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A DEMATEL Analysis of Factors Contributing to Low Fluency in ESL Spontaneous Speaking Among Local Undergraduates

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ABSTRACT

This study aims to investigate the interdependent causal relationships among the factors contributing to low fluency in spontaneous English speaking as well as to categorize the identified factors into "cause" and "effect" groups to prioritize the most critical drivers of spontaneous speech disfluency among local ESL undergraduates.

1. Introduction

1.1 Research Background

Spontaneous speaking requires the immediate and/or impromptu generation and production of school of thoughts, involving the seamless cognitive processing integration, lexical knowledge as well as grammatical encoding. In practice, this demand often exposes inefficiencies in speech production, resulting the ESL learners' hesitation, fragmented speech and utterances, as well as reduced the oral competence clarity. In this regard, low fluency in spontaneous English speaking among undergraduate ESL learners has been a growing in concern in the discourse of higher education in recent years, particularly within contexts where communicative competence is institutionally emphasised yet unevenly realised [3]. On the other hand, some argue that fluency is not solely dependent on ESL learners' linguistic knowledge but is fundamentally shaped by their own automaticity and processing pace during real-time interaction [22] [8] [14].

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Despite prolonged formal instruction, many ESL undergraduates still demonstrate limited fluency, highlighting a disconnect between pedagogical and instructional focus and actual communicative demands. Emerging empirical evidence further underscores the constraining role of affective variables, particularly speaking anxiety and fear of negative evaluation, which have been shown to suppress willingness to communicate and disrupt speech performance [15; 21]. Collectively, these insights suggest that low fluency in spontaneous speaking should not be viewed as an isolated linguistic deficiency. Instead, it represents a complex and dynamic phenomenon shaped by the interplay of cognitive, linguistic, and affective factors, which requires more rigorous and context-sensitive scholarly investigation.

In the Malaysian tertiary landscape – which extends beyond basic literacy, oral communicative competence has emerged as a critical benchmark for ESL undergraduates' achievement, serving as a primary determinant of both integrated academic performance and readiness for the globalized labour market. Research in Malaysia often highlights that while these students may pass written exams, their lack of spontaneous English-speaking skills creates a "language wall" during job interviews and professional integration [5; 13; 4; 10].

While Malaysian higher education has made communicative proficiency a strategic priority, a persistent "fluency paradox" continues to hinder ESL undergraduates; specifically, students often possess a functional grasp of linguistic rules yet face significant difficulty mobilizing this knowledge during spontaneous, real-time discourse. Predominant pedagogical frameworks continue to prioritize grammatical precision and rote rehearsal, a focus that inadvertently neglects the complex cognitive-linguistic integration essential for spontaneous oral production [20]. While extant literature has identified various impediments—such as lexical deficiency and speaking anxiety [15; 21]—these variables are frequently examined as discrete, isolated entities rather than components of a holistic system.

Consequently, there remains a notable lack of scholarly consensus regarding the interdependent causal architecture of these factors. Current research is largely dominated by descriptive or correlational methodologies, which lack the analytical depth required to differentiate between primary causal drivers and their resultant symptoms. This theoretical disconnect signifies a critical research gap; without a systemic understanding of how these variables interact, instructional interventions remain largely symptomatic, failing to address the foundational mechanisms that precipitate low fluency in ESL learners. Thus, there is an urgent need for a robust, structural modelling approach—such as the Decision-Making Trial and Evaluation Laboratory (DEMATEL)—to map the complex cause-and-effect relationships within the Malaysian undergraduate context.

The findings of this research carry profound implications for both pedagogical innovation and institutional policy within the ESL landscape. By utilizing the DEMATEL method to prioritize influential factors, this study provides a strategic roadmap for curriculum designers to move beyond superficial fluency drills and target the foundational causal drivers of speech disfluency. From a pedagogical standpoint, the results may necessitate a shift toward "fluency-first" instructional strategies that emphasize ESL learners' cognitive automaticity and affective resilience over mere grammatical correctness. Furthermore, at an institutional level, this study underscores the necessity of aligning assessment rubrics with the unpredictable demands of globalized professional environments. By bridging the disconnect between academic tertiary instruction and real-world communicative requirements, the research offers a data-driven framework for enhancing the human capital of Malaysian ESL graduates, ensuring they are not only linguistically literate but also communicatively agile in a competitive, spontaneous global market.

1.2 Research Objectives

This study aims to investigate the interdependent causal relationships among the factors contributing to low fluency in spontaneous English speaking as well as to categorize the identified factors into "cause" and "effect" groups to prioritize the most critical drivers of spontaneous speech disfluency among local ESL undergraduates.

2. Methodology

2.1 DEMATEL overview

By creating intricate impact-relation maps, DEMATEL or Decision-Making Trial and Evaluation Laboratory method, a flexible multi-criteria decision-making tool, illustrates how different elements within a system affect one another [18]. This structured approach serves as a flexible and useful tool for making decisions in studies that require a detailed mapping of an impact-relation context [16]. DEMATEL's methodological strength is its ability to quantify qualitative expert(s)' judgements, which clarifies the feedback processes and hidden interdependencies among system variables [16]. Plus, DEMATEL's proven versatility across diverse scholarly domains—ranging from organisational performance to environmental assessment—provides a rigorous and validated foundation for studying the structural complexities of spontaneous speech production [4] [15].

However, in contrast to traditional statistical paradigms—which often rely on the reductive assumption of orthogonality among variables—the DEMATEL methodological framework effectively captures the non-linear, reciprocal causalities and complex feedback loops inherent in real-world phenomena [18]. Hence, by moving beyond the limitations of variable independence, this modern-age methodology facilitates a more nuanced exploration of the latent interdependencies that characterize ESL fluency challenges and barriers.

2.1 Procedural Framework: Utilizing DEMATEL Method

Seyed-Hosseini et al. [18] clearly instructed that DEMATEL's methodological execution is based on a five-stage analytical approach that converts subjective expert(s)' judgments and personal view(s) into a transparent causal model. The procedure begins with the creation of a direct-influence matrix (First stage), in which professionals assess the reciprocal impacts between variables using a standardised Likert-type scale ranging from 0 to 4 (0 = no influence at all). In a similar vein, Lin and Wu [16] emphasized that computational consistency is achieved through the normalization of the direct-relation matrix (Second stage), wherein individual values are scaled relative to the maximum row or column totals to facilitate a regulated dataset for subsequent structural modelling. Then, the core of the analysis involves the derivation of the total-relation matrix (Third stage), calculated through the formula $T = X(I - X)^{-1}$ (X = normalized direct-relation matrix, I = identity matrix) which integrates both direct and indirect systemic influences [22]. From this matrix, two critical indices are extracted (Fourth stage): Prominence ($D + R$), which reflects the overall importance of a factor within the system, and Relation ($D - R$), which identifies whether a factor functions as a positive value or a negative value [4]. The final stage culminates in the visualization of these dynamics via a causal-effect diagram, where factors are mapped onto a graph system. This graphical representation yields a sophisticated structural model that empowers researchers to differentiate between foundational causal drivers and resultant manifestations, thereby providing a data-driven basis for informed decision-making and the formulation of targeted strategic interventions [15] [20].

2.2 The Five-Stage DEMATEL Procedure

Table 1 DEMATEL Procedure in Five Stages

Stage	Process Description	Mathematical Operation / Output
Stage 1: Generate the Direct Relation Matrix	To identify the model of the relations among the n criteria, an n × n matrix is first generated. The effect of the element in each row is exerted on the element of each column of this matrix. If multiple experts' opinions are used, all experts must complete the matrix. arithmetic mean of all of the experts ' opinions is used and then a direct relation matrix X is generated.	$X = \begin{bmatrix} 0 & \cdots & x_{n1} \\ \vdots & \ddots & \vdots \\ x_{1n} & \cdots & 0 \end{bmatrix}$
Stage 2: Compute the Normalized Direct-Relation Matrix	To normalize, the sum of all rows and columns of the matrix is calculated directly. The largest number of the row and column sums can be represented by k. To normalize, it is necessary that each element of the direct-relation matrix is divided by k.	$k = max\{max\sum_{j=1}^{n} x_{ij}, \sum_{i=1}^{n} x_{ij}\}$ $N = \frac{1}{k} * X$
Stage 3: Compute the Total Relation Matrix	After calculating the normalized matrix, the fuzzy total-relation matrix can be computed as stated in the output section. In other words, an n × n identity matrix is first generated, then this identity matrix is subtracted from normalized matrix and the resulting matrix is reversed. The normalized matrix is multiplied by the resulting matrix to obtain the total relation matrix.	$T = \lim_{k\to+\infty}(N^1 + N^2 + \cdots + N^k)$ $T = N \times (I - N)^{-1}$
Stage 4: Set the Threshold Value	The threshold value must be obtained in order to calculate the internal relations matrix. Accordingly, partial relations are neglected and the network relationship map (NRM) is plotted. Only relations whose values in matrix T is greater than the threshold value are depicted in the NRM. To compute the threshold value for relations, it is sufficient to calculate the average values of the matrix T. After the threshold intensity is determined, all values in matrix T which are smaller than the threshold value are set to zero, that is, the causal relation mentioned above is not considered.	In this study, the threshold value is equal to 0.6723
Stage 5: Final Output & Create a Causal Diagram	The next step is to find out the sum of each row and each column of T (in step 3). The sum of rows (D) and columns (R) can be calculated as stated in the output section. Then, the values of D+R and D-R can be calculated by D and R, where D+R represent the degree of importance of factor i in the entire system and D-R represent net effects that factor i contributes to the system.	$\boldsymbol{D} = \sum_{j=1}^{n} \boldsymbol{T_{ij}}$ $\boldsymbol{R} = \sum_{i=1}^{n} \boldsymbol{T_{ij}}$

2.3 Expert Selection and Sampling Strategy

The integrity of the structural model is fundamentally contingent upon the calibre and representativeness of the expert panel when using DEMATEL analysis method. This study utilized purposive sampling—a non-probability technique—to strategically recruit participants characterized by their specialized mastery and longitudinal experience within the specific problem domain [18] [16]. While the determination of an optimal sample size in is often a point of scholarly deliberation, the literature suggests that a cohort of 5 to 15 experts is sufficient to ensure a robust diversity of perspectives while maintaining analytical focus [22] [4].

Adhering to specific selection criteria established in prior research [15] [20], the recruitment process prioritized individuals with over five years of professional tenure, advanced academic credentials (Master's level or above), and active engagement in decision-making or academic publication within the ESL field. Consequently, a panel of 10 subject-matter experts was finalized for this investigation. This sample size aligns with established methodological norms, ensuring that the resulting impact-relation maps are derived from high-fidelity, authoritative data rather than a broad, yet potentially superficial, respondent base.

2.4 Data Collection Instrument and Scale Justification

To empirically evaluate the causal architecture of the identified variables, this study utilized a structured DEMATEL survey instrument. Participants or in this case, the experts were tasked with performing a pairwise comparison of factors, quantifying the perceived direct influence of one element upon another via a five-point Likert-type intensity scale. The scalar designations are operationalized as follows:

Table 2 0-4 Scalar Designation Justification

0 (Null Influence): Denotes a complete absence of causal impact.
1 (Minimal Influence): Indicates a marginal or peripheral effect.
2 (Moderate Influence): Suggests a perceptible and substantive degree of impact.
3 (High Influence): Represents a significant and potent causal force.
4 (Extremely High Influence): Signifies a critical and dominant driver within the system.

This numerical framework facilitates the systemic quantification of subjective expert insights into a rigorous mathematical format. The raw data are aggregated to construct the initial direct-relation matrix, which is subsequently subjected to normalization and inversion processes to yield the total- relation matrix. From this final output, the study derives the Prominence (D+R) and Relation (D-R) indices.

The Prominence value serves as a diagnostic measure of a factor's systemic weight or overall visibility, while the Relation value provides a binary classification, distinguishing between foundational causal drivers (positive values) and resultant effects (negative values). By mapping these interdependencies, the methodology provides a sophisticated structural blueprint that identifies the high-leverage variables essential for designing effective pedagogical interventions.

3. Results

The results and analysis have been conducted in the subsequent steps. The findings in this section constitute an analysis of the causal relationships among factors contributing to the Low Fluency in English as a Second Language (ESL) Spontaneous Speaking Among Undergraduates, derived from the application of the Decision-Making Trial and Evaluation Laboratory (DEMATEL) methodology. DEMATEL is a way to figure out how different parts of a complicated system affect each other. It takes the experts' opinions and turns them into numbers or data to show how factors are related to each other, both directly and indirectly. The experts look at how one factor affects another and put that information into a matrix.

After that, the matrix is changed (normalized) and used to figure out the total relationships between factors, including both direct and indirect effects. Then, the two important values are calculated: prominence (R+C), which shows how important a factor is, and relation (R−C), where R is the influence, a factor gives and C is the influence it gets. This analysis provides definitive evidence

regarding the influence of various factors on the fluency of ESL undergraduates. It helps find important areas where teachers or students can make changes and shows how complicated the relationships are between different language learning methods, especially the reasons why university students have low English Language proficiency.

3.1 Stage 1: Direct Relation Matrix

The table below shows the direct relation matrix, which is the same as the experts' pairwise comparison matrix

Table 3 Pairwise comparison matrix

	Limited Exposure to English Interaction	Weak Grammatical Automisation During Speech	Speech Performance Anxiety	Fear of Negative Peer Review	Lack of Strategic Communication Competence	Cognitive Interference of First Language Translation
Limited Exposure to English Interaction	0.0000	3.5000	3.3000	3.1000	2.4000	3.4000
Weak Grammatical Automisation During Speech	2.5000	0.0000	2.6000	2.5000	2.2000	2.9000
Speech Performance Anxiety	2.3000	2.0000	0.0000	2.7000	2.0000	2.0000
Fear of Negative Peer Review	2.2000	2.0000	2.7000	0.0000	2.0000	2.0000
Lack of Strategic Communication Competence	2.5000	2.2000	2.0000	2.0000	0.0000	3.0000
Cognitive Interference of First Language Translation	3.0000	2.9000	2.0000	2.0000	3.0000	0.0000

This DEMATEL (Decision Making Trial and Evaluation Laboratory) matrix shows the direct influence relationships between six factors that were seen as barriers to English speaking proficiency among undergraduates. Each value shows how much a row factor affects a column factor on a scale from 0 to 4. The analysis indicates that Limited Exposure to English Interaction is the most significant barrier, exerting considerable effects on Weak Grammatical Automatisation (3.5), Cognitive Interference of First Language Translation (3.4), and Lack of Strategic Communication Competence (3.1). These findings suggest that inadequate practice opportunities lead to various subsequent language deficiencies. Cognitive Interference of First Language Translation is also a very important factor, especially when it comes to Limited Exposure (3.0) and Weak Grammatical Automatisation (2.9).

This suggests a mutually reinforcing relationship between these two language barriers that impacts learners' fluency. Weak Grammatical Automatisation also has a moderate effect on most of the factors, especially Cognitive Interference (2.9) and Speech Performance Anxiety (2.6). This suggests that not being able to use grammar automatically makes psychological barriers worse.

Conversely, Speech Performance Anxiety and Fear of Negative Peer Review seem to have a relatively minor impact on other factors, as indicated by their lower scores (2.0–2.7). This suggests that they function more as effect-dominant barriers influenced by other factors, rather than as primary drivers themselves.

The idea that learners rely on first-language thinking in the absence of compensatory communication strategies undermines fluency and automaticity is reinforced by the moderate influence pattern of Lack of Strategic Communication Competence, which is strongest on Cognitive Interference (3.0) and Weak Grammatical Automatization (2.2). Overall, the matrix indicates that since these two elements seem to be the main causes of the system of speaking obstacles, resolving Limited Exposure to English Interaction and lowering Cognitive Interference from the original language should be given priority.

3.2 Stage 2: Normalized Direct-Relation Matrix

The total of the matrix's rows and columns is computed immediately in order to normalize. K can be used to express the biggest number of the row and column sums. Every element in the direct-relation matrix must be divided by k in order to normalize.

Table 4 Direct-relation matrix normalized

	Limited Exposure to English Interaction	Weak Grammatical Automisation During Speech	Speech Performance Anxiety	Fear of Negative Peer Review	Lack of Strategic Communication Competence	Cognitive Interference of First Language Translation
Limited Exposure to English Interaction	0.0000	0.2229	0.2102	0.1975	0.1529	0.2166
Weak Grammatical Automisation During Speech	0.1592	0.0000	0.1656	0.1592	0.1401	0.1847
Speech Performance Anxiety	0.1465	0.1274	0.0000	0.1720	0.1274	0.1274
Fear of Negative Peer Review	0.1401	0.1274	0.1720	0.0000	0.1274	0.1274
Lack of Strategic Communication Competence	0.1592	0.1401	0.1274	0.1274	0.0000	0.1911
Cognitive Interference of First Language Translation	0.1911	0.1847	0.1274	0.1274	0.1911	0.0000

In Table 2, The direct influence links between the six obstacles to English speaking competency are shown in this DEMATEL (Decision Making Trial and Evaluation Laboratory) matrix. With zeros on

the diagonal because a factor cannot affect itself, each cell value indicates the extent to which the row factor affects the column factor. The most significant factor overall is Limited Exposure to English Interaction, which has a particularly strong impact on other barriers, especially Weak Grammatical Automatization (0.2229), Cognitive Interference of First Language Translation (0.2166), and Lack of Strategic Communication Competence (0.1975). This suggests that a lack of practice opportunities leads to a number of downstream issues. A reciprocal and reinforcing relationship between Limited Exposure (0.1911) and Lack of Strategic Communication Competence (0.1911) is demonstrated by the comparatively large outgoing influence of Cognitive Interference of First Language Translation. It appears that Speech Performance Anxiety and Fear of Negative Peer Review function in a closely related, mutually reinforcing cluster of psychological barriers since they frequently share identical or nearly identical influence scores across several pairs (e.g., both score 0.1274 on multiple targets).

Lack of Strategic Communication Competence and Weak Grammatical Automatization are in the centre, both modestly affecting and being impacted throughout the system. Overall, the matrix indicates that the barrier system is primarily driven by environmental and cognitive variables (exposure and L1 interference), but psychological elements (anxiety and peer fear) create a strongly connected sub-cluster that exacerbates speaking difficulties.

3.3 Stage 3: Total Relation Matrix

Table 5 Compute the total relation matrix

	Limited Exposure to English Interaction	Weak Grammatical Automisation During Speech	Speech Performance Anxiety	Fear of Negative Peer Review	Lack of Strategic Communication Competence	Cognitive Interference of First Language Translation
Limited Exposure to English Interaction	0.6524	0.8410	0.8304	0.8079	0.7442	0.8641
Weak Grammatical Automisation During Speech	0.6824	0.5493	0.6895	0.6737	0.6343	0.7288
Speech Performance Anxiety	0.6060	0.5954	0.4826	0.6195	0.5616	0.6163
Fear of Negative Peer Review	0.5970	0.5908	0.6248	0.4684	0.5576	0.6116
Lack of Strategic Communication Competence	0.6494	0.6397	0.6261	0.6156	0.4808	0.6999
Cognitive Interference of First Language Translation	0.7191	0.7202	0.6741	0.6624	0.6849	0.5899

The interdependencies between six foreign language anxiety (FLA) components are shown in this DEMATEL-based correlation matrix Table 3, where off-diagonal values show inter-construct correlations and diagonal values show Average Variance Extracted (AVE). With consistently high correlations with all other constructs, especially with Cognitive Interference of First Language Translation (0.8641), Weak Grammatical Automisation (0.8410), and Speech Performance Anxiety (0.8304), Limited Exposure to English Interaction stands out as the most significant factor. This suggests it acts as a root cause that amplifies the entire anxiety network. Additionally, Cognitive Interference of First Language Translation exhibits high cross-construct effect (range 0.6624–0.7202), supporting the notion that L1 dependency sustains communicative breakdown and grammatical weakness.

The most significant factor is English interaction, which shows consistently high correlations with all other constructs, especially with Cognitive Interference of First Language Translation (0.8641), Weak Grammatical Automisation (0.8410), and Speech Performance Anxiety (0.8304). This suggests that English interaction serves as a root cause that amplifies the entire anxiety network. Additionally, Cognitive Interference of First Language Translation exhibits high cross-construct effect (range 0.6624–0.7202), supporting the notion that L1 dependency sustains communicative breakdown and grammatical weakness.

However, the AVE diagonal values show issues with build reliability: Speech Performance Anxiety (0.4826) and Fear of Negative Peer Review (0.4684) are below the suggested 0.50 threshold, suggesting that they may not fully reflect their respective variances and may overlap with nearby components. Weak Grammatical Automisation and Lack of Strategic Communication Competence, on the other hand, exhibit moderate-to-high inter-correlations overall (0.63–0.70), indicating a tightly coupled anxiety system where deficiencies in one domain easily spread into others. This suggests that any pedagogical intervention must address exposure and cognitive interference concurrently rather than focusing on isolated anxiety dimensions.

3.4 Stage 4: The Threshold Value (0.6723)

Table 6 Set the threshold value

Factor	R (Influence)	C (Influenced)	R+C (Prominence)	R-C (Relation)
Limited Exposure to English Interaction	4.7400	3.9063	8.6463	0.8336
Weak Grammatical Automisation During Speech	3.9579	3.9365	7.8944	0.0215
Speech Performance Anxiety	3.4814	3.9275	7.4089	-0.4461
Fear of Negative Peer Review	3.4502	3.8474	7.2976	-0.3971
Lack of Strategic Communication Competence	3.7116	3.6635	7.3752	0.0481
Cognitive Interference of First Language Translation	4.0507	4.1107	8.1614	-0.0600

With the greatest R+C value of 8.6463 and a positive R-C value of 0.8336, the DEMATEL analysis shows that Limited Exposure to English Interaction emerged as the most significant and important element in the system, defining it as a net cause that drives other barriers. Following closely in prominence (R+C = 8.1614), Cognitive Interference of First Language Translation operated as a net

receiver (R-C = -0.0600), suggesting that although it is extensively connected within the system, it is more reactive than directive.

Weak Grammatical Automatization During Speech showed a moderate prominence (R+C = 7.8944) and a near-neutral causal relationship (R-C = 0.0215), indicating that it plays a transitional role between cause and effect. Insufficient Strategic Communication In a similar vein, competence showed a marginal causal tendency (R-C = 0.0481) with a R+C of 7.3752, making it a borderline cause. On the other hand, with negative R-C values of -0.4461 and -0.3971, respectively, Speech Performance Anxiety and Fear of Negative Peer Review were found to be net receivers, indicating that these psychological obstacles are primarily the result of structural and cognitive factors functioning elsewhere in the system.

All of the data points to contextual and cognitive factors, especially restricted engagement chances and mother tongue interference, as the fundamental triggers that lead to learners experiencing affective and psychological speaking barriers.

3.5 Stage 5: Final Output and A Causal Diagram

Table 7 Cause and Effect Relationship

Criteria	ri	ci	ri + ci	ri − ci	Cause / Effect
Limited Exposure to English Interaction	4.74	3.91	8.65	0.83	**Cause**
Weak Grammatical Automisation During Speech	3.96	3.94	7.89	0.02	**Cause**
Speech Performance Anxiety	3.48	3.93	7.41	-0.45	**Effect**
Fear of Negative Peer Review	3.45	3.85	7.30	-0.40	**Effect**
Lack of Strategic Communication Competence	3.71	3.66	7.38	0.05	**Cause**
Cognitive Interference of First Language Translation	4.05	4.11	8.16	-0.06	**Effect**

The correlations between the six obstacles influencing English speaking performance are shown by the DEMATEL analysis. With the highest prominence value (ri + ci = 8.65) and the largest positive relation value (ri − ci = 0.83), "Limited Exposure to English Interaction" was identified as the most significant factor that drives other barriers in the system. Following with a prominence of 8.16, "Cognitive Interference of First Language Translation" has a little negative relation value (−0.06), which places it marginally in the effect category, indicating that it is slightly more influenced by other factors than it influences them. With a prominence of 7.89 and a nearly zero relation value (0.02), "Weak Grammatical Automatization During Speech" is theoretically a cause but has very little net impact over other variables.

With a relation value of 0.05 and a prominence of 7.38, "Lack of Strategic Communication Competence" also belongs to the cause category, indicating that it only slightly contributes to other obstacles. On the receiving end, "Fear of Negative Peer Review" (ri − ci = −0.40, prominence = 7.30)

and "Speech Performance Anxiety" (ri − ci = −0.45, prominence = 7.41) are categorized as effects, suggesting that these psychological barriers are primarily products of the causal factors rather than independent drivers, with both being greatly influenced by external conditions like limited exposure and weak grammatical automatization.

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Increased exposure to meaningful engagement improves language acquisition, especially in terms of establishing communicative competence and spontaneous speaking abilities, according to a recent study [17]. Lack of Strategic Communication Competence (R−C = 0.05) and Weak Grammatical Automatization During Speech (R−C = 0.02) are also classified as causal factors, suggesting that learners' incapacity to internalize grammar and use communication strategies contributes to more general speaking difficulties. This interpretation is further supported by the overall relation matrix (Table 3), where greater influence values from limited exposure (such as 0.8641 and 0.8304) emphasize its crucial role in influencing other system variables.

Conversely, the effect group includes Speech Performance Anxiety (R−C = −0.45), Fear of Negative Peer Review (R−C = −0.40), and Cognitive Interference of First Language Translation (R−C = −0.06), all of which are indicative of underlying linguistic and experience limits. This result is consistent with recent studies showing that low skill, little practice, and little exposure to communicative contexts frequently result in language anxiety and fear of evaluation [16].

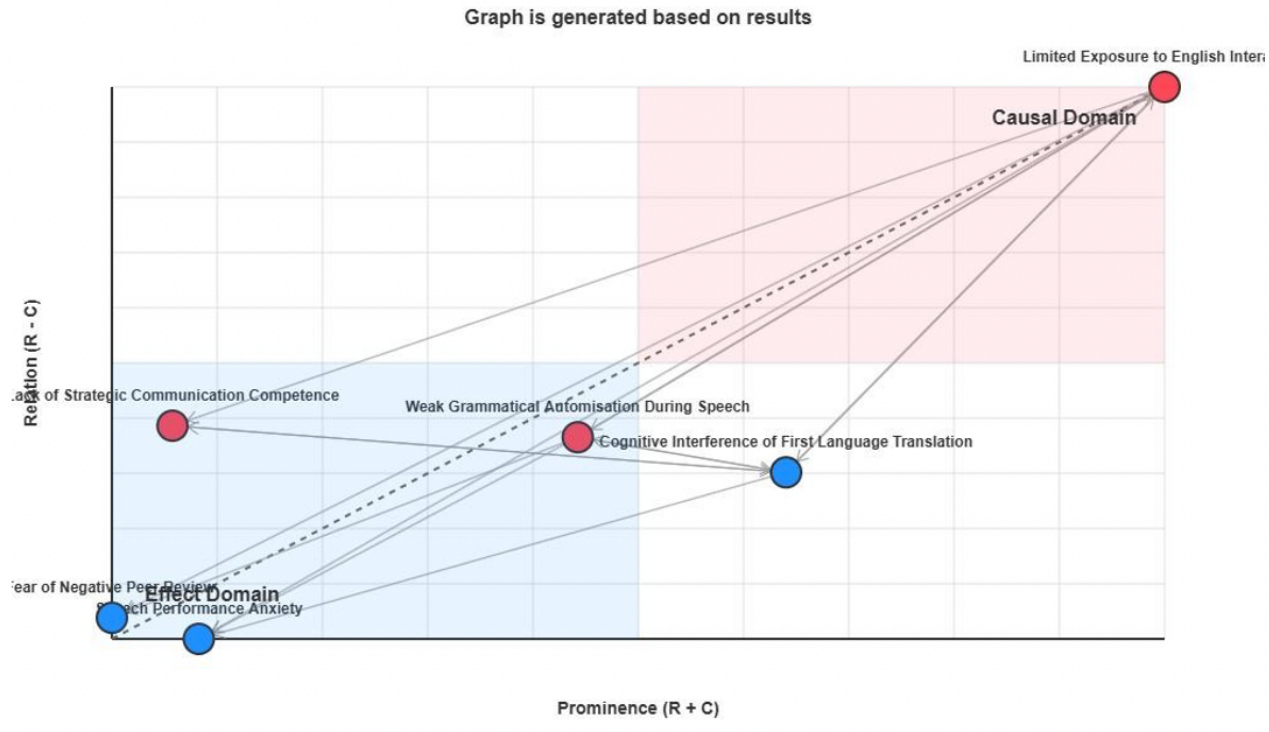

Fig. 1. Cause-Effect Diagram

Additionally, recent psycholinguistic research on bilingual speech production has shown that cognitive interference from first language translation indicates learners' reliance on L1 due to inadequate automatization in L2 processing [9]. The most important factors, according to the prominence values (R+C), are Limited Exposure to English Interaction (8.65) and Cognitive Interference of First Language Translation (8.16), highlighting the interaction between environmental input and cognitive processing in influencing ESL speaking performance [12].

According to their prominence (R+C) and relation (R–C) values, the DEMATEL causal diagram shows the distribution of factors affecting low English-speaking fluency throughout the cause-and-effect domains. As the most significant causative element influencing the system, "Limited Exposure to English Interaction" is clearly located in the upper-right quadrant, showing great prominence and a strong positive association. This implies that other difficulties in ESL speaking performance are greatly influenced by a lack of opportunities for actual language use. Similar to this, "Weak Grammatical Automatization During Speech" and "Lack of Strategic Communication Competence" are situated within the causal domain, albeit with relatively less prominence. This suggests that although they contribute to the system, their influence is secondary and frequently mediated by exposure-related factors.

Conversely, "Speech Performance Anxiety" and "Fear of Negative Peer Review" fall into the effect domain (negative R–C values), indicating that they are mostly results of other underlying problems rather than their primary causes.

Cognitive Interference of First Language Translation shows close to the boundary but stays in the effect region, suggesting that causal factors specifically, weak automatization and limited exposure both impact and interact with it. The directional arrows support recent findings that the linguistic environment and practice opportunities significantly predict speaking confidence and fluency outcomes, further confirming the strong causal flow from exposure-related and competence-based factors toward affective variables like anxiety [2]. The diagram shows that pedagogical interventions should focus on developing automatic language processing skills and increasing meaningful English interaction, as these are leverage points to lower anxiety and enhance communicative performance in ESL learners.

Overall, the diagram shows that pedagogical interventions should focus on developing automatic language processing skills and increasing meaningful English interaction because these are leverage points to lower anxiety and enhance communicative performance in ESL learners [23] [6] [16].

Fig. 2: The DEMATEL Influence Diagram "Cognitive Interference of First Language Translation" comes close to the boundary but stays in the effect region, suggesting that it is both influenced by and interacts with causal factors, especially poor automatization and limited exposure. The directional arrows support recent findings that the linguistic environment and practice opportunities significantly predict speaking confidence and fluency outcomes by confirming the strong causal flow from exposure-related and competence-based factors toward affective variables like anxiety.

By clearly differentiating between cause (red) and effect (blue) elements based on a predetermined threshold value, the DEMATEL impact diagram graphically depicts the causal structure and directional linkages among factors contributing to low ESL speaking fluency. The most significant contributing factor is "Limited Exposure to English Interaction," which has a significant direct impact on a number of variables, such as "Weak Grammatical Automatization During Speech," "Cognitive Interference of First Language Translation," "Speech Performance Anxiety," and "Fear of Negative Peer Review." This suggests that insufficient exposure is the primary cause of both cognitive and affective difficulties.

"During Speech" and "Lack of Strategic Communication Competence" also serve as cause factors. The diagram illustrates reciprocal and reinforcing relationships, especially between strategic competence and first language interference, implying a cyclical dependency in which a lack of strategies increases reliance on L1, which impedes the development of fluency. The effect factors "Speech Performance Anxiety" and "Fear of Negative Peer Review," on the other hand, are positioned as outcomes impacted by several upstream variables, emphasizing how language deficits and lack of exposure result in psychological obstacles.

Notably, "Cognitive Interference of First Language Translation" has a dual mediating role in the system, receiving impact from causal factors while simultaneously influencing anxiety and communication skills. The idea that increasing exposure and automatization might break negative cycles and lessen anxiety-related effects is reinforced by the directed arrows above the threshold, which attest to the power and significance of these associations. This is consistent with previous research showing that ESL learners' speaking fluency and performance anxiety are much improved by greater authentic contact and less reliance on L1 processing [23] [11].

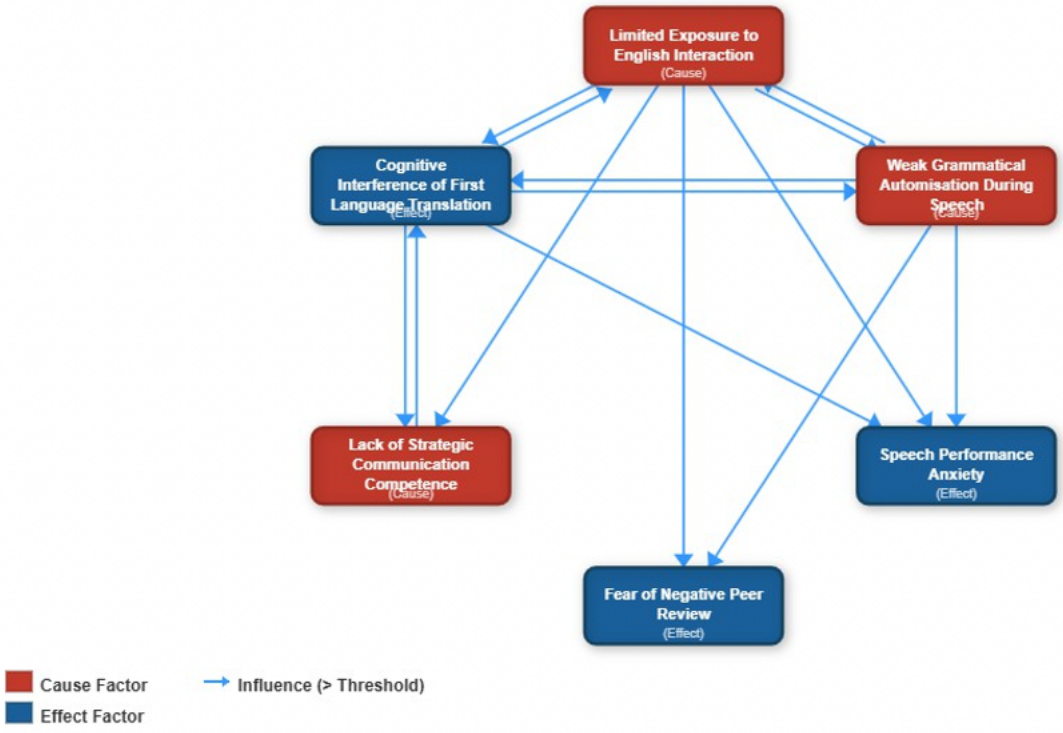

Fig. 2. DEMATEL influence program

4. Conclusions

The DEMATEL analysis concludes that improving learners' exposure to real-world English interaction and bolstering grammatical automatization and strategic communication competence are important causal factors that must be prioritized in order to improve low English-speaking competency. Teachers can indirectly reduce anxiety, fear of receiving a poor grade, and dependence on first-language translation by focusing on these fundamental components. To promote long-lasting gains in ESL speaking fluency, instructional strategies should prioritize interactive, student-centred methods and chances for real-world communication.

This research also shows that improving learners' exposure to real-world English interactions and bolstering their grammatical automatization and strategic communication skills are important cause factors that must be prioritized in order to overcome low English-speaking competency. Teachers can indirectly reduce anxiety, fear of receiving a poor grade, and dependence on first-language translation by focusing on these fundamental components. To promote long-lasting gains in ESL speaking fluency, instructional strategies should prioritize interactive, student-centred methods and chances for real-world communication.

The results also imply that rather than focusing on individual elements, treatments should take a systemic and holistic approach. Strong interdependencies between cognitive, linguistic, and affective characteristics are revealed by the DEMATEL model, thus changes in one area can have a beneficial knock-on effect on the entire system. Increasing meaningful exposure to English, for example, not only improves linguistic ability but also lessens learners' reliance on first language processing and progressively boosts confidence in spontaneous speech. This is consistent with recent studies that highlight the value of communicative and immersive settings in fostering automaticity and lowering cognitive burden during the production of second languages [7] [18].

Teachers and curriculum designers could also incorporate organized chances for anxiety management and strategy training into speaking lessons. Giving students communication techniques like paraphrasing, asking for clarification, and taking turns will help them deal with communication failures more skilfully, which will lessen their performance anxiety and dread of being judged by their peers.

At the same time, encouraging desire to communicate requires a classroom environment that is encouraging and accepts mistakes as a necessary part of learning. In order to confirm how focused increases in causative factors might sustainably improve ESL speaking competency across various learning contexts, future research may investigate longitudinal treatments based on DEMATEL findings [19].

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