A Comparative Study of AI English Tutors and Tamil Nonverbal Communication Patterns for the Development of Culturally Adaptive AI Tools in ESL Contexts

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Abstract

Artificial Intelligence (AI) powered English tutoring is a paradigm shift in English as a Second Language (ESL). It is an AI-centred teaching and learning approach rather than a teacher- or student-centred approach for Tamil speaking ESL learners and teachers. The AI tutors facilitate training for the target groups to communicate verbally and nonverbally like native speakers. Though AI tutors are an effective tool for improving verbal communication among learners and teachers, the cultural nonverbal communication system would be affected as the AI-powered tutors are designed based on Western communicative norms and communication practices. This creates a significant cultural gap for Tamil ESL learners whose communicative behaviours are deeply influenced by indigenous cultural traditions and performance arts such as Bharatanatyam. This study aims to comparatively investigate the nonverbal communication patterns embedded in AI English tutors and Tamil nonverbal communication practices derived from Bharatanatyam in order to contribute to the development of culturally adaptive AI tools for ESL contexts. The study specifically examines the extent to which current AI English tutors incorporate culturally diverse facial expressions, gestures, eye movements, and emotional communication patterns relevant to Tamil learners. A qualitative comparative research design was employed for the study. Ten AI English tutoring systems were purposively selected and analysed using multimodal discourse analysis and nonverbal communication frameworks. The communicative behaviours of these AI tutors were compared with Tamil nonverbal communication patterns referenced through the Bharatanatyam concept of Abhinaya, including Mukhabhinaya (facial expressions), Netrabhinaya (eye expressions), gestures (Mudras), head movements, eyebrow movements, and body posture. Also, the analysis combined the *Navarasa* framework, which classifies nine cultural and emotional expressions such as *Shringara* (love), *Hasya* (Joy), *Karuna* (sandness), *Raudra* (anger), *Veera* (courage), *Bhayanaka* (fear), *Bibhatsa* (disgust), *Adbhuta* (wonder), and *Shanta* (peace). The findings of the research revealed that almost all the existing AI English Tutors consisted of limited Western-oriented facial

expressions like broad smiling, sustained eye contact, frowning for anger, and raised eyebrows for surprise and visible facial tension for disagreement. While these expressions support basic emotional interaction, the AI tutors demonstrated limited incorporation of culturally nuanced Tamil nonverbal communication features, which are commonly represented in Bharatanatyam traditions, such as respectful downward gazes, side glances, subtle eyebrow movements, controlled emotional expressions, head tilting, gentle nodding, and culturally contextualised emotional transitions were largely absent or underrepresented within the analysed AI English tutors. The study emphasises that an AI English Tutoring system without Tamil cultural nonverbal communication patterns may contribute to cultural incongruence in an AI-centred ESL learning context. Therefore, the study newly propose and conceptualize a culturally adaptive framework for the creation of a 'Tamil AI English Tutor' as a paradigm shift towards facilitating Tamil ESL learners while preserving the indigenous communicative identities, acknowledging the diverse, and evolving concept of Englishes**.** In addition, this research contributes to the fields of AI-assisted language learning, applied linguistics, intercultural communication and human-computer interaction by introducing a culturally responsive framework for designing AI education technologies for ESL context.

Keywords: Tamil AI English Tutor, Culturally Adaptive AI, Tamil Nonverbal Communication, AI in Education, Intercultural Communication.

Introduction

Artificial Intelligence (AI) has become a main source in education including in English language learning. Advances in natural language processing, speech recognition, computer vision, machine learning, and generative AI have enabled systems like ChatGPT, Duolingo Max, ELSA Speak, Google Gemini, and Microsoft Copilot to offer conversational practice, personalised instruction and immediate feedback on pronunciation, grammar, vocabulary, fluency, and writing (Holmes et al., 2022). Unlike traditional Computer Assisted Language Learning (CALL), AI tutors can provide interactive, adaptive, and learner-centred learning experiences (Luckin & Cukurova, 2019).

However, contemporary AI English tutors mostly reflect dominant Western communication norms. This is a challenge because nonverbal communication: facial expressions, eye contact, gestures, posture, interpersonal distance, and emotional expression is strongly influenced by cultural aspects and social conventions (Hall, 1976; Matsumoto & Hwang, 2016; Knapp et al.,

2014). Accordingly, culturally standardised AI tutors do not adequately represent the communicative expectations of Tamil-speaking ESL learners at present.

Bharatanatyam includes cultural nonverbal framework for conceptualising Tamil-associated embodied communication. Meaning is conveyed through facial expressions (Mukhabhinaya), eye movements (Netrabhinaya), hand gestures (Mudras), head and neck movements, and body postures through Abhinaya (Vatsyayan, 1977). These culturally structured expressive practices may offer a foundation for developing culturally responsive AI tutors. Therefore, this study examines nonverbal communication patterns represented in contemporary AI English tutors and compares them with Tamil cultural communication patterns reflected through Abhinaya to propose a culturally adaptive framework for AI English tutors for Tamil-speaking ESL learners.

1.1 Objectives

The research aim to:

1. Identify the dominant nonverbal communication patterns of existing AI English tutors.
2. Compare Western-oriented AI nonverbal communication style with Tamil cultural nonverbal communication patterns through the Bharatanatyam framework of Abhinaya.
3. Propose and conceptualize culturally adaptive Tamil AI English tutor.

1.2 Research Questions

1. What are the dominant nonverbal communication patterns represented in the present AI English tutors?

2. How do the nonverbal communication represented in Western-oriented AI English tutors compare with the Tamil cultural communication patterns?
3. What conceptual framework can be proposed for developing culturally adaptive Tamil AI English tutors?

2. Literature Review

2.1 Artificial Intelligence in English Language Learning

AI plays an important role in modern English language teaching and learning, including AI tutoring systems, personalised learning, automated assessment, and conversational learning. In natural language processing, speech recognition, large language models and multimodal AI have enhanced the capacity of AI systems to deliver adaptive instruction and prompt feedback (Holmes et al., 2022). With flexible opportunities for self-study, AI English tutors can help learners improve their grammar, vocabulary, pronunciation, fluency, and speaking skills. These can also increase motivation, speaking practice and confidence, and reduce anxiety of interaction and evaluation (Kukulska-Hulme, 2020).

2.2 Nonverbal Communication in Language Learning

Nonverbal communication conveys meaning through face, body, hands and gestures, posture, eye contact, interpersonal distance, body orientation, appearance, silence and voice. These signs control interaction, affirm verbal messages, convey emotions, and set interpersonal relations (Knapp et al., 2014). In the field of second language acquisition, communicative competence is not limited to grammatical competence, but includes sociolinguistic, pragmatic, discourse, and strategic competence (Canale & Swain, 1980). Thus, students should be conscious of culturally appropriate nonverbal communication to be able to communicate well in diverse social settings.

2.3 Tamil Nonverbal Communication and Bharatanatyam

The Tamil culture is rich with symbolic and embodied communication, especially in the Bharatanatyam which has its roots in the Natyasastra. Bharatanatyam conveys message and meaning through body language, facial expression, gestures, posture, voice, dress and moods (Vatsyayan, 1977; Srinivasan, 1985). The expressive element of Abhinaya has four components that are complementary forms: Angika (body and gestural expression), Vachika (speech and vocal expression), Aharya (costume and appearance) and Sattvika (inner emotional expression) (Bharata Muni, trans.). 1956; Vatsyayan, 1977).

Among these, Angika Abhinaya is particularly relevant to nonverbal communication as it includes facial expression (Mukhabhinaya), eyes movement (Netrabhinaya), hand movements

(Mudras), movement of the eyebrows and neck, head movement and body postures. These elements are culturally constructed symbols which convey meanings that transcend verbal communication (Vatsyayan, 1977; Srinivasan, 1985). The Navarasa framework also describes how expressive actions communicate and evoke emotional states. The nine Navarasa are Shringara (love), Hasya (humour), Karuna (compassion/sorrow), Raudra (anger), Veera (heroism), Bhayanaka (fear), Bibhatsa (disgust), Adbhuta (wonder) and Shanta (peace) (Bharata Muni, trans.). 1956; Vatsyayan, 1977).

2.4 Cultural Adaptation in Artificial Intelligence

As AI becomes increasingly integrated into education and social interaction, cultural adaptation has become an important principle of human-centred AI. Users' expectations regarding communication, social behaviour, trust, and interaction are influenced by their cultural backgrounds. Thus, AI systems based on Western-oriented interaction norms may not adequately address culturally diverse users' expectations (Samuel et al., 2023; Heimgartner, 2026). Also, In human-computer interaction, cultural adaptation may comprise linguistic localisation as well as culturally appropriate interfaces, gestures, facial expressions, gaze, posture, emotional expression, and interactional conventions (Heimgartner, 2026). Accordingly, cultural responsiveness in AI English tutors should extend beyond translating content into Tamil.

2.5 Critical Analysis of Previous Studies and Identification of the Research Gap

Previous research has shown that effective communication involves not only grammatical competence, but also sociolinguistic, strategic, interpersonal and nonverbal components (Canale & Swain, 1980; Hall, 1976; Lantolf, 1984; Prentice, 1985; Long, 1980; Longman, 1981; and Long & Gardner, 1986). Eye contact, gestures, facial expression, posture, gaze, interpersonal distance, and body positioning are culturally bound and are important in the interaction of people (Hall, 1976; Knapp, Hall, & Horgan, 2014). Likewise, Matsumoto and Hwang (2016) stress that while some emotional expressions can be universal, the culturally specific rules of the display of emotions may differ. In the context of AI in language learning, researchers have identified the following benefits of AI in L2 education: Personalised learning, Adaptive instruction, Learner analytics, Motivation, Autonomy, Language practice (Holmes, Bialik, & Fadel, 2019/2022; Kukulska-Hulme, 2020; Luckin & Cukurova, 2019). Cassell (2000) also shows how human-like gestures and facial expressions are important in improving

human–computer interaction. However, in the studies, they have been mainly on common patterns of learning assisted by AI, or on universal and Western-oriented of human–computer communication, and little attention has been paid to indigenous communication patterns in AI-mediated English learning. While Bharatanatyam offers a system of culturally grounded framework called Abhinaya that includes facial expressions, eye movements, gestures, body movements and representation of emotions, the Navarasa framework provides structured representations of culturally meaningful emotions (Vatsyayan, 1997; Kapoor, 2021). Hence, there is a significant gap in the research of incorporating culturally specific aspects of nonverbal communication with AI tutoring for the English language. To address this, the present study proposes and conceptualizes culturally adaptive framework for Tamil AI English tutors

3. Theoretical Framework

The present study is grounded in an interdisciplinary theoretical perspective that integrates Artificial Intelligence in Education, Nonverbal Communication Theory, Intercultural Communication Theory, Social Semiotics, and Bharatanatyam's Abhinaya Theory. These complementary theoretical perspectives provide a comprehensive framework for analysing the nonverbal communication patterns embedded in AI English tutors and comparing them with indigenous Tamil communicative practices. The integration of these theories enables the study to examine not only how AI tutors communicate but also whether their communicative behaviours are culturally appropriate for Tamil-speaking ESL learners.

3.1 Conceptual Framework of the Study

Based on the above theories, the study proposes a conceptual framework in which AI English tutors are evaluated through the lens of Tamil nonverbal communication.

Input

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- Present AI English Tutors
- Facial expressions
- Eye contact
- Gestures
- Head movement

- Body posture
- Emotional expressions

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Comparative Analysis

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- Tamil Nonverbal Communication Framework
- Mukhabhinaya
- Netrabhinaya
- Mudras
- Head movements
- Eyebrow movements
- Navarasa

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Output

- Development of a Culturally Adaptive **Tamil AI English Tutor** capable of preserving indigenous communicative identity while supporting effective ESL learning.

4. Methodology

4.1 Research Design

The study employed a qualitative comparative research design to investigate similarities and differences between the nonverbal communication patterns of Present AI English tutors and Tamil communicative practices represented through Bharatanatyam. This design is relavant because the research focused on interpreting visual communication behaviours rather than measuring numerical variables. Comparative analysis enabled systematic examination of culturally embedded communication features across multiple AI systems.

4.2 Selection of AI English Tutors

Purposive sampling was used to select ten widely used AI English tutoring systems that incorporate conversational interaction and visual or avatar-based communication.

The selected AI tutors included:

1. **Duolearn AI Tutor**
   - @duolearn
   - 4.42K subscribers•247 videos
   - https://www.youtube.com/@duolearn/shorts

2. **Praktika AI Tutor**
   - @praktikaai
   - 8.47K subscribers•319 videos
   - app.adjust.com/12bz3lxz_12d8kat1
   - https://www.youtube.com/@praktikaai/shorts

3. **Learna AI Tutor**
   - @AILearna
   - https://www.youtube.com/@AILearna/shorts

4. **Loora AI Tutor**
   - @speak-English-with-loora-AI
   - 750 subscribers•59 videos
   - loora.onelink.me/ntkb/igeig
   - https://www.youtube.com/@I.Get.English/shorts

5. **Promova AI Tutor**
   - @promovaapp
   - https://www.youtube.com/shorts/seoprZ1WD0A

6. **Say AI Tutor**
   - @sayai.papyonlab
   - 503 subscribers•89 videos
   - linktr.ee/sayai.app
   - https://www.youtube.com/@sayai.papyonlab/shorts

7. **Speakology AI**
   - @speakologyai
   - 286 subscribers•63 videos
   - https://www.youtube.com/@speakologyai

8. **MySivi English learning AI**
   - @my.siviai
   - 22K subscribers•1.3K videos
   - https://www.youtube.com/@my.siviai/shorts

9. **Langl English**



- @Langl.english
- 7.62K subscribers•666 videos
- https://www.youtube.com/@Langl.english/shorts

10. **Talkio AI Tutor**

- https://www.talkio.ai/?utm_campaign=paid-ielts-speaking&campaign=ielts-speaking&gad_source=2&gad_campaignid=20526980613&gclid=Cj0KCQjw4orUBhCjARIsAIbF3qzYo9lRIAeOSTZs4GAyaf7XefrBk3YQEfNpg_4qBB3s73lEpSknfwUaApE7EALw_wcB

4.3 Data Collection

The researcher interacted with each AI tutor using same communicative situations to ensure reliability. The situations included greetings; introducing oneself; expressing happiness; apologising; asking for help; showing sympathy; giving instructions; expressing disagreement; storytelling; and casual conversation. Each interaction of the AI tutors was observed using a structured observation protocol.

4.4 Analytical Framework

The analysis combined Multimodal Discourse Analysis (MDA).

The AI tutors were analysed across six dimensions:

No	Dimension	Indicators
1.	Facial expressions	Smiling, frowning, surprise, neutrality
2.	Eye behaviour	Eye contact, gaze direction, blinking
3.	Gestures	Hand movement, pointing, openness
4.	Head movement	Nodding, tilting, shaking
5.	Body posture	Orientation, openness, movement
6.	Emotional expressions	Happiness, sadness, anger, empathy, encouragement

Each communicative behaviour of the AI tutors was then compared with corresponding elements of Mukhabhinaya, Netrabhinaya, Mudras, and Navarasa.

4.5 Data Analysis

The collected data were analysed using Multimodal Discourse Analysis (MDA) (Kress & van Leeuwen, 2021). The analysis involved four stages:

1. Identification: Documenting nonverbal behaviours exhibited by each AI tutor.
2. Observation: Categorising behaviours according to the six analytical dimensions.
3. Comparison: Mapping AI behaviours against Bharatanatyam-based Tamil nonverbal communication patterns.
4. Interpretation: Identifying cultural similarities, differences, and areas requiring adaptation.

A thematic analysis was then conducted to identify recurring patterns related to cultural representation, emotional communication, gaze behaviour, gestures, and expressive styles.

5. Findings

The present study comparatively analysed ten AI English tutoring systems to observe the range of nonverbal communication behaviours align with Tamil nonverbal communication patterns represented through the Bharatanatyam concepts of Abhinaya and Navarasa. The analysis focused on six dimensions such as facial expressions, eye behaviour, gestures, head movements, body posture, and emotional expressions.

5.1 Facial Expressions

The analysis revealed that the ten AI English tutors consist very limited range of facial expressions. The most important expressions are broad smile, neutral expression while teaching, raised eyebrows to show surprise, frown to show disagreement or confusion and widened eyes to show encouragement. All these expressions showed the aspects of western culture.

On the other hand, the Mukhabhinaya of Bharatanatyam has a very elaborate and complex system of facial expressions. Tamil expressive traditions are not based on any exaggerated display but are more conveyed in a coordinated set of movements of the eyebrows, eyelids, cheeks, lips and forehead. The expressions are context-dependent and culturally relevant. The

AI tutors, therefore, were also able to communicate basic emotions effectively, but lacked in expressiveness compared to the nonverbal communication system of Tamil.

5.2 Eye Behaviour

The most significant difference between AI tutors and Tamil communication was seen in the eye behaviour. Most AI tutors kept the eye-to-eye contact for a long period during interaction. Use of gaze shown attentiveness, confidence, friendliness and engagement. A few avatars used intermittent blinking or slight eye gaze changes.

However, Bharatanatyam's Netrabhinaya is a much more elaborate system of eye communication. Tamil communicative practice is often accompanied by eye movements directed downwards (for respect), sideways (for hesitation or affection), and upwards (for reflection), as well as with the deliberate direction of eye movements in the right way (for emotional expression). The analysis of the gaze behaviour between the two groups showed that culturally relevant behaviours like the respectful downward look and context-dependent differences in gaze were nearly completely missing in the AI tutors.

5.3 Hand Gestures

Only a limited number of generic hand gestures were used by the AI tutors. Common gestures were welcoming gestures, open palms during explanations, pointing gestures, and occasional waving and hand movements when placing emphasis. The gestures were not cultural but were commonly used. In comparison, Bharatanatyam has an abundance of Mudras, the number of which communicate people, objects, actions, emotions, relationships and abstract concepts.

While formal Bharatanatyam Mudras are not used in daily communication, many familiar hand gestures used in everyday communication can be seen in Tamil society, such as those that do not involve the hands at all but rather occur in the context of communication. The culturally meaningful gestures were not used by the analysed AI tutors.

5.4 Head Movements

Another difference that was apparent was in head movements. The main modalities that were used by the AI tutors were vertical nodding for agreeing; slight head shaking for disagreeing and occasional head tilting when listening.

In comparison, Bharatanatyam has codified many movements of the head which convey various meanings in various communicative settings. Although the meanings are generally understood, subtle rounds of the head and a respectful downward head can be used in the context of Tamil interaction, and the nuances of nodding may vary from culture to culture. The AI tutors exhibited only the simplest of head moves, and lacked culturally differentiated head gestures.

5.5 Emotional Expressions

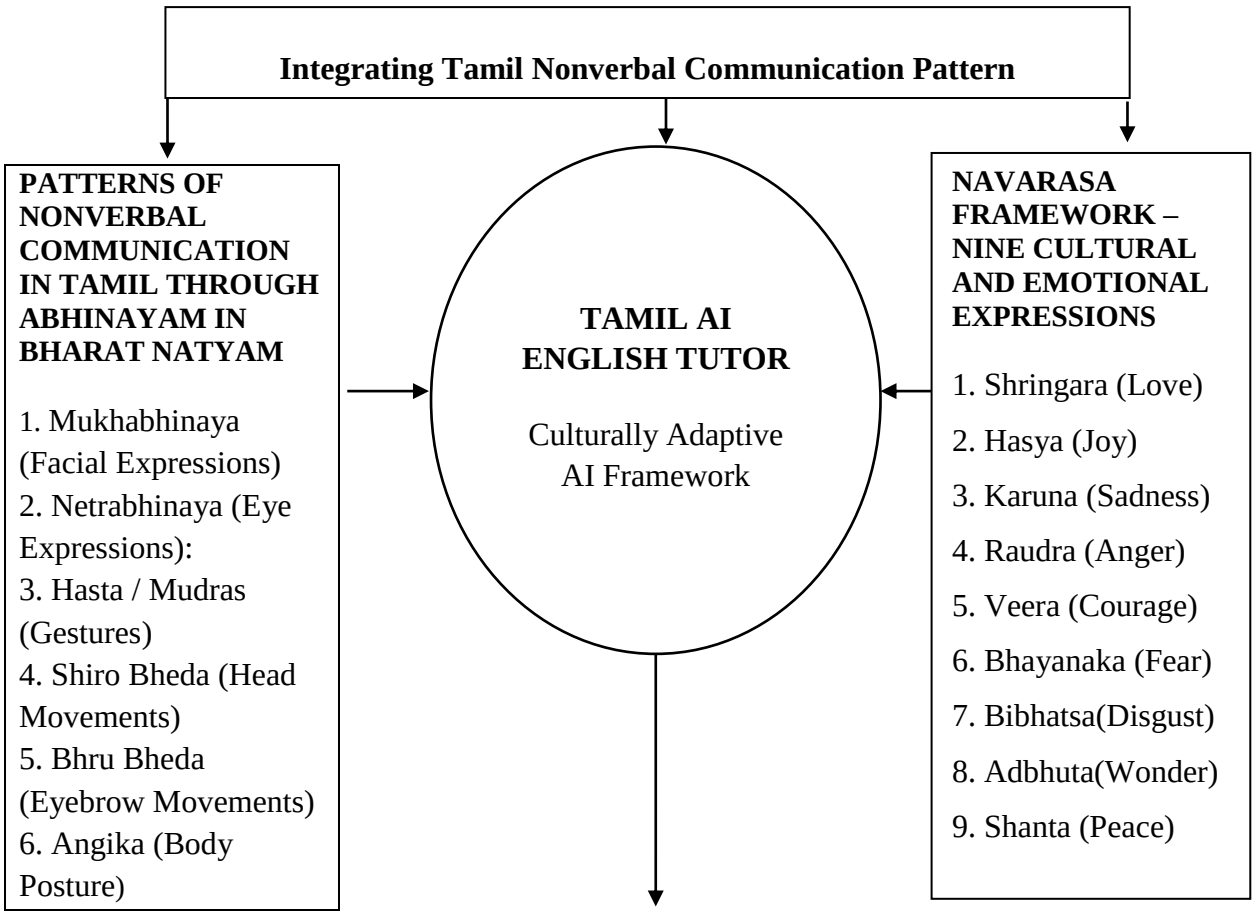
There were significant differences between emotional communication using the Navarasa framework.The emotion represented by the AI tutors was always one of four basic emotions such as happy; surprised; sad or angry. Such emotions were expressed in wide-open faces like those seen in the West. The other Navarasa emotions like Veera (heroism), Shanta (peace), Adbhuta (wonder), Bibhatsa (disgust) and those culturally nuanced emotions like compassion, reverence, were either missing or poorly represented. Also, there was a tendency for emotional transitions to be sudden in many instances. The importance of managing emotions and moving from one emotion to another is highlighted in Tamil communication traditions especially in formal learning and interpersonal settings.

6. The Concept of Tamil AI English Tutor

Based on the data analysis and the findings, almost all the existing AI English Tutors consisted of limited Western-oriented facial expressions like broad smiling, sustained eye contact, frowning for anger, and raised eyebrows for surprise and visible facial tension for disagreement. Therefore, the study newly proposes and conceptualizes a culturally adaptive framework for the creation of a ‘Tamil AI English Tutor’ as a paradigm shift towards facilitating Tamil ESL learners while preserving the indigenous communicative identities, acknowledging the diverse, and evolving concept of Englishes.

The Tamil AI English Tutor comprises Tamil nonverbal communication patterns referenced through the Bharatanatyam concept of Abhinaya and Navarasa as follows:

TAMIL AI ENGLISH TUTOR



HOLISTIC INTEGRATION				
Contextual understanding Understands context through Tamil nonverbal communication.	**Emotional expression** Displays suitable expressions of emotion.	**Culturally appropriate behaviour** Engages in culturally appropriate gestures, expressions and postures.	**Engagement and connection** Establishes trust, engagement and connection.	**English learning** Improves English learning through meaningful interaction.

The Concept of Tamil AI English Tutor (Sebarajah, 2026)

7. Discussion

The findings indicate that current AI English tutoring systems successfully facilitate verbal language learning but insufficiently address culturally appropriate nonverbal communication. This observation extends previous studies by Holmes et al. (2022), Luckin and Cukurova

(2019), and Kukulska-Hulme (2020), which primarily examined AI's contribution to personalised learning, adaptive assessment, and speaking practice.

While these studies recognised AI's effectiveness in improving language proficiency, they paid relatively little attention to the cultural dimensions of communication. The present study demonstrates that communicative competence involves more than linguistic accuracy; it also includes culturally appropriate facial expressions, gaze behaviour, gestures, emotional regulation, and interpersonal interaction.

The findings support Matsumoto and Hwang's (2016) argument that nonverbal communication is culturally constructed rather than universal. Although AI tutors currently employ direct eye contact and overt emotional expression to signal engagement, these behaviours may not always align with Tamil communicative norms, where respect, modesty, and contextual appropriateness frequently influence nonverbal behaviour.

Similarly, Knapp et al. (2014) emphasised that nonverbal communication shapes interpersonal relationships and meaning construction. The absence of culturally familiar communicative behaviours may therefore reduce learners' emotional connection with AI tutors.

One of the most significant findings concerns the limited representation of Bharatanatyam's expressive system. Mukhabhinaya, Netrabhinaya, and Navarasa collectively provide one of the world's most sophisticated nonverbal communication frameworks. Yet these indigenous communicative resources remain largely unexplored within AI-assisted language learning. Therefore, the study extends Human-Computer Interaction (HCI) research by proposing that AI tutors should become culturally adaptive rather than culturally neutral.

Instead of presenting identical avatars worldwide, future AI tutors could incorporate culturally configurable communication styles that allow learners to select communication behaviours appropriate to their own cultural backgrounds.

For Tamil-speaking learners, such adaptation may include:

- respectful gaze behaviours;
- culturally appropriate emotional moderation;
- gentle nodding styles;
- subtle facial expressions;

- culturally familiar gesture patterns;
- context-sensitive interpersonal communication.

Such culturally adaptive AI would preserve indigenous communicative identities while simultaneously supporting effective English language acquisition.

8. Conclusion

Artificial Intelligence has transformed English language education by providing intelligent tutoring systems capable of delivering personalised, interactive, and adaptive learning experiences. Nevertheless, current AI English tutors predominantly reflect Western communicative norms and therefore represent only a limited range of culturally diverse nonverbal communication behaviours. This comparative study demonstrated that significant differences exist between the nonverbal communication patterns employed by AI English tutors and those represented within Tamil communicative traditions through Bharatanatyam's Abhinaya and Navarasa frameworks. The findings suggest that culturally adaptive AI tutors have the potential to improve learner engagement, intercultural sensitivity, communication authenticity, and educational inclusiveness. The study therefore proposes the development of Tamil AI English Tutors capable of integrating culturally appropriate facial expressions, eye behaviour, gestures, emotional communication, and interaction styles. Such systems would contribute to preserving indigenous communicative identities while promoting equitable and culturally responsive AI-assisted language learning. The study also contributes theoretically by integrating Artificial Intelligence in Education, Human-Computer Interaction, Applied Linguistics, Social Semiotics, Intercultural Communication, and Bharatanatyam communication theory into a single interdisciplinary framework.

9. Recommendations for Future Research

Future research should expand this work in several directions.

- Experimental studies should investigate whether culturally adaptive AI tutors improve Tamil learners' motivation, communicative competence, cultural identity, and learning outcomes compared with conventional AI tutors.
- Researchers should develop and validate a Tamil Cultural Nonverbal Communication Corpus containing annotated examples of facial expressions, eye movements, gestures,

head movements, and emotional expressions. Such a corpus would support the training of culturally adaptive AI systems.

- Future studies may employ computer vision and deep learning techniques to recognise Tamil nonverbal communication automatically and integrate these patterns into intelligent tutoring systems.
- Cross-cultural comparisons could be extended to other South Asian traditions, including Sinhala, Malayalam, Telugu, Kannada, and classical Indian dance forms such as Kathak, Kuchipudi, and Odissi, to examine how AI can support multiple indigenous communication systems.
- Interdisciplinary collaborations among AI researchers, applied linguists, Bharatanatyam scholars, psychologists, and Human-Computer Interaction specialists are recommended to develop culturally responsive AI educational technologies that preserve local communicative identities while promoting effective English language learning.

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