likert scale (see Table 3). When we compare the BNU data to the UMN data, we obtain mixed results. In the case of SS, BNU students ($M = 3.94$, SD = 0.58) and UMN students ($M = 3.96$, SD = 0.60) do not appear to relate to one another any differently in the ALC, suggesting that Chinese and US students may have a similar understanding of their roles and relationships to one another. That is, students relate to each another in similar ways despite cultural differences. BNU students, however, report on average significantly lower levels of agreement about the informal relationship they have with their instructors (SI-I) ($M = 3.55$, SD = 0.81) than do their UMN counterparts ($M = 4.03$, SD = 0.63). BNU students ($M = 3.54$, SD = 0.71) also have significantly lower scores on instructing other students (SAI) than UMN students ($M = 3.83$, SD = 0.61). That is, students in the Chinese context do not appear to have an informal relationship with their instructor that is as strong as students in the US context and US students report greater levels of ability to help their peers learn than do Chinese students.

Comparisons: ALCs versus traditional classrooms in China

A comparison of Chinese students' experiences in ALCs and traditional classrooms reveals significant differences in the social contexts (see Table 4). Compared to students in the traditional classroom setting, we found that students in ALCs posted significantly higher average social context scores on all three of the dimensions we retained from the translated instrument: SS (diff = 0.14, $p < .01$), SI-I (diff = 0.17, $p < .01$), and SAI (diff = 0.14, $p < .01$). This means that general student–student relationships, informal student–instructor relationships, and student as instructor relationships are stronger in ALCs than in traditional classroom spaces, a finding that confirms the work of Walker and Baepler (2018, p. 6). These findings support the idea that ALCs produce social contexts that are more conducive to the types of interaction, cooperation, and collaboration that lead to improved student learning in those spaces. Although more research is required to confirm the nature and magnitude of the relationship, especially as it relates to student learning outcomes and other impact measures, the similarities in results suggest that social context may play a similar role in higher education classrooms in both the US and China.

Discussion

In this study, the first of its kind to our knowledge, we compared levels of the various social contexts present in an ALC between students from the US and China. The mixed results we present lend

Table 4. Comparison of social contexts in China, ALCs versus traditional classrooms.

	Learning space types	Mean	Difference
SS	ALC	3.9397	0.1416*
	Traditional	3.7981	
SI-I	ALC	3.5497	0.1660*
	Traditional	3.3837	
SAI	ALC	3.5448	0.1438*
	Traditional	3.4010	

Note: *$p < .01$.

themselves to further research to better understand (1) the impact of culture on classroom relationships among students and between students and their instructors and (2) the ways in which formal learning spaces may serve as mediating or mitigating factors in those social contexts. Moreover, there are methodological lessons to be learned from carrying out cross-cultural, cross-national research that may inform the work of future scholars in this or similar fields.

First, we observe that Chinese and US students relate to one another quite similarly in ALCs. That is, on average, students from both countries learn things from one another, rely on one another for help in learning class material and are helpful resources to each other, work well together on class assignments, are acquainted with and know something personal about one another, are comfortable seeking help from one another, discuss materials in class with one another, respect each other's opinions, and are helpful resources to one another at similar levels when working in ALCs. Given what we know about the impact of learning spaces on teaching practices, learning activities, learning outcomes, and social relationships (Baepler et al., 2016; Brooks, 2011, 2012, 2014; Chiang, 2015; Walker & Baepler, 2017), we aver that the organization of ALCs to facilitate student interaction may contribute to these similarities, despite cultural differences.

Second, US students in ALCs appear to have significantly better informal relationships with their instructors than do Chinese students in similar classroom spaces. That is, Chinese students are significantly less likely to report that their instructor knows their names, cares about them, is acquainted with them, and has spoken informally with them before, during, or after class than US students in ALCs. This difference pervades despite the fact that ALCs are explicitly designed to reduce the physical and psychological distance between instructors and students, creating more opportunities for them to interact with one another formally or informally. We think that part of this may be related to the impact of Confucian culture on students' orientation to the instructor in the Chinese context. Historically, the pedigree of Chinese teachers commanded respect for their wisdom, especially from students who are taught not to question their teachers and to admire them from afar. Although this cultural disposition may have weakened over time, instructors continue to command a significant amount of respect from their students and are viewed as authority figures both inside and outside of the classroom. In the US context, students still view their instructors as sources of authority and expertise, but US culture is dominated by egalitarian and democratic impulses (Tocqueville, 1838) that flatten those student–instructor relationships. Instructors, especially in an ALC context, may be seen as more of a collaborator, colleague, and friend in the US than in China.

Third, students from the US engage one another as instructors on average significantly more than do students from China. When it comes to understanding these differences, it may be that US students have had more exposure to and, therefore, may be more comfortable with constructivist and active learning modes of instruction. US students, who are more likely to have received instruction using these approaches (Johnson, 2000) may have more experience communicating with one another directly and sharing knowledge with one another (Boyle & Rothstein, 2008; Burden & Byrd, 2012). Chinese students, on the other hand, are frequently encouraged to learn by themselves and to demonstrate their knowledge and skills individually.

Fourth, we have learned that the formal relationship between students and instructors in the Chinese university differs from its US manifestation. The SI-F dimension of the SCALE instrument, which has been subjected to a rigorous validation regime (Walker & Baepler, 2017), failed to load onto a single factor in the Chinese context. This suggests that the formal relationship between Chinese students and Chinese instructors is fundamentally different than the formal relationship between US students and their US instructors. However, it is possible that the sample of students on whom data was collected at BNU for this project are not representative of the typical Chinese university student because BNU is widely considered the best university for training teachers in China. In that case, collecting more data using the same instrument from students at other Chinese universities can help us understand both if and how the Chinese SI-F dimension is different than the US one. This is an important next step given that Walker and Baepler (2018) have found that SI-F is a significant and positive predictor of student learning outcomes in ALCs.

Fifth, and finally, we find that students in ALCs have more interaction with students and instructors. Faculty and students who teach and learn in ALCs are more familiar with each other than those who offer and take courses in traditional classrooms. Through observation, we found that in ALCs, instructors will move more and often adopt student-centered teaching methods and that students cooperate and collaborate with one another in groups with greater ease. The polycentric layout of these spaces directs the attention of students not to the front of the room occupied by an authority figure but to each other, fostering group cohesion and better communication (Talbert & Mor-Avi, 2019). This phenomenon was confirmed by Brooks (2012) who found significantly less lecturing, more class discussion, and less time spent at the podium in ALCs. ALCs are conducive to student-centered activities and encourage more connections between students and teachers.

As with any study, there are limitations of design, measurement, and scope that impede our ability to generalize. We have identified two major limitations of this study, although there may be others. First, despite the relatively large sample sizes and the cross-national nature of the comparison here, the data in this study are drawn from only two institutions and do not represent representative sample of higher education students from either country. In China's normal universities, the proportion of male and female students has been relatively low, which is related to the stereotype of teachers in Chinese history and culture. As we collect data in normal institutions, the ratio of female students in the sample is much higher than that of male students, which is the same as the actual gender ratio of students in normal universities. Our ability to generalize our lessons about social context to other students, institutions, and countries is, therefore, severely limited. Second, our inability to replicate the SI-F dimension of the SCALE instrument using the Chinese data limits our comparisons between the Chinese and US students and may require further research to understand if these results require us to reconceptualize that dimension or to gather more data. Until we know more about the formal relationship between students and faculty in China, our cross-national comparisons will continue to be limited. We think that with the collection of more student data from a larger number of institutions we will be able to understand better the SI-F dimension in China and may take steps to a more generalizable theory and measure of social context in learning spaces.

Conclusion

As the first cross-national, cross-cultural attempt to compare social context in learning environments, our research aims to move the field forward by considering the impact of culture on the relationships among students and between students and instructors in the classroom. On the surface, the results – US students and Chinese students are similar in some of their relationships and different in others – may be typical of a study of this type. However, we think that our research is laying the groundwork for future comparisons between Chinese and US students, for future explorations of the relationships between Chinese students and their instructors and understanding how social context serves as a mechanism for improving student learning outcomes in innovative learning spaces. As ALCs continue to be considered one of the most important strategic technologies in higher education (Brooks, 2019; Grajek & Grama, 2018) and the global popularity of ALCs continues to grow, it will become increasingly important for us to understand how students and instructors everywhere relate to these new and innovative classroom spaces.

Acknowledgments

The authors would like to acknowledge the Advanced Innovation Center for Future Education, Beijing Normal University, Beijing, China for its generous support of this project. The authors would also like to thank J.D. Walker and Paul Baepler, both of the University of Minnesota, for sharing the SCALE survey and summary data from their analyses for this project.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Advanced Innovation Center for Future Education (AICFE), Beijing Normal University.

Notes on contributors

Feng-Kuang Chiang is a Distinguished Professor of Educational Technology at Shanghai Normal University.

D. Christopher Brooks is Director of Research for EDUCAUSE.

Hui Chen is a graduate student at Beijing Normal University.

ORCID

Feng-Kuang Chiang http://orcid.org/0000-0002-6010-6048
D. Christopher Brooks http://orcid.org/0000-0002-6707-7104

References

Alstete, J. W., & Beutell, N. J. (2018). Designing learning spaces for management education: A mixed methods research approach. *Journal of Management Development*, *37*(2), 201–211. https://doi.org/10.1108/JMD-08-2017-0247

Ambrose, S. A., Bridges, M. W., DiPietro, M., Lovett, M. C., & Norman, M. K. (2010). *How learning works: Seven research-based principles for smart teaching*. Wiley.

Baepler, P., Walker, J. D., Brooks, D. C., Saichaie, K., & Petersen, C. I. (2016). *A guide to teaching in active learning classrooms: History, research, and practice*. Stylus.

Baepler, P., Walker, J. D., & Driessen, M. (2014). It's not about seat time: Blending, flipping, and efficiency in active learning classrooms. *Computers & Education*, *78*, 227–236. https://doi.org/10.1016/j.compedu.2014.06.006

Beichner, R., Bernold, L., Burniston, E., Dail, P., Felder, R., Gastineau, J., Gjerston, M., & Risley, J. (1999). Case study of the physics component of an integrated curriculum. *American Journal of Physics*, *67*(S1), S16–S24. https://doi.org/10.1119/1.19075

Beichner, R. J., Saul, J. M., Abbott, D. S., Morse, J. J., Deardorff, D. L., Allain, R. J., Bonham, S. W., Dancy, M. H., & Risley, J. S. (2007). Student-centered activities for large enrollment undergraduate programs (SCALE-UP) project. In E. Redish & P. Cooney (Eds.), *Research-based reform of university physics* (pp. 1–42). Maryland: American Association of Physics Teachers.

Bernard, R. M., Abrami, P. C., Borokhovski, E., Wade, C. A., Tamim, R. M., Surkes, M. A., & Bethel, E. C. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational Research*, *79*(3), 1243–1289. https://doi.org/10.3102/0034654309333844

Boyle, E., & Rothstein, H. (2008). *Essentials of college and university teaching: A practical guide* (3rd ed). ProActive Press.

Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology*, *1*(3), 185–216. https://doi.org/10.1177/135910457000100301

Brooks, D. C. (2011). Space matters: The impact of formal learning environments on student learning. *British Journal of Educational Technology*, *42*(5), 719–726.

Brooks, D. C. (2012). Space and consequences: The impact of different formal learning spaces on instructor and student behavior. *Journal of Learning Spaces*, *1*(2).

Brooks, D. C. & McCormack, M. (2019). *Higher Education's 2019 Trend Watch and Top 10 Strategic Technologies*. Research report. Louisville, Colorado: ECAR.

Brooks, D. C. & Solheim, C. (2014). Pedagogy matters, too: The impact of adapting teaching approaches to formal learning environments on student learning. In P. Baepler, D. C. Brooks, & J. D. Walker (Eds.), *Active Learning Spaces: New Directions for Teaching and Learning*. J-B TL Single Issue Teaching and Learning (vol. 137, pp. 53–61).

Burden, P. R., & Byrd, D. M. (2012). *Methods for effective teaching: Meeting the needs of all students* (6th ed). Pearson.

Byers, T., Imms, W., & Hartnell-Young, E. (2014). Making the case for space: The effect of learning spaces on teaching and learning. *Curriculum and Teaching*, *29*(1), 5–19. https://doi.org/10.7459/ct/29.1.02

Chiang, F.-K., & Chen, H. (2017). The effect of seating arrangement design with different learning spatial densities on students' active learning. *Modern Educational Technology*, *11*, 64–70. (In Chinese).

Chiu, P. H. P., & Cheng, S. H. (2017). Effects of active learning classrooms on student learning: A two-year empirical investigation on student perceptions and academic performance. *Higher Education Research & Development*, *36*(2), 269–279. https://doi.org/10.1080/07294360.2016.1196475

Cicuto, C. A. T., & Torres, B. B. (2016). Implementing an active learning environment to influence students' motivation in biochemistry. *Journal of Chemical Education*, *93*(6), 1020–1026. https://doi.org/10.1021/acs.jchemed.5b00965

Cotner, S., Loper, J., Walker, J. D., & Brooks, D. C. (2013). Research and teaching: "it's not you, it's the room" – Are the high-tech, active learning classrooms worth it? *Journal of College Science Teaching*, *42*(6), 82–88. https://doi.org/10.2505/4/jcst13_042_06_82

Cuseo, J. (1992). Collaborative and cooperative learning in higher education: A proposed taxonomy. *Cooperative Learning and College Teaching*, *2*(2), 2–4.

Dori, Y. J., Belcher, J., Besette, M., Danziger, M., McKinney, A., & Hult, E. (2003). Technology for active learning. *Materials Today*, *6*(12), 44–49. https://doi.org/10.1016/S1369-7021(03)01225-2

Dori, Y. J., & Belcher, J. (2005). How does technology-enabled active learning affect undergraduate students' understanding of electromagnetism concepts? *Journal of the Learning Sciences*, *14*(2), 243–279. https://doi.org/10.1207/s15327809jls1402_3

Grajek, S., & Grama, J. (2018). *Higher education's 2018 Trend Watch and Top 10 strategic technologies. Research report*. ECAR.

Hacisalihoglu, G., Stephens, D., Johson, L., & Edington, M. (2018). The use of an active learning approach in a SCALE-UP learning space improves academic performance in undergraduate general Biology. *PLoS One*, *13*(5), e0197916. https://doi.org/10.1371/journal.pone.0197916

Hynes, M. H., & Hynes, W. J. (2018). If you build it, will they come? Student preferences for Makerspace environments in higher education. *International Journal of Technology and Design Education*, *28*(3), 867–883. https://doi.org/10.1007/s10798-017-9412-5

Johnson, A. P. (2000). *Up and out: Using creative and critical thinking skills to enhance learning*. Allyn and Bacon.

Lee, D., Morrone, A. S., & Siering, G. (2018). From swimming pool to collaborative learning studio: Pedagogy, space, and technology in a large active learning classroom. *Educational Technology Research and Development*, *66*(1), 95–127. https://doi.org/10.1007/s11423-017-9550-1

McArthur, J. A. (2015). Matching instructors and spaces of learning: The impact of space on behavioral, affective and cognitive learning. *Journal of Learning Spaces*, *4*(1), 1–16. http://libjournal.uncg.edu/jls/article/view/766

Muthyala, R. S., & Wei, W. (2013). Does space matter? Impact of classroom space on student learning in an organic-first curriculum. *Journal of Chemical Education*, *90*(1), 45–50. https://doi.org/10.1021/ed3002122

Nicol, A. A. M., Owens, S. M., Le Coze, S. S. C. L., MacIntyre, A., & Eastwood, C. (2018). Comparison of high-technology active learning and low-technology active learning classrooms. *Active Learning in Higher Education*, *19*(3), 253–265. https://doi.org/10.1177/1469787417731176

Oliver-Hoyo, M. T., Allen, D., Hunt, W. F., Hutson, J., & Pitts, A. (2004). Effects of an active learning environment: Teaching innovations at a research I institution. *Journal of Chemical Education*, *81*(3), 441–448. https://doi.org/10.1021/ed081p441

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research*. Vol. 2. Jossey-Bass.

Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, *93*(3), 223–231. https://doi.org/10.1002/j.2168-9830.2004.tb00809.x

Ridenour, J., Feldman, G., Teodorescu, R., Medsker, L., & Benmouna, N. (2013). Is conceptual understanding compromised by a problem-solving emphasis in an introductory physics course? *AIP Conference Proceedings*, *1513*, 338–341. https://doi.org/10.1063/1.4789721

Roman, T. A., & Uttamchandani, S. (2018). Researching pedagogy within small active learning classrooms: Examining enacted pedagogies of learner and instructor interactions. *International Journal of Research & Method in Education*, *41*(4), 447–467. https://doi.org/10.1080/1743727X.2018.1452199

Sawers, K. M., Wicks, D., Mvududu, N., Seeley, L., & Copeland, R. (2016). What drives student engagement: Is it learning space, instructor behavior, or teaching philosophy? *Journal of Learning Spaces*, *5*(2), 26–38. http://libjournal.uncg.edu/jls/article/view/1247

Soneral, P. A. G., & Wyse, S. A. (2017). A SCALE-UP mock-up: Comparison of student learning gains in high- and low-tech active-learning environments. *CBE- Life Sciences Education*, *16*, 1–15. https://doi.org/10.1187/cbe.16-07-0228

Song, C., Liu, Y., Chen, Y., Li, Q. J., & Chiang, F.-K. (2015). Evaluation of the future learning space: A case analysis of the future experiential learning center at Beijing Normal University. *Open Education Research*, *21*(6), 39–52. https://doi.org/10.13966/j.cnki.kfjyyj.2015.06.005. (In Chinese)

Sun, M., Chen, H., Chiang, F.-K., & Brooks, D. C. (2017, August 9-11). An investigation of students' satisfaction towards the active learning environment. *International Forum on Active Learning Classrooms*. Minneapolis, Minnesota: University of Minnesota.

Talbert, R., & Mor-Avi, A. (2019). A space for learning: An analysis of research on active learning spaces. *Heliyon*, *5*(12), e02967. https://doi.org/10.1016/j.heliyon.2019.e02967

Tocqueville, A. d. (1838). *Democracy in America*. G. Dearborn & Co.

Walker, J. D., & Baepler, P. (2017). Measuring social relations in new classroom spaces: Development and validation of the social context and learning environments (SCALE) survey. *Journal of Learning Spaces*, *6*(3), 34–41. http://libjournal.uncg.edu/jls/article/view/1525

Walker, J. D., & Baepler, P. (2018). Social context matters: Predicting outcomes in formal learning environments. *Journal of Learning Spaces*, *7*(2), 1–11. http://libjournal.uncg.edu/jls/article/view/1639

Walker, J. D., Brooks, D. C., & Baepler, P. (2011) Pedagogy and space: Empirical research in new learning environments. *EDUCAUSE Quarterly*, *34*(4). Retrieved February 13, from 2019, http://www.educause.edu/ero/article/pedagogy-and-space-empirical-research-new-learning-environments.

Wang, J. (2013). Understanding the Chinese learners from the perspective of Confucianism.'' In M. Cortazzi (Ed.), *Researching cultures of learning: International perspectives on language learning and education* (pp. 61–79). Palgrave Macmillan.