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PAPER

# The Impact of Interactive Mobile Learning on Enhancing University Students' English-Speaking Proficiency

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**ABSTRACT**

In the context of globalization, proficiency in English-speaking is crucial for the academic and career development of university students. However, traditional English teaching methods often fall short in effectively enhancing students' speaking proficiency. With the advancement of information technology (IT), interactive mobile learning has gradually emerged as a vital teaching tool, offering new avenues for teaching English speaking. By leveraging the convenience and diversity of mobile devices, interactive mobile learning provides students with a flexible environment to improve their speaking proficiency. The current study predominantly focuses on the integration of technology and education, but there is limited investigation into the specific applications and effectiveness of interactive mobile learning in enhancing English-speaking proficiency. Furthermore, existing studies tend to provide fragmented analyses of mobile learning interaction behaviors and their constituent elements, failing to fully reveal the advantages of this approach. This study aims to construct an interactive mobile learning framework tailored to university students' English-speaking practice, analyze the interaction behaviors and elements within this framework, and explore its impact on improving students' speaking proficiency. The goal is to enrich the theoretical system of interactive mobile learning and provide practical insights for English-speaking teaching in higher education.

**KEYWORDS**

interactive mobile learning, university students, English-speaking proficiency, learning behavior analysis, teaching innovation

## 1 INTRODUCTION

In the context of globalization, English, as an international lingua franca, plays a crucial role in university students' academic and professional development [1–4]. However, traditional English teaching methods often neglect the cultivation of students' speaking proficiency, limiting their opportunities for oral expression in the classroom [5–8]. Consequently, with the rapid advancement of IT, interactive mobile learning has progressively become an essential tool in teaching English speaking.

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The convenience of mobile learning, allowing for anytime, anywhere access, along with its diverse interactive formats, is gradually transforming traditional teaching methods, aiding students in improving their English-speaking proficiency in more relaxed learning environments.

Interactive mobile learning is not merely the integration of IT with English language teaching but also a critical means of promoting student autonomy and enhancing the overall learning experience [9, 10]. Through mobile devices, students can engage in extensive oral practice, improving both the fluency and accuracy of their English-speaking proficiency [11–14]. This study aims to explore the specific role of interactive mobile learning in enhancing the speaking proficiency of university students, addressing the gap in traditional classroom settings where oral training is often insufficient and providing new teaching strategies and theoretical foundations for English education in higher education.

To date, most studies on English-speaking proficiency have focused on classroom interaction and traditional teaching methods, with relatively few examining the systematic application of interactive mobile learning. Furthermore, existing research has provided only fragmented analyses of the interactive behaviors in mobile learning, often overlooking the potential of mobile devices to enhance student engagement and learning outcomes [15, 16]. The essential components, behavioral patterns, and actual impact of interactive mobile learning on speaking proficiency remain underexplored, and current study methods have been insufficient in fully revealing both the strengths and limitations of mobile learning [17, 18].

This study aims to fill this gap by systematically investigating the role of interactive mobile learning in improving the speaking proficiency of university students. The study is structured into four main parts: first, the design and construction of an interactive mobile learning network tailored to the needs of university students' English-speaking practice; second, the analysis of mobile interaction behaviors in English-speaking learning; third, the exploration of the constituent elements of interactive mobile learning; and finally, an in-depth examination of how mobile interaction impacts the improvement of students' speaking proficiency. This study not only enriches the theoretical framework of interactive mobile learning but also provides practical pathways for the teaching of English-speaking in higher education, offering significant academic and practical value.

## 2 INTERACTIVE MOBILE LEARNING NETWORK FOR UNIVERSITY STUDENTS' ENGLISH-SPEAKING PRACTICE

To construct an effective interactive mobile learning network, several key principles must be considered. The first is the centrality of interaction. In graph theory, centrality analysis can help identify the nodes that play a crucial role in the learning process. For English-speaking practice, teachers and certain students with stronger speaking skills may emerge as central nodes in the interaction network. These individuals can drive engagement through frequent interactions, thereby fostering a highly interactive learning environment. Centrality analysis can also identify isolated students, enabling timely intervention by teachers. The second principle is the connectivity of the social network. To ensure the efficiency of the interactive mobile learning network, the connections between all nodes should be as dense as possible. English-speaking practice requires students to engage frequently, and stronger connectivity implies more opportunities for interaction, leading to a more significant improvement in speaking proficiency. Connectivity analysis within graph

theory can reveal which students participate less in interactions, and targeted learning tasks can then be designed to enhance their engagement. Figure 1 illustrates the mobile interaction model for English-speaking practice among university students.

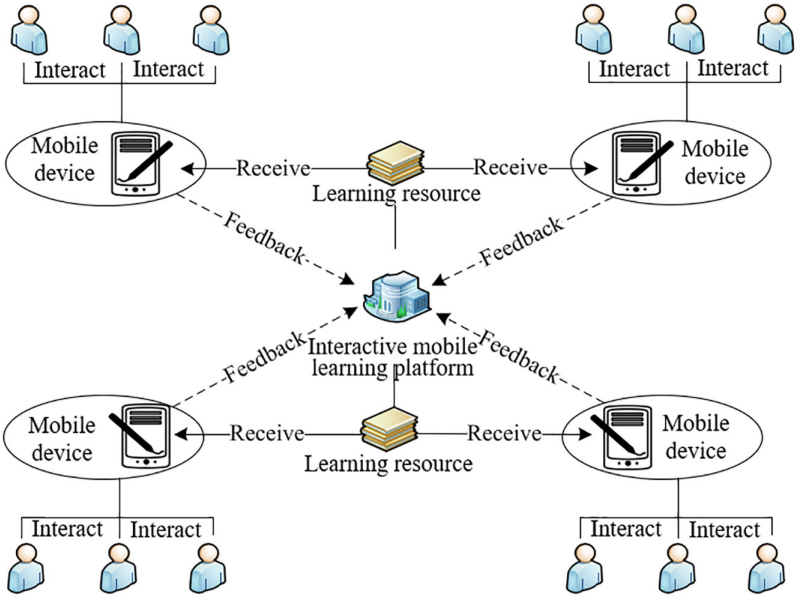


**Fig. 1.** Mobile interaction model for university students' English-speaking practice

For student nodes in an interactive mobile learning network, a higher degree indicates more frequent interaction. For instance, a student with a high out-degree signifies frequent initiation of interactions, while a high in-degree may suggest that other students often seek help from or collaborate with them. In this network, each element of the adjacency matrix represents whether there is a connection between two nodes and the strength of that connection. For a network with $V$ nodes, the adjacency matrix is a $V \times V$ matrix. If an interaction exists between two nodes, the corresponding matrix element is one; otherwise, it is 0. If the interaction strength needs to be represented, higher values can be used to denote stronger interactions. The adjacency matrix not only provides a visual representation of the entire network structure but also facilitates the rapid calculation of specific network characteristics, such as overall connectivity or the degree of a particular node. In the context of interactive mobile learning, the adjacency matrix can be applied to analyze the collaboration network among students, the frequency of learning resource usage, and ultimately optimize interaction strategies. Specifically, it is assumed that the set of nodes in the network is represented by $N = \{n_u | u = 1, 2, ..., v\}$, where the network size, i.e., the number of nodes, is given by $|N| = v$. The set of edges in the network is represented by $R = \{r_k | k = 1, 2, ..., l\}$, and the total number of edges in the network is $|R| = l$. If an edge exists between node $u$ and node $k$, it is indicated by $x_{uk} = 1$, while $x_{uk} = 0$ signifies no edge between the two nodes. The adjacency matrix expression is as follows:

$$X = \begin{bmatrix} x_{11}, x_{12}, x_{13}, \ldots, x_{1v} \\ x_{21}, x_{22}, x_{23}, \ldots, x_{2v} \\ \vdots \ , \vdots \ , \vdots \ , \cdots, \ \vdots \\ x_{v1}, x_{v2}, x_{v3}, \ldots, x_{vv} \end{bmatrix} \tag{1}$$

The degree of any node $u$ is calculated using the following formula:

$$F(u) = \sum_{k=1}^{v} x_{uk} \tag{2}$$

## 3 ANALYSIS OF MOBILE INTERACTION BEHAVIORS IN ENGLISH-SPEAKING PRACTICE FOR UNIVERSITY STUDENTS

In the interactive mobile learning network designed for university students' English-speaking practice, mobile interactions can be defined and analyzed from two dimensions: relational interaction and informational interaction. Specifically, relational interaction primarily reflects the establishment of social relationships and emotional exchange between learners. In this network environment, learners engage in behaviors such as following other learners, teachers, and learning resources, giving likes, leaving comments, adding friends, and sharing learning achievements. These behaviors demonstrate relational interactions and go beyond mere linguistic accuracy or phonetic imitation, involving a broader spectrum of social and emotional engagement. Informational interaction also plays a critical role in the mobile learning network, especially when it comes to English-speaking practice. It is manifested through the publication, transmission, and acquisition of information between learners. In this environment, learners are not only receivers of information but also producers and disseminators. The content of informational interaction includes learners' uploaded videos or audio of their speaking practice, shared learning materials, published learning experiences and reflections, as well as classroom content and learning methods delivered through the platform.

The strength of relational interaction can be quantified by measuring the intensity and reach of mobile interaction relationships. In the interactive mobile learning network designed for university students' English-speaking practice, the strength of mobile interaction relationships is an essential dimension of analysis. It can be quantified through the weighted values of likes, comments, and shares between users. The higher the strength of a mobile interaction relationship, the greater the user's activity and influence within the network, and the stronger their ability to motivate other learners in the process of English-speaking practice. For any given user $u$, the strength of their mobile interaction relationships can be expressed as the sum of the weights of interaction edges between that user and all their connected users. In other words, the interaction strength of user $u$ equals the cumulative weight of likes, comments, and shares between them and other learners. Assuming the set of nodes directly connected to $u$ is denoted by $\partial(u)$, and the relationship weight between nodes $u$ and $k$ is represented by $q_{uk}$, the calculation formula is as follows:

$$E(u) = \sum_{k \in \partial(u)} q_{uk} \tag{3}$$

In the interactive mobile learning network designed for university students' English-speaking practice, the range of mobile interaction influence reflects the direct and indirect impact that a learner has on other users. In a mobile learning network, users with a larger influence range exert a greater impact on the learning community

through their speaking practices and shared learning content. Particularly in the context of English-speaking practice, learners with a broad influence range often emerge as key facilitators in the network, as the content they post generates more interactions and further dissemination, thus influencing a larger group of learners. In the mobile learning network for university students' English-speaking practice, the range of a learner's mobile interaction influence can be measured by the sum of the degrees of their friends and their friends' friends. The expansion of this influence range signifies that the learner is highly active within the network, and the information they share contributes to the learning of others, further promoting knowledge sharing and dissemination within the entire network. Assuming the degree of node $q$ is represented by $F(q)$, and the sets of neighboring nodes for nodes $u$ and $k$ are denoted by $\Xi(u)$ and $\Xi(k)$, respectively, the mobile interaction influence range for any given node $u$ is represented as follows:

$$W(k) = \sum_{q \in \Xi(k)} F(q) \tag{4}$$

$$TM(k) = \sum_{k \in \Xi(u)} W(k) \tag{5}$$

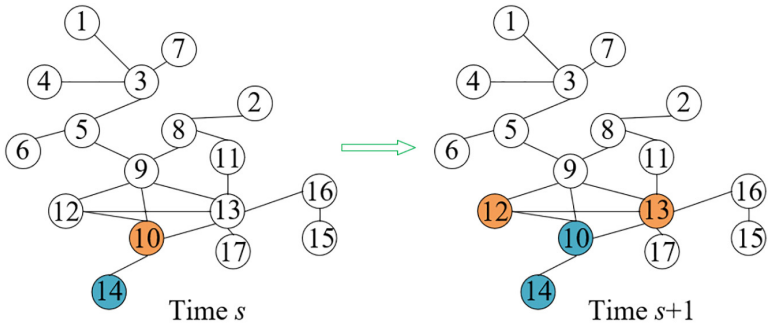


**Fig. 2.** Schematic diagram of information dissemination in the mobile learning network

Figure 2 illustrates a schematic diagram of information dissemination in the mobile learning network. Information interaction can be quantified by measuring information dissemination control. Information dissemination control is a crucial metric for evaluating a learner's ability to influence and direct the flow of information within the learning network. It reflects a learner's key role in the publication, transmission, and spread of learning content, particularly in the context of knowledge sharing and providing feedback on speaking practice among learners. Information dissemination control not only reflects the learner's social reach but, more importantly, their function as a bridge or central node in the network—indicating the extent to which information must pass through a particular learner to reach others. In an interactive mobile learning network, information dissemination control can be quantified through betweenness centrality, a classic metric in social network analysis. Betweenness centrality measures the "intermediary" role a node plays in the dissemination of information. In the context of English-speaking practice for university students, certain learners may act as critical nodes for information dissemination—meaning that information can only be effectively transmitted between learners through these key nodes. Assuming the number of shortest paths from node $t$ to node $s$ is denoted by $h_{ts}$, and the number of shortest paths from node $t$

to node $s$ that pass through a given node is represented by $h_{ts}^{u}$, the method for assessing the importance of a node using betweenness centrality is as follows:

$$Y(u) = \sum_{u \neq t, u \neq s, t \neq s} \frac{h_{ts}^{u}}{h_{ts}} \tag{6}$$

To avoid cases where the betweenness value is zero, the following adjustment to the calculation formula was made in this study:

$$Y(u) = \sum_{u \neq t, u \neq s, t \neq s} \frac{h_{ts}^{u} + 1}{h_{ts} + v} \tag{7}$$

Compared to relying solely on the number of friends or influence range to measure a learner's importance, information dissemination control reveals which learners serve as "bridges" or "bottlenecks" in the entire learning network by analyzing information flow paths. For instance, if a learner has a high betweenness centrality within the learning network, a reduction in their interaction or their withdrawal from the network may lead to delays in information dissemination or even interruptions in local information flow. This analysis can help researchers identify weaknesses in the learning network and develop strategies to enhance the efficiency and connectivity of information dissemination.

## 4 COMPONENTS OF MOBILE INTERACTION FOR UNIVERSITY STUDENTS' ENGLISH-SPEAKING PRACTICE

In the interactive mobile learning network, the establishment of initial trust relies on a learner's behavior, interaction history with other users, and overall image displayed within the network. Whether a learner is easily trusted by others in the network depends on their performance in the following dimensions: mobile interaction strength, mobile interaction influence range, and information dissemination control. These three dimensions form the foundational components of trust quantification and serve as essential metrics for evaluating a learner's credibility within the network. Specifically, assuming that the contributions of mobile interaction strength, mobile interaction influence range, and information dissemination control to user trust are represented by $q_1$, $q_2$, and $q_3$, respectively, the trust level of any given node $u$ can be expressed as follows:

$$CR(u) = q_1 * E(u) + q_2 * TM(u) + q_3 * TUE(u) \tag{8}$$

In the process of quantifying trust, the entropy weight method was applied in this study to calculate the contribution of each factor to trust. The entropy weight method is a weight allocation technique based on information entropy theory, which dynamically adjusts the weight distribution by considering the information provided by each factor. In the interactive mobile learning network for university students' English-speaking practice, the entropy weight method was implemented through the following steps:

Step 1: Interaction data from learners in the network were extracted, forming an evaluation matrix that includes mobile interaction strength, mobile interaction influence range, information value, and information dissemination control. Specifically, assuming that the trust value of the $k$-th node for the $u$-th influencing factor is represented by $e_{uk}$, for an interactive mobile learning network of size $v$, with $l$ influencing factors used to rank trust, the following evaluation matrix can be obtained:

$$E = \begin{bmatrix} e_{11}, e_{12}, \ldots, e_{1v} \\ e_{21}, e_{22}, \ldots, e_{2v} \\ \vdots, \ \vdots, \ddots, \ \vdots \\ e_{l1}, e_{l2}, \ldots, e_{lv} \end{bmatrix} \tag{9}$$

Step 2: The data in the evaluation matrix were normalized to ensure consistency across the different factor scales.

Step 3: The information entropy of each factor was then calculated. The smaller the information entropy, the greater the amount of information that factor provides, and thus, its contribution to trust is higher, warranting a larger weight. Conversely, if the information entropy of a factor is higher, it indicates that its contribution to trust evaluation is smaller, and it should be assigned a lower weight. Specifically, each row of $E$ was normalized based on the following formula, and then the information entropy $G_u$ of the $u$-th influencing factor was calculated:

$$G_u = -\frac{1}{LNv} \sum_{k=1}^{v} o_{uk} LNo_{uk} \tag{10}$$

$$o_{uk} = \frac{e_{uk}}{\sum_{j=1}^{v} e_{uj}} = e_{uk} \tag{11}$$

Therefore, the weight of the $u$-th influencing factor is represented as follows:

$$q_k = \frac{1 - G_u}{\sum_{k=1}^{l} (1 - G_u)} \tag{12}$$

Step 4: The overall trust level of each learner in the network was obtained through a comprehensive evaluation.

## 5 THE IMPACT OF MOBILE INTERACTION ON THE ENHANCEMENT OF UNIVERSITY STUDENTS' ENGLISH-SPEAKING PROFICIENCY

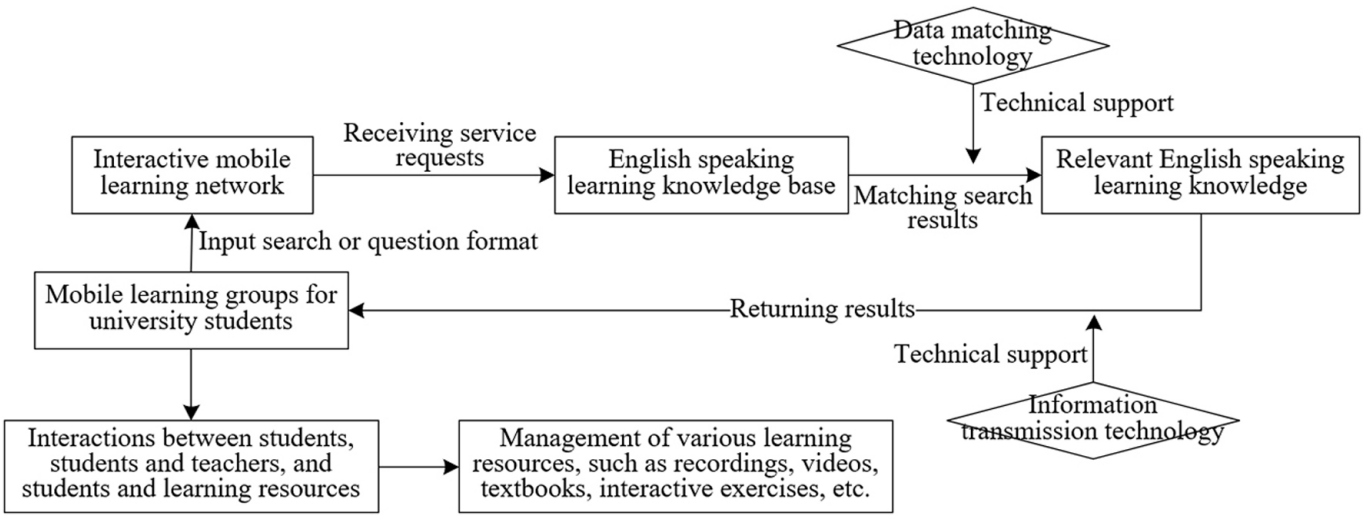


**Fig. 3.** Mechanism for enhancing university students' English-speaking proficiency based on mobile interaction

Informational interaction plays a critical role in improving the English-speaking proficiency of university students within an interactive mobile learning network. This interaction is primarily facilitated through the sharing and acquisition of learning resources, knowledge, and experiences related to English-speaking, enabling learners to continuously enhance their speaking skills through practice. Figure 3 illustrates the mechanism for enhancing English-speaking proficiency through mobile interaction. To analyze the specific effects of informational interaction on the improvement of students' English-speaking proficiency, several dimensions were explored in this study, including the richness of learning resources, personalized learning content, real-time feedback mechanisms, and self-regulated learning.

**a)** Richness and diversity of learning resources: A core feature of informational interaction is the richness and diversity of available learning resources. In an interactive mobile learning network, learners can access a wide range of materials related to English-speaking at any time. These resources include speaking practice videos, grammar tutorials, pronunciation correction courses, and dialogue examples.

**b)** Personalized learning content and adaptability: Informational interaction is also highly personalized and adaptive. In traditional classrooms, the teaching content is often standardized and may not meet the specific needs of each learner. However, informational interaction within an interactive mobile learning network can offer personalized content based on the learner's English proficiency, interests, and learning goals. For instance, certain mobile learning platforms can analyze a learner's speaking performance and automatically recommend relevant resources, providing tailored speaking practice materials that align with their proficiency level.

**c)** Enhancement of real-time feedback mechanism: Informational interaction within the mobile learning network is often accompanied by real-time feedback, which is a significant factor in its positive impact on English-speaking proficiency. The real-time feedback mechanism enables learners to promptly understand the effectiveness of their learning and quickly make adjustments for improvement. For instance, when learners engage in speaking practice on a mobile platform, the platform can provide immediate feedback, such as pronunciation correction and tone suggestions, through speech recognition technology.

**d)** Strengthening of self-regulated learning abilities: Informational interaction also plays a critical role in fostering self-regulated learning. Self-regulated learning refers to the ability of learners to independently adjust their learning strategies and content based on their progress and goals. In an interactive mobile learning network, informational interaction provides learners with a wealth of learning materials and diverse practice methods, enabling them to flexibly choose resources that meet their specific needs, thereby enhancing their self-regulation abilities.

In the interactive mobile learning network for university students' English-speaking practice, relational interaction also plays a significant role in improving English-speaking proficiency. Relational interaction not only focuses on the transfer of knowledge and skills but also encompasses emotional support, the building of interpersonal relationships, and the enhancement of social skills among learners. This type of interaction promotes the socialization and contextualization of

language learning and, through various means, improves learners' confidence in speaking, provides more opportunities for language practice, and fosters cultural adaptation. The specific impact of relational interaction on the improvement of English-speaking proficiency was discussed from four dimensions in this study: interpersonal support, learning motivation, social interaction, and cultural understanding.

**a)** Interpersonal support and emotional encouragement: One of the key features of relational interaction within the interactive mobile learning network is interpersonal support and emotional encouragement. The process of language learning is often accompanied by frustration and self-doubt, especially when practicing speaking, where learners may feel anxious about pronunciation, grammatical errors, or improper word choices.

**b)** Enhancement of learning motivation and persistence: Relational interaction plays a positive role in enhancing learning motivation. Language learning is not solely an individual effort but a social process. In an interactive mobile learning network, relational interaction fosters a sense of community and belonging among learners, making them feel part of a learning community. This, in turn, stimulates their motivation and commitment to learning. For instance, learners may need to collaborate with others on group tasks, such as completing speaking exercises or delivering English presentations.

**c)** Increased social interaction and language practice opportunities: Relational interaction can significantly increase learners' opportunities for social interaction and language practice. The nature of language learning is inherently social, especially in the context of speaking, which requires continuous practice and application in real-life situations. Through relational interaction in an interactive mobile learning network, learners can engage in voice or video conversations with other learners or foreign mentors, often in simulated or real social scenarios. They may also participate in language exchange programs.

**d)** Enhancement of cross-cultural understanding and adaptation: Relational interaction also plays a crucial role in improving learners' cross-cultural understanding and adaptation. Through interaction with peers or mentors from different cultural backgrounds in the mobile learning network, learners gain a deeper understanding of the practical usage of English and the linguistic differences across cultures.

## 6 EXPERIMENTAL RESULTS AND ANALYSIS

The experimental results reveal the characteristics of mobile interaction within the interactive mobile learning network designed for university students' English-speaking practice. In the distribution of mobile interaction relationship strength, as shown in Figure 4, a small number of nodes exhibit significantly higher relationship strength compared to other nodes, with the overall distribution following a power-law pattern. This indicates that while most learners have low interaction intensity, a few learners engage in frequent and close interactions, forming a core group of learners. In Figure 5, the distribution of mobile interaction influence range follows a normal distribution, suggesting that most learners have a similar range of interaction influence, with only a few nodes having either a very large or very small impact on other learners.

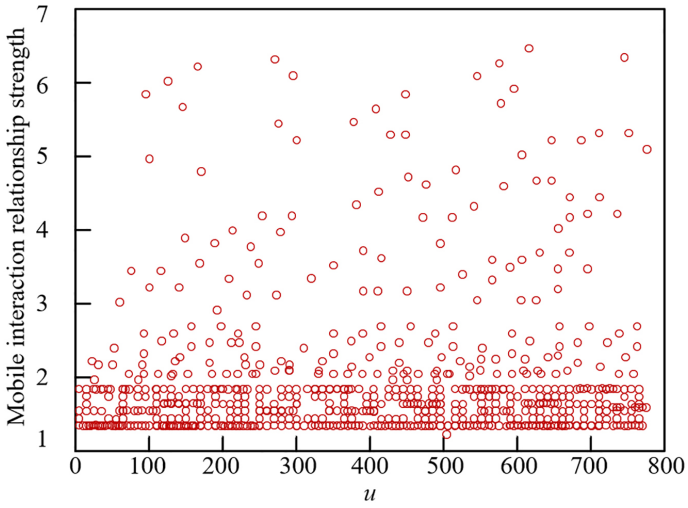


**Fig. 4.** Distribution of mobile interaction relationship strength

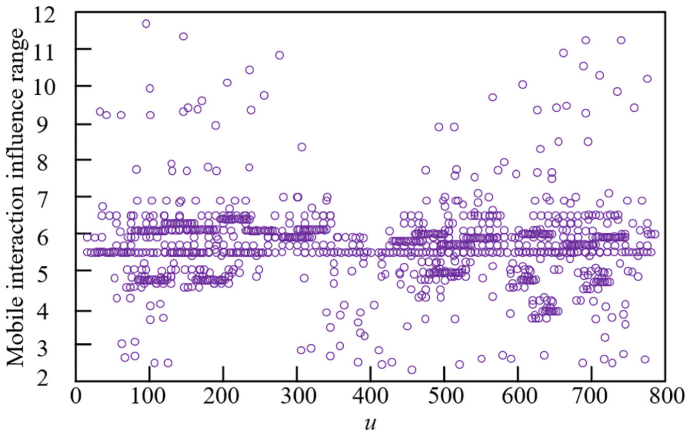


**Fig. 5.** Distribution of mobile interaction influence range

Similarly, Figure 6 illustrates the distribution of information dissemination control, which also follows a normal distribution. Most nodes exhibit relatively balanced control over information dissemination, with only a few nodes demonstrating exceptionally high or low control. These experimental results indicate that interaction behavior among learners within this interactive mobile learning network exhibits complex hierarchies and structures. Based on the above findings, it can be concluded that the power-law distribution characteristic in the network reflects that a small group of learners, identified as "core learners," engage in higher frequencies of interaction. These core nodes, through frequent interactions, contribute to facilitating opportunities for language practice and the improvement of speaking proficiency within the network. However, the lower levels of interaction among most learners indicate an imbalance in interaction intensity, which may result in slower progress for some learners in improving their speaking proficiency. At the same time, the normal distribution observed in the interaction influence range and information dissemination control suggests that the majority of learners have relatively similar levels of influence and control over information flow, demonstrating that the system effectively supports widespread information dissemination and interaction coverage.

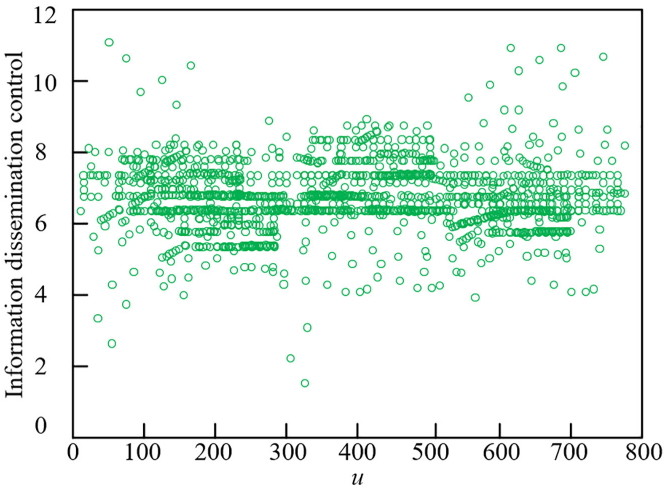


**Fig. 6.** Distribution of information dissemination control

**Table 1.** The impact of three mobile interaction factors on university students' trust in different networks

| Weight / Network | Mobile Interaction Relationship Strength | Mobile Interaction Influence Range | Information Dissemination Control |
|---|---|---|---|
| Teacher-student interaction | 0.18952 | 0.2345 | 0.4325 |
| Peer interaction | 0.2236 | 0.3269 | 0.3854 |
| Adaptive interaction | 0.2145 | 0.2562 | 0.5124 |

Based on the results presented in Table 1, across the three types of interactive mobile learning networks—teacher-student interaction, peer interaction, and adaptive interaction—information dissemination control exhibits the most significant impact on students' trust, with the highest weight observed in the adaptive interaction network at 0.5124. This highlights the prominent role that adaptive learning systems play in establishing trust among students. In comparison, the information dissemination control weights for the teacher-student interaction and peer interaction networks are 0.4325 and 0.3854, respectively. The mobile interaction influence range has a greater effect on trust in the peer interaction network, with a weight of 0.3269, while the influence range weights for the adaptive interaction and teacher-student interaction networks are 0.2562 and 0.2345, respectively. The mobile interaction relationship strength has a relatively smaller impact on trust across all three networks, with the peer interaction network showing the highest weight at 0.2236, followed by the adaptive interaction network at 0.2145 and the teacher-student interaction network at 0.18952.

**Table 2.** Top 10 nodes in the teacher-student interaction network based on different indicators

| Ranking / Indicator | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mobile interaction relationship strength | 3652 | 6789 | 6458 | 6895 | 483 | 52 | 658 | 1248 | 3215 | 712 |
| Mobile interaction influence range | 3521 | 465 | 1562 | 3265 | 6745 | 1612 | 726 | 1356 | 336 | 721 |
| Information dissemination control | 52 | 3652 | 6452 | 6785 | 659 | 3874 | 478 | 332 | 1758 | 489 |
| Credibility | 3578 | 52 | 6412 | 6795 | 498 | 659 | 3698 | 345 | 1547 | 1784 |

Table 2 shows the top 10 nodes in the teacher-student interaction network based on four different indicators. First, in the ranking of mobile interaction relationship strength, nodes 3652, 6789, and 6458 occupy the top three positions, indicating that these nodes have high interaction frequencies with other learners, forming a tightly knit teacher-student interaction network. Second, the ranking for mobile interaction influence range shows that nodes 3521, 465, and 1562 have the widest influence, suggesting that these nodes are able to affect a larger number of learners within the network. In terms of information dissemination control, nodes 52 and 3652 rank first and second, respectively, demonstrating strong information dissemination and control abilities, effectively guiding the flow of information within the network. The ranking for credibility indicates that nodes 3578 and 52 have the highest levels of credibility, signifying that learners associated with these nodes are trusted and regarded as authoritative figures, capable of exerting a positive influence on other learners.

**Table 3.** Top 10 nodes in the peer interaction network based on different indicators

| Indicator \ Ranking | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mobile interaction relationship strength | 215 | 78 | 658 | 625 | 137 | 732 | 535 | 421 | 94 | 642 |
| Mobile interaction influence range | 213 | 77 | 674 | 634 | 156 | 741 | 94 | 458 | 537 | 632 |
| Information dissemination control | 78 | 659 | 223 | 724 | 641 | 94 | 539 | 136 | 715 | 638 |
| Credibility | 78 | 215 | 644 | 629 | 158 | 741 | 94 | 539 | 668 | 435 |

Table 3 shows the top 10 nodes in the peer interaction network based on four different indicators: mobile interaction relationship strength, mobile interaction influence range, information dissemination control, and credibility. For mobile interaction relationship strength, nodes 215, 78, and 658 rank in the top three, indicating that these nodes maintain high interaction frequencies in peer interaction, engaging in frequent communication with other learners. The ranking of mobile interaction influence range shows that nodes 213 and 77 have a broad influence, suggesting that these nodes can affect a larger number of peers within the network. In terms of information dissemination control, nodes 78, 659, and 223 are at the top, demonstrating their pivotal role in controlling and directing the flow of information, which significantly impacts the information transmission paths. The ranking of credibility shows that nodes 78, 215, and 644 have the highest credibility, indicating that these learners are highly trusted within peer interactions and possess a strong authority and demonstrative effect within the network. The experimental results suggest that nodes with high interaction frequency in the peer interaction network promote learners' English-speaking proficiency through frequent exchanges and collaboration. Such positive peer interactions contribute to mutual learning and practice of speaking skills.

**Table 4.** Top 10 nodes in the adaptive interaction network based on different indicators

| Indicator \ Ranking | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Mobile interaction relationship strength | 518 | 424 | 1189 | 5789 | 145 | 3562 | 2879 | 25456 | 3652 | 5481 |
| Mobile interaction influence range | 534 | 415 | 1185 | 5741 | 3895 | 147 | 3125 | 3548 | 3648 | 5652 |
| Information dissemination control | 1125 | 533 | 125 | 5756 | 426 | 2568 | 5658 | 2354 | 1256 | 1125 |
| Credibility | 536 | 1178 | 428 | 127 | 5789 | 2548 | 3748 | 5874 | 3562 | 2356 |

Table 4 presents the top 10 nodes in the adaptive interaction network, ranked based on four different indicators: mobile interaction relationship strength, mobile interaction influence range, information dissemination control, and credibility. In terms of mobile interaction relationship strength, nodes 518 and 424 rank the highest, indicating that these nodes demonstrate high interaction frequency within the adaptive learning network, enhancing learner engagement through frequent personalized interactions. For mobile interaction influence range, nodes 534 and 415 are ranked at the top, showing that these nodes can influence a broad group of learners, thus helping to expand the coverage of adaptive interactions. In the ranking for information dissemination control, nodes 1125 and 533 stand out, indicating their leading roles in controlling the quality and speed of information transmission within the network. In terms of credibility, nodes 536 and 1178 rank the highest, suggesting that these nodes possess a high level of trust within the adaptive learning network and are able to encourage learners to actively participate and trust the feedback and recommendations provided by the system. The experimental results indicate that frequent personalized interactions in the adaptive interaction network contribute to increased learner engagement and motivation, thus enhancing the improvement of English-speaking proficiency. High interaction frequency not only provides more opportunities for practice but also delivers more timely feedback, which improves learning outcomes. Nodes with a larger mobile interaction influence range help expand the reach of adaptive learning, distributing learning resources and personalized content to a broader group of learners, thereby promoting speaking practice across a wider learner population. Furthermore, nodes with high information dissemination control highlight the importance of information quality and transmission efficiency within the adaptive network, ensuring that learners receive high-quality learning materials and feedback, which further enhances speaking proficiency. Finally, nodes with high credibility indicate that trust and authority are key factors in sustaining learner participation and in fostering confidence in the system's feedback in the adaptive learning environment.

## 7 CONCLUSION

This study systematically investigated the role of interactive mobile learning in improving university students' English-speaking proficiency, focusing on four main aspects: First, an interactive mobile learning network specifically designed for English-speaking practice among university students was developed, enabling effective learning through mobile devices. Second, the mobile interaction behaviors of students engaged in English-speaking practice were analyzed, including interaction relationship strength, influence range, and information dissemination control. Third, the study explored the structural elements of the interactive mobile learning network, identifying key nodes and their functions in different types of networks, such as teacher-student interaction, peer interaction, and adaptive interaction. Finally, the specific impact of mobile interaction on students' English-speaking proficiency was examined in depth, with the data highlighting how factors such as interaction relationship strength, information dissemination control, and credibility affect learning outcomes and trust levels.

Based on an analysis of the experimental results, several comprehensive conclusions can be drawn: the construction and optimization of interactive mobile learning networks can significantly enhance students' English-speaking proficiency. This effect is particularly notable in environments characterized by high relationship

strength, efficient information dissemination, and broad influence. The experimental results indicate that the frequency of interaction, influence range, and information control among network nodes play a critical role in improving learner engagement, learning outcomes, and trust levels. However, certain limitations were identified in this study, such as the insufficient exploration of learners' personalized needs and the need for further verification of the long-term effects across different network environments.

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