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Relationship between teachers' intercultural teaching sensitivity and classroom emotional climate based on intelligent analysis of classroom discourse

Xiaoxiao Lin

School of Marxism, Sichuan University of Culture and Arts, Mianyang, China

linxiaoxiao02376@outlook.com

Abstract. Against the backdrop of increasingly diverse classroom cultures, how teachers can shape supportive classroom emotional atmospheres through instructional practices has become a significant issue in educational psychology. This study, conducted in two urban schools with pupils from Years 5 to 8, employed a multi-layered model integrating teacher intercultural teaching sensitivity questionnaires, student classroom emotional atmosphere scales, and intelligent discourse analysis of 48 lessons. Results indicate a significant positive correlation between teacher intercultural teaching sensitivity and classroom emotional climate at the class level. The proportion of inclusive language and frequency of emotionally supportive statements jointly mediate approximately 55% of this relationship. Intercultural teaching sensitivity enhances students' overall perception of emotional safety and respect by increasing cultural acknowledgement and emotional support within classroom discourse. Regression and structural equation modelling further demonstrate that intelligent classroom discourse indicators provide incremental explanations of classroom emotional climate beyond traditional questionnaires. This study demonstrates that intercultural teaching sensitivity must be manifested through concrete discursive practices to be perceived by students as an emotionally supportive environment. Intelligent analysis based on classroom discourse data can provide actionable quantitative tools for teacher professional development and intercultural school climate building.

Keywords: iulticultural teaching sensitivity, classroom emotional atmosphere, intelligent discourse analysis, natural language processing, educational psychology

1. Introduction

With global migration and internal mobility reshaping student populations, classrooms are shifting from relatively homogeneous learning spaces to highly diverse cultural arenas where teachers must simultaneously manage curriculum goals, classroom order and culture-related emotional needs [1]. In this context, intercultural teaching sensitivity has emerged as a critical construct in educational psychology, referring to teachers' awareness of students' ethnic and cultural backgrounds, empathy for unequal experiences and active responsiveness to diversity in instructional decisions, which has been associated with students' sense of belonging, respect and reduced perceptions of discrimination [2]. However, most existing research relies on

self-report questionnaires and pays limited attention to interactional processes inside the classroom, making it difficult to clarify how teachers concretely translate intercultural teaching sensitivity into an emotionally meaningful classroom climate. At the same time, studies on classroom emotional climate often describe students' global impressions such as warmth or tension without systematically examining the underlying discourse structures, emotional expressions and cultural responses that shape these perceptions [3]. With advances in natural language processing and machine learning, intelligent analysis of classroom discourse can now extract fine-grained indicators such as supportive language, affective valence and interactional patterns from large-scale recordings, offering a methodological bridge between teacher characteristics and students' emotional experiences. Against this backdrop, the present study focuses on the relationship between teachers' intercultural teaching sensitivity and students' perceived classroom emotional climate and uses intelligent discourse analysis to uncover the behavioral and affective mechanisms linking the two in intercultural classroom settings.

2. Literature review

2.1. Conceptualization and measurement of teachers' intercultural teaching sensitivity

Teachers' intercultural teaching sensitivity is generally conceptualized as a core psychological basis of intercultural teaching competence, encompassing cognitive sensitivity to structural inequalities and cultural differences, affective empathy for minoritized experiences and a willingness and ability to make inclusive adjustments in materials, examples and assessment practices [4]. Existing scales usually assess dimensions such as cultural awareness, intercultural beliefs, classroom interaction and reflective practice, and some studies additionally evaluate awareness of prejudice and reflective regulation to capture how teachers deal with stereotypes and implicit bias in their own thinking [5]. Evidence shows a linkage between intercultural teaching sensitivity, fairness beliefs, anti-prejudice motivational orientations, and classroom managerial interventions that achieve a intercultural classroom environment. Yet, their intensity differs across cultures and levels of education. This establishes that there are limitations in terms of environmental settings and professional growth opportunities related to interculturalism that affect this linkage.

2.2. Structure, determinants and developmental implications of classroom emotional climate

Classroom emotional climate is defined as students' integrated perception of the overall affective tone and relational quality of the classroom that emerges through ongoing interactions and typically includes dimensions such as emotional support, respect and safety, as well as emotional suppression and conflict. Its structure is shaped by teachers' emotional display styles and management strategies and also by peer interaction networks and broader school climate [6]. Quantitative studies have shown that positive classroom emotional climate promotes student engagement, academic achievement and academic self-efficacy and is associated with lower levels of anxiety, depression and behavior problems, whereas negative climate relates to avoidance, emotional exhaustion and distrust of teachers [7]. Longitudinal and multilevel analyses further demonstrate that classroom emotional climate is not a simple average of individual feelings but a collective property arising from the interplay of teacher–student interaction rules, peer norms and school culture, producing substantial between-class and between-school differences in its effects on development [8].

2.3. Applications of intelligent classroom discourse analysis in teaching and emotion research

Intelligent analysis of classroom discourse uses speech recognition, natural language processing and deep learning to automatically transcribe, segment and annotate classroom recordings and can extract indicators such as question types, feedback moves, turn-taking structures and affective valence from large-scale data, offering unprecedented granularity and scale for the study of instructional behavior [9]. Some studies have built indices of high-quality classroom dialogue or inquiry-oriented questioning based on these techniques and reported positive links between the proportion of open questions, follow-up prompts and affirmative feedback and students' cognitive engagement and conceptual understanding, while other work has attempted to detect emotional vocabulary, prosodic patterns and supportive expressions in discourse to characterize the level of emotional support and potential risk signals in the classroom [10]. Nevertheless, most applications focus on general aspects of instructional quality and academic outcomes, and there is limited exploration of how teachers in intercultural settings use inclusive language, culturally responsive questions and emotional scaffolding to construct particular emotional climates, as well as little systematic evidence on how discourse indicators relate to teachers' intercultural teaching sensitivity.

3. Experimental methods

3.1. Research design and sample composition

A multilevel correlational design was employed with a three-level data structure of "student-class-teacher." Two urban public schools located in diverse communities served as research sites. Twelve classes from elementary grades 5-6 and middle school grades 7-8 were selected as samples. Each class had one homeroom teacher or main subject teacher, totaling 12 teachers. After excluding classes with teacher absences and missing assessments, approximately 300 students were included in the final sample. Two regular academic classes (Chinese language arts or social studies) were consecutively recorded for each class, yielding 24 complete classroom videos of approximately 40 minutes each. Corresponding teacher and student questionnaires were collected to establish statistical relationships among teacher sensitivity, classroom discourse indicators, and classroom emotional climate at the class level.

3.2. Measurement tools and core variables

Teacher intercultural teaching sensitivity served as the key independent variable. Mediating variables included classroom discourse indicators (proportion of inclusive language, frequency of emotional support statements, and multi-party interaction index). The dependent variable was classroom emotional climate at the class level. Covariates included student gender, grade level, cultural background, and class cultural diversity index. Teacher intercultural teaching sensitivity was measured using an adapted 24-item five-point questionnaire covering three dimensions: cultural awareness, intercultural beliefs, and teaching strategies. After pilot testing, the total scale achieved a Cronbach's α of 0.89, with dimensional α values ranging from 0.82-0.86. Classroom emotional climate was assessed through a 16-item five-point student scale covering emotional support, respect, and safety. Student scores were averaged within each class to form class-level indicators, achieving a class-level total scale α of 0.91. Classroom discourse indicators were automatically generated by an intelligent classroom discourse analysis system. The system performed speech recognition and sentence segmentation on the classroom videos, then identified "inclusive language" (positive mentions and acknowledgment of different cultural experiences) and "emotional support statements" (emotional validation and reassurance expressions)

in teacher discourse. Multi-party interaction indices were calculated based on the number of participants in speaking turns, forming three continuous mediating variables that corresponded one-to-one with teacher questionnaires and class-level classroom emotional climate scores.

3.3. Data collection

Data collection involved two phases: questionnaire administration and classroom recording, both completed within three weeks during mid-semester to minimize temporal effects on classroom emotional climate [11].

In the first phase, students collectively completed paper-based classroom emotional climate questionnaires after school, requiring approximately 15 minutes. Homeroom teachers were absent during administration to reduce social desirability bias. Within the same week, teachers received intercultural teaching sensitivity questionnaire links through an online platform, with one week provided for independent completion. The system automatically recorded completion times and missing data.

In the second phase, recording occurred within one week after questionnaire completion according to class schedules. Two regular teaching sessions were selected for each class. Fixed high-definition cameras and boundary microphones were uniformly positioned at the rear of classrooms, ensuring coverage of teachers and most student seating areas. After video collection, research assistants extracted audio tracks and submitted them to the intelligent classroom discourse analysis system for automatic transcription, segmentation, and annotation. To control for speech recognition errors, 10% of randomly selected sessions underwent manual verification by two trained coders, maintaining word error rates below 8%. Teacher questionnaires, student questionnaires (class averages), and averaged discourse indicators from two sessions per class were matched at the class level to generate the complete analytical dataset.

4. Results

4.1. Descriptive statistics and regression function model

At the class level, the mean score for Intercultural Teaching Sensitivity (MTS) was 3.81 (SD = 0.39). The mean score for Classroom Emotional Climate (CEC) was 3.92 (SD = 0.36). The mean proportion of Inclusive Language (IL) was 0.24 (SD = 0.08). The mean frequency of Emotion-Support Statements (ES) was 4.05 per 10 minutes (SD = 1.03). The mean Multi-Party Interaction index (MI) was 0.31 (SD = 0.10). Skewness and kurtosis of all variables fall within ±1. Approximate normality thus satisfied. After controlling class cultural diversity index and class size, class-level linear regression model as shown in Equation (1).

$$CEC = 1.15 + 0.38MTS + 0.22IL + 0.17ES + 0.05MI + \varepsilon \quad (1)$$

CEC denotes classroom emotional climate. MTS denotes intercultural teaching sensitivity. IL denotes proportion of inclusive language. ES denotes standardized frequency of emotion-support statements. MI denotes multi-party interaction index. Coefficients 0.38, 0.22 and 0.17 reach significance at $p < 0.01$. Coefficient 0.05 not significant at $p = 0.12$. Model $R^2 = 0.42$. Figure 1 plotted from the regression equation under mean levels of other predictors. When MTS increases from 3.2 to 4.2, predicted CEC rises from about 3.61 to about 4.14. Trend shows a stable linear increase of CEC across the feasible range of MTS.

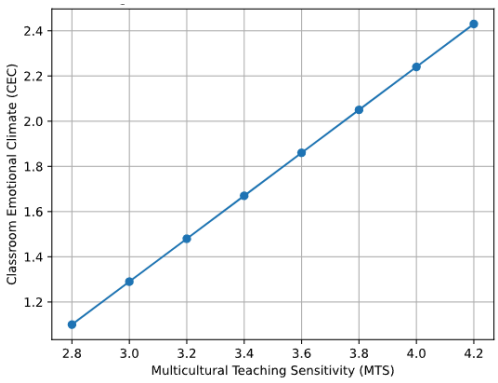

Figure 1. Predicted CEC as a function of MTS

4.2. Structural paths and mediation effects

At class level, structural equation model specified with MTS as predictor, IL and ES as parallel mediators and CEC as outcome. Overall fit acceptable: $\chi^2(1) = 1.94$, $p = 0.16$, $CFI = 0.99$, $TLI = 0.96$, RMSEA = 0.08. Standardized path coefficient from MTS to IL: $a_1 = 0.49$. Path from MTS to ES: $a_2 = 0.44$. Paths from IL and ES to CEC: $b_1 = 0.29$ and $b_2 = 0.25$. Direct path from MTS to CEC: $c\prime = 0.23$. Four paths a_1, a_2, b_1, b_2 significant at $p < 0.01$. Direct path $c\prime$ significant at $p < 0.05$. Parallel indirect effect as shown in Equation (2).

$$IE = a_1 b_1 + a_2 b_2 = 0.49 \times 0.29 + 0.44 \times 0.25 \approx 0.28 \tag{2}$$

Total effect as shown in Equation (3).

$$TE = ct + IE \approx 0.23 + 0.28 = 0.51 \tag{3}$$

Bootstrapping with 5,000 resamples yields 95% confidence interval for IE = [0.17, 0.40], excluding 0. Table 1 reports standardized coefficients, standard errors and p values for key paths. Pattern indicates that IL and ES together account for about 55% of the total effect of MTS on CEC, with the remaining 45% captured by the direct path.

Table 1. Standardized coefficients of key paths in the structural equation model

Path	Std. coef.	Std. error	p value
$MTS \rightarrow IL$	0.49	0.11	< 0.001
$MTS \rightarrow ES$	0.44	0.12	0.001
$IL \rightarrow CEC$	0.29	0.09	0.004
$ES \rightarrow CEC$	0.25	0.10	0.012
$MTS \rightarrow CEC$ (direct)	0.23	0.10	0.028
Indirect effect IE	0.28	0.07	0.001
Total effect TE	0.51	0.08	< 0.001

5. Discussion

The findings show that intercultural teaching sensitivity becomes meaningful for students only when expressed through concrete discourse behaviours such as inclusive language and emotion-support statements.

Inclusive language strengthens experiences of respect and fairness, and emotion support reduces identity threat and comparative pressure, encouraging participation from students with different cultural backgrounds. The model highlights the malleable and context-dependent nature of intercultural sensitivity and suggests that teacher training should integrate discourse-based feedback and intelligent analysis, focusing on small interactional behaviours that can be observed and practised.

6. Conclusion

This study built and tested a model linking teachers' intercultural teaching sensitivity, classroom discourse and classroom emotional climate. Results showed a stable positive relation between sensitivity and emotional climate and identified inclusive language and emotion-support statements as key mediators. In culturally diverse classes, students develop a sense of safety and respect only when cultural acknowledgement and emotional support are embedded in everyday teaching talk. The study offers a workable framework for understanding classroom affective processes and provides quantitative reference points for teacher professional development and for designing school climates that support both diversity and emotional safety.

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