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Based Learning Instructional Design Using Interactive Presentation Technology in a Cross-Cultural Management Course at a Private University

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Abstract

A quasi-experimental framework structured the investigation, drawing on data from 184 international BBA students allocated to experimental and control cohorts. Instruction in the experimental cohort embedded Mentimeter-facilitated PBL sequences designed to elicit iterative peer input and collective hypothesis testing. In contrast, the comparison cohort proceeded through lecture-centered sessions that prioritized instructor exposition. Intercultural competence was quantified through matched pre- and post-intervention assessments, while engagement was indexed via participation analytics and standardized survey measures. Instructional effects were modeled using independent-samples t-tests, ANCOVA, and multivariate regression procedures calibrated to partial out baseline differences.

Students exposed to the technology-mediated PBL environment registered higher terminal achievement and denser engagement profiles than their lecture-taught counterparts. When initial ability was statistically controlled, participation frequency retained substantial explanatory power, functioning as a robust predictor of subsequent learning performance. Embedding interactive response systems within a sequenced PBL structure appears to redistribute classroom agency, intensify observable engagement, and translate that engagement into measurable intercultural gains. The analysis extends the empirical basis for scalable, technology-augmented pedagogical design in business education.

Keywords: Cross-Cultural Management / Interactive Presentation Technology / Intercultural Competence / Problem-Based Learning / Student Engagement

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Introduction

The rapid internationalization of higher education has intensified the demand for instructional models that support intercultural competence in large, culturally heterogeneous classrooms. Business programs, in particular, increasingly enroll students from diverse linguistic and cultural backgrounds, yet pedagogical structures have not always kept pace. While cross-cultural management courses aim to cultivate perspective-taking, adaptive communication, and reflective judgement, these outcomes depend heavily on sustained student participation. In large lecture-dominated settings, participation often becomes uneven, episodic, and socially stratified. As a result, the experiential conditions necessary for intercultural learning are difficult to maintain.

Problem-Based Learning (PBL) has been widely advocated as a framework for experiential and collaborative learning. Its emphasis on authentic problem solving and iterative reflection aligns closely with theoretical accounts of intercultural competence development. However, the scalability of PBL in large multicultural classrooms remains contested. Existing studies report inconsistent engagement patterns when group size increases, particularly in contexts shaped by cultural norms that discourage public disagreement or visible uncertainty. These constraints raise a critical pedagogical question: whether structured integration of interactive presentation technologies can stabilize participation dynamics sufficiently to preserve the benefits of PBL at scale.

Interactive response systems offer new mechanisms for redistributing classroom participation. By enabling anonymous, low-threshold contributions, such technologies can reduce social risk and make students' thinking immediately visible to instructors. However, technology alone does not transform learning environments. Its instructional impact depends on how digital tools are embedded within coherent pedagogical sequences. Research on technology-enhanced learning has frequently focused on short-term engagement indicators or descriptive case studies, leaving a limited body of quasi-experimental evidence linking structured participation to measurable competence development in multicultural higher education.

This study addresses that gap by evaluating a five-stage Mentimeter-supported PBL model implemented in a large undergraduate cross-cultural management course. The model conceptualizes engagement as a mediating mechanism through which instructional design influences intercultural learning outcomes. Using a quasi-experimental design, the study

examines whether embedding interactive participation within a staged PBL framework leads to sustained engagement and improved intercultural competence. By connecting classroom participation patterns with learning performance, this research contributes empirical evidence to discussions of scalable technology-mediated pedagogy in higher education.

Objectives

1. To study the current situation of teaching outcomes in the Cross-Cultural Management course at the undergraduate level.

2. To design a Problem-Based Learning (PBL) model using MENTIMETER as an Interactive Presentation Technology in the Cross-Cultural Management course.

3. To implement the designed model in the Cross-Cultural Management course at a private university

4. To evaluate and revise the designed model's effectiveness in enhancing cross-cultural competency and learning outcomes

LITERATURE REVIEW

Theoretical Framework and Related Research

This study is grounded in a broad theoretical framework that integrates ideas about intercultural competency, problem-based learning (PBL), and student participation. These theoretical frameworks are not merely isolated academic discussions; they serve as the basis for instructional design and the study of learning outcomes in intercultural management education.

This study integrates three theoretical pillars. First, intercultural competence is conceptualized as a dynamic amalgamation of cognitive comprehension, emotional disposition, and adaptive behavioral capability that develops through recursive cycles of action and reflection (Byram, 1997; Deardorff, 2006; Earley & Ang, 2003). Second, Problem-Based Learning (PBL) grounded in constructivist epistemology organizes instruction around ill-structured problems that require collaborative inquiry, knowledge-gap identification, and iterative model refinement (Hmelo-Silver, 2004; Walker et al., 2015). In cross-cultural management education, this architecture is particularly generative because exposure to ambiguous cultural problems exercises perspective-taking and adaptive decision-making. Third, student engagement theory frames participation as a multidimensional construct

encompassing behavioral, affective, and cognitive dimensions that mutually reinforce learning outcomes (Fredricks et al., 2004; Kahu, 2013). Interactive presentation technologies operationalize low-threshold participation channels that can stabilize engagement in large, culturally diverse classrooms (Siau et al., 2006; Belland, 2014; Zhao & McDougall, 2008). The epistemic advantages of group work dissipate. Many voices recede.

This study addresses this gap by evaluating a Mentimeter-mediated PBL design implemented in a large multicultural undergraduate classroom. By mapping observable participation structures to subsequent learning outcomes, it advances the analytical discourse on technology-driven pedagogies in business education and provides controlled evidence.

Materials and methods

This study employed a quasi-experimental non-equivalent control group design. The population comprised 184 international undergraduate BBA students enrolled in a cross-cultural management course at a private university. Students were allocated by intact class to an experimental group (n = 92), which received a five-stage PBL model delivered via Mentimeter, and a control group (n = 92), which followed a traditional lecture-discussion format. Both groups were taught by the same instructor using an identical syllabus to control for delivery variance. Pre-test and post-test intercultural competence assessments, student engagement surveys, and Mentimeter participation logs served as the primary instruments. Baseline differences were controlled statistically through ANCOVA, and data were analyzed using independent-samples t-tests and multiple linear regression. Figure 1 presents the conceptual framework, illustrating how the Mentimeter-based PBL design operates through engagement as a mediating variable to produce intercultural competence outcomes.

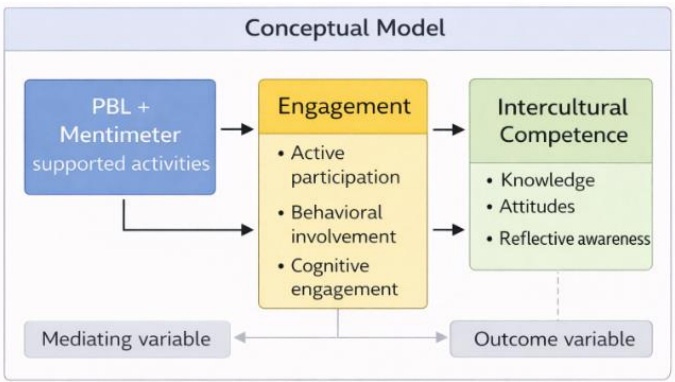


Figure 1: Conceptual Framework

Population

The sample included 126 male students (68.5%) and 58 female students (31.5%), reflecting the culturally heterogeneous composition of internationally oriented business programs.

Instructional Intervention

The intervention operationalized an optimized five-stage PBL–Mentimeter architecture designed to convert observable engagement into incremental intercultural capability through a sequenced set of learning mechanisms. Rather than treating participation as an end state, the model channels it through staged cognitive and affective processes, with each phase activating a distinct pathway through which intercultural understanding is constructed and stabilized.

Stage 1: Problem Identification — Emotional Safety

The opening phase focuses on reducing interpersonal risk to externalize latent cultural tensions that would otherwise remain unarticulated. Anonymous word-cloud aggregation and moderated Q&A exchanges redistribute expressive authority away from public performance and toward collective pattern recognition. As students project culturally inflected concerns into a shared digital space, psychological safety expands and initial affective resistance contracts. Hidden frictions surface. Dialogue becomes possible.

Stage 2: Data Collection — Knowledge Calibration

Once salient issues are visible, the instructional sequence redirects attention toward epistemic alignment. Comparative cultural quizzes juxtapose competing interpretations and immediately return corrective feedback, forcing students to confront discrepancies between assumed and evidenced knowledge. This rapid feedback loop recalibrates cognitive schemas and sharpens awareness of informational blind spots. Misconceptions destabilize. Conceptual frames adjust.

Stage 3: Hypothesis Generation — Perspective Taking

The third phase compels students to formulate multiple culturally anchored explanations through open-ended polling tasks that privilege divergence over consensus. By requiring the simultaneous consideration of alternative interpretive logics, the activity stretches cognitive flexibility and interrupts ethnocentric default positions. Competing viewpoints accumulate in visible form. Perspective plurality is normalized.

Stage 4: Solution Development — Justified Decision Making

Attention then shifts from explanation to adjudication. Ranking exercises, coupled with written justification prompts, oblige students to defend culturally situated decisions and to refine those defenses iteratively in light of peer input. Reasoning is externalized and subjected to collective scrutiny, thereby strengthening argumentative precision and encouraging adaptive revision. Decisions are not merely selected. They are warranted.

Stage 5: Reflection and Metacognition — Internal Consolidation

The final stage consolidates prior activity through guided metacognitive appraisal. Structured reflection tasks prompt students to trace shifts in their assumptions, evaluate the reasoning processes that produced those shifts, and encode emergent intercultural insights into their self-concept. Experience is reorganized into a durable understanding. Learning is internalized.

Research Procedure

The study spanned one 15-week semester. During Week 1, all participants completed the baseline intercultural competence assessment. From Weeks 2 through 14, the experimental group engaged in the five-stage PBL-Mentimeter sequence, while the control group received lecture-based instruction. In Week 15, both groups completed the post-test competence instrument and the engagement survey. Mentimeter automatically logged participation data throughout the semester. All data were anonymized prior to analysis, and participation in the research component was voluntary. Institutional ethical protocols were observed.

Instruments

Intercultural Competence Assessment

Intercultural competence was operationalized through a paired pre–post measurement instrument calibrated to multidimensional models of intercultural learning. The scale indexed four interlocking domains: culturally situated knowledge structures, dispositional openness toward diversity, adaptive communicative repertoires, and reflexive self-appraisal. Respondents registered agreement on a five-point Likert continuum anchored from 1 (strongly disagree) to 5 (strongly agree). Item responses were aggregated into composite indices via arithmetic averaging, such that elevated scores signified stronger self-attributed competence. Scale reliability was assessed using Cronbach's alpha coefficients, computed separately for the pre-test and post-test administrations. Both iterations satisfied conventional thresholds for

internal consistency, indicating that the instrument functioned as a coherent measurement construct across time points. The scale held together.

Student Engagement Scale

Student engagement was quantified using a structured questionnaire partitioned into behavioral enactment and cognitive investment components. Behavioral items probed the frequency and regularity of participation in interactive tasks and discussions, whereas cognitive items targeted analytic effort, problem interrogation, and the application of conceptual resources. Responses followed the same five-point Likert structure used in the competence instrument. A global engagement index emerged from the averaged item pool. Reliability diagnostics again yielded acceptable internal consistency, supporting the interpretability of the composite score.

Participation Analytics

Behavioral engagement in the experimental cohort was further operationalized through platform-generated analytics. Mentimeter interaction logs enumerated the volume of individual student submissions across digitally mediated activities, and this count variable served as an objective proxy for participation intensity. These trace data were entered into subsequent regression models as predictors of learning performance. Engagement was not inferred. It was recorded.

Data Collection

Data Analysis

Quantitative evaluation proceeded through a staged analytic sequence aligned with the quasi-experimental design. Descriptive statistics first profiled baseline characteristics and the distributions of outcomes. Independent-samples t-tests compared post-intervention group differences, and effect magnitudes were indexed using Cohen’s d to contextualize practical significance. To improve understanding of cause and effect, analysis of covariance (ANCOVA) was used to examine group differences after the test. This adjustment generated a more conservative appraisal of instructional impact by statistically equalizing initial disparities. Multiple linear regression models then examined whether how often participants took part predicted their intercultural competence after the intervention, while accounting for their initial level. Before interpretation, diagnostic checks evaluated the normality, linearity, and homoscedasticity assumptions. Statistical decisions were anchored to an alpha threshold of .05.

Results

Objective 1: Current Situation of Teaching Outcomes — Descriptive Statistics and Baseline Comparison

Table 1 summarizes descriptive profiles for the principal study variables. At the onset of the semester, the experimental cohort registered moderately higher intercultural competence scores than the comparison cohort. A Welch independent-samples t-test indicated that this discrepancy was statistically significant, $t(161.42) = 3.15$, $p = .002$. Because group assignment followed intact classroom boundaries rather than random allocation, subsequent inferential models incorporated baseline scores as covariates to control for potential selection bias.

Post-intervention comparisons revealed a consistent advantage for the experimental condition. Students who participated in the Mentimeter-based PBL sequence performed better, showed greater learning improvements, and had much higher levels of participation. Self-reported engagement and perceived intercultural competence followed the same directional pattern.

Table 1 Descriptive Statistics by Instructional Group

Variable	Control M (SD)	Experimental M (SD)
Pre-test score	63.02 (10.14)	67.06 (6.98)
Final score	76.53 (6.47)	84.25 (4.80)
Gain score	13.51 (11.38)	17.18 (2.22)
Participation count	5.32 (1.74)	56.29 (10.31)
Engagement total	3.34 (0.46)	3.97 (0.32)
Intercultural competence	3.54 (0.43)	4.12 (0.27)

Objective 2: Effectiveness of the PBL-Mentimeter Model — Group Differences in Final Performance

A Welch independent-samples t-test registered a pronounced performance asymmetry between conditions, with the experimental cohort surpassing the control cohort on the terminal assessment, $t(167.90) = 9.19$, $p < .001$. The associated effect magnitude signals more than a marginal statistical fluctuation; it points to a substantive instructional shift attributable to the intervention. Students in the experimental group showed greater learning gains and

reported higher levels of engagement and intercultural skills than their classmates in the lecture-based setting. The pattern is consistent.

The marked divergence in participation frequency warrants careful interpretation. Opportunities to contribute were built into the way the lessons were designed, so the differences we see in participation are a planned part of the learning environment, not just random excitement.

Table 2: Group Differences in Outcomes

Outcome	t	df	p
Final score	9.19	167.90	< .001
Gain score	3.04	97.90	.003
Engagement total	10.81	162.58	< .001
Intercultural competence	10.91	153.58	< .001
Participation count	46.78	96.19	< .001

Objective 3: Implementation Outcomes — ANCOVA Controlling for Pre-test Performance

To neutralize pre-existing performance disparities, an analysis of covariance (ANCOVA) was used to model final assessment scores, statistically partialling out pre-test performance. The analysis showed significant results and explained a large portion of the variance in scores ($R^2 = .43$), indicating that the considered factors were important in understanding performance differences.

Within this adjusted framework, both baseline competence and instructional conditions exerted independent effects on final achievement. Even after accounting for initial ability differences, being in the experimental group was still associated with higher final scores than the control group. The intervention retained explanatory force.

Table 3: *Predictors of Final Achievement (ANCOVA and Regression)*

Predictor	B	SE	t	p
Panel A: ANCOVA predicting final scores ($R^2 = .43$)				
Intercept	59.49	2.84	20.92	< .001
Pre-test score	0.27	0.04	6.11	< .001

Predictor	B	SE	t	p
Group (Experimental)	6.62	0.79	8.41	< .001
Panel B: Regression predicting final scores (R^2 = .50)				
Intercept	64.55	2.75	23.49	< .001
Pre-test score	0.17	0.04	3.88	< .001
Participation count	0.15	0.02	10.26	< .001

Objective 4: Model Effectiveness in Enhancing Intercultural Competency Participation and Learning Outcomes

A multiple regression model examined whether the extent of someone's participation could predict their final achievement, while accounting for their initial skill level. The results were statistically significant and accounted for about half of the differences in final scores (R^2 = .50), indicating that the included factors together explained a large portion of the variation in performance.

In this model, participation frequency had a positive coefficient, indicating that denser interaction traces were associated with stronger outcomes. Since participation was built into the program instead of relying on students to join on their own, this connection shows that staying involved in the organized PBL environment led to noticeable improvements in learning.

Reliability of Measurement Scales

The measurement architecture underwent a series of reliability and validity checks designed to stabilize the interpretation of the quantitative results. Internal consistency was estimated through Cronbach's alpha coefficients, which registered high coherence for both primary instruments. The engagement scale yielded α = .90, while the intercultural competence scale produced α = .94. Coefficients of this magnitude indicate tightly coupled item clusters that function as unified constructs at the aggregate level. The instruments behaved consistently.

Taken together, these reliability and validity provisions consolidate the study's evidentiary base: the instruments performed as intended, and the analytic pipeline operated within defensible methodological bounds.

Mentimeter Participation Patterns

Interaction traces from the Mentimeter platform were analyzed to characterize participation across the experimental cohort. Platform analytics indicate that students generated a mean of 56.29 recorded contributions over the semester (SD = 10.31), with individual totals ranging from 35 to 79 responses (median = 55.50; IQR: 49.00–63.25). Individual participation varied greatly, with students logging between 35 and 79 responses each, showing differences in how actively they engaged in the program.

This distribution indicates broadly distributed engagement rather than domination by a small group of active contributors. This pattern reflects an instructional design that routinized participation, supporting the inference that the observed link between frequency of engagement and academic performance reflects a systematic relationship rather than an artifact of extreme cases.

Discussion and Conclusion

The results confirm that a five-stage Mentimeter-mediated PBL model significantly enhances intercultural competence and student engagement in large multicultural classrooms. Even after statistically controlling for baseline differences, the instructional condition remained an independent predictor of final performance, consistent with Hmelo-Silver et al.'s (2007) finding that scaffolded PBL environments produce stronger learning outcomes than minimally guided approaches.

The strong association between participation frequency and final scores supports Fredricks et al.'s (2004) multidimensional engagement framework: because interaction was structured into each PBL stage rather than left to voluntary initiative, it shifted from episodic to continuous, benefiting the full cohort.

Classroom observations supplement this statistical depiction. Prior to the intervention, vocal debate in lecture sessions tended to center on a small group of strong presenters, while quieter students tended to retreat to observer roles. The inclusion of digitally mediated activities redistributed expressive bandwidth: students who seldom engaged in face-to-face interactions began to contribute anonymously, suggesting that organized anonymity can equalize participation across culturally diverse cohorts.

From the instructor's perspective, the phased PBL sequence also resets pedagogical receptivity. Real-time visualizations of aggregated replies revealed misunderstandings at the

time of articulation. Early diagnostic questionnaires, for example, usually revealed reductive cultural assumptions; correcting these distortions instantly provided an opportunity for guided investigation and group reframing. Formative assessment ceased to be episodic feedback and evolved into a continuous dialogue process that influenced instructional pace—teaching in action.

The intervention further illuminated the role of emotional safety in intercultural learning. Observational records indicate that students articulated culturally sensitive positions with greater candor when mediation occurred through digital interfaces. Psychological security emerged not merely from interpersonal rapport but from the material design of participation channels. In large classrooms where reputational risk can silence minority perspectives, technology-mediated interaction appears to normalize exploratory discourse.

Several limitations warrant acknowledgment. The single-site, single-course design restricts generalizability. Intact group assignment limits causal precision. Reliance on self-report measures of intercultural competence may not fully capture enacted behavior. Future studies should replicate across multiple institutions, employ performance-based competence assessments, and explore longitudinal effects.

Conclusion

This study evaluated the effectiveness of a Mentimeter-based five-stage problem-based learning (PBL) model in a large undergraduate intercultural management course. In a quasi-experimental design, students in the PBL-Mentimeter group significantly outperformed the lecture-based control group in both intercultural competence and engagement, even after statistically controlling for baseline differences. These findings are consistent with Hmelo-Silver's (2004) proposition that PBL environments promote deeper cognitive elaboration and collaborative inquiry, and with Fredricks et al.'s (2004) framework linking behavioral, affective, and cognitive engagement to enhanced learning outcomes. The widespread pattern of participation across the experimental cohort supports Kahu's (2013) argument that institutional designs promoting low-risk, inclusive participation are essential for equitable learning in diverse classrooms. Deardorff's (2006) process model of intercultural competence development emphasizing recursive cycles of reflection and action — is further corroborated by the structured five-stage sequence, which systematically converted participation into measurable intercultural gains.

In line with Deardorff's (2006) process model and Kahu's (2013) engagement framework, this study demonstrates that structured, technology-mediated PBL can cultivate intercultural competence in large, culturally diverse classrooms by creating conditions for inclusive, iterative participation. The five-stage PBL-Mentimeter architecture is a scalable and resource-efficient model that prioritizes psychological safety, redistributes expressive bandwidth, and embeds reflection as a routine practice translating engagement into measurable intercultural gains.

Recommendations

Based on the findings of this study, the following recommendations are offered for future research and practice.

1. Longitudinal studies tracking intercultural competence development beyond a single semester are needed to determine whether the gains observed here are durable and transferable to real-world intercultural interactions (Deardorff, 2006).

2. Future research should replicate this design across multiple institutions and cultural contexts to test the generalizability of the PBL-Mentimeter model, particularly in settings where cultural norms around public participation differ markedly (Hallinger & Lu, 2011).

3. Researchers should incorporate performance-based or behavioral assessments of intercultural competence alongside self-report measures to reduce reliance on perceived competence, which may not accurately reflect enacted behavior.

4. Comparative studies examining different interactive response platforms (e.g., Poll Everywhere, Kahoot, Padlet) would help identify which technological affordances most effectively scaffold intercultural reasoning in large classrooms.

5. Future designs should systematically investigate the role of instructor facilitation quality, as the effectiveness of technology-supported PBL likely depends heavily on instructional expertise and pedagogical intentionality (Hmelo-Silver et al., 2007).

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