# Assessing the Impact of Problem-Solving Teaching Methods on Medical Students' Verbal Proficiency Skills

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**Abstract**
This study examines the impact of Problem-Solving Teaching Methods (PSTMs) on the verbal proficiency of first-year medical students at 21 September University for Medical and Applied Sciences (UMAS) in Sana'a, Yemen. A total of 90 students enrolled in an English for Medical Purposes (EMP) course were selected through a cluster sampling technique and divided into three groups: two experimental groups and one control group, each consisting of 30 participants. Group assignment was conducted randomly, and baseline comparability among the groups was verified through pre-test scores to minimize selection bias. The study employed a quasi-experimental design with pre- and post-tests over a three-month intervention period (90 instructional hours, July–September 2024). The Sub-Speaking Occupational English Test was used to assess participants' speaking proficiency. Details on the test's scoring criteria, administration procedures, and rater reliability were considered to ensure its validity in this context. The pedagogical framework was grounded in communicative language teaching and constructivist principles, supporting the use of real-life problem-solving tasks to improve speaking skills. Statistical analysis was conducted using SPSS version 22. Paired-sample t-tests, ANCOVA, and Bonferroni post hoc tests were used to determine the effect size and compare group performances. Results and effect size showed statistically significant improvements in all groups, with the experimental groups performing better than the control group. The experimental groups achieved a post-test mean of 80.51, while the control group had a mean of 73.90 ($p < 0.001$). These gains were evident in key speaking domains, including intelligibility, fluency, grammatical accuracy, appropriateness of language, and clinical communication. To enrich the interpretation of findings, qualitative feedback from instructors involved in the intervention was also considered, offering insights into students' engagement, response to tasks, and observable language use during sessions. While the results support the effectiveness of PSTMs, interpretations are made cautiously, acknowledging the scope and context of the study. The study recommends further longitudinal research into varied instructional methods to assess their long-term effects on medical students' verbal proficiency and to inform EMP curriculum development.

**Keywords:** Problem-Solving Teaching Methods; English for Specific Purposes; English for Medical purposes; verbal proficiency skills

## 1. Introduction

English has emerged as the main medium of international communication in business, education, and across disciplines such as medicine, natural sciences, and social sciences (Hutchinson and Waters, 1992). The ability to communicate effectively in English has shifted from an additional skill to a professional necessity (Dudley-Evans and John, 2012). This reflects global trends in science and technology, where English serves as the lingua franca, facilitating knowledge dissemination and fostering innovation (Crystal, 2003). For professionals, mastering English is crucial for conveying ideas, building relationships, and contributing meaningfully to their fields (Sridhivya et al., 2024). In medicine, effective English communication directly impacts clinical outcomes (Ferguson, 2013).

With increasingly interconnected and linguistically diverse healthcare systems, the demand for precise, context-specific communication in medical practice has intensified. This emphasis is addressed in English for Specific Purposes (ESP), particularly in English for Medical Purposes (EMP), which focuses on the linguistic needs of medical professionals (Paltridge & Starfield, 2013).

Maher (1992) defined EMP as the teaching of English to doctors, nurses, and other medical staff. Its defining feature is reliance on specialized medical discourse—terminology and language patterns—used to achieve accurate communication in contexts such as diagnosis (Gylys and Wedding, 1983).

In reference to English Verbal proficiency, it is widely recognized as a key indicator of communication mastery and professional success (Leong & Ahmadi, 2017). It entails the ability to present ideas clearly, persuasively, and appropriately across contexts and audiences (Hyland, 2006). In medicine, verbal proficiency enables professionals to collaborate internationally, participate in research, attend conferences, and engage in multinational clinical trials. Yet verbal communication is often one of the most challenging language skills to acquire (Brown and Yule, 1983). Traditional teaching methods, emphasizing memorization and passive learning, frequently fail to prepare learners for the dynamic demands of real-world medical contexts (Schyve, 2007).

To address this, Problem-Solving Teaching Methods (PSTMs) have emerged as effective approaches for bridging linguistic gaps in clinical communication. Rooted in constructive and experiential learning theories, PSTMs prioritize learner-centered and collaborative environments. Inspired by John Dewey's educational philosophy and later adapted in medical training through Problem-Based Learning (PBL), these methods engage students with authentic, ill-structured problems that reflect real-life professional situations (Dewey, 1960; Barrows and Tamblyn, 1980). Simulating authentic medical scenarios helps students acquire language skills, subject knowledge, and critical thinking abilities essential for their careers (Barrows and Tamblyn, 1980; Boud and Feletti, 1997). These methods also bridge the gap between language learning and practical application (Jones, 1993).

Despite the increased use of PSTMs in ESP contexts, limited research has examined their specific impact on medical verbal proficiency. Medical students—particularly in Yemen—face significant linguistic and contextual challenges that impede their speaking skills. For English teachers in Yemeni medical institutions, developing verbal skills remains a demanding task, requiring innovative, targeted teaching methods. This highlights the need for focused studies to evaluate the effectiveness of PSTMs in improving the oral communication abilities essential for clinical practice.

In response to this need, the present study aims to investigate the impact of PSTMs on enhancing verbal proficiency in medical English. By equipping students with the ability to overcome linguistic barriers, the study seeks to improve their engagement in professional communication and strengthen their contributions to the global healthcare community. The findings are expected to benefit all medical students in Yemeni universities and institutions, offering practical implications for curriculum design and pedagogical strategies

## 2. Research aims

a- To assess the impact of PSTMs on verbal proficiency skills of medical students at UMA, Sana'a.
b- To determine whether there are significant differences in the mean scores of the verbal proficiency skills of the experimental groups learners compared to the control group in the post-test assessment.
c- To compare the effectiveness of PSTMs with the traditional method in developing verbal proficiency skills in EMP contexts.
d- To explore EMP teachers' perceptions regarding the effectiveness of PSTMs in enhancing verbal Proficiency skills.

## 3. Literature Review

### 3.1. Problem-Solving Teaching Methods

PSTMs are instructional approaches enabling students to learn through hands-on experience, which enhances comprehension and retention as they synthesize abstract ideas via problem-solving tasks (Bransford, 1984). These methods promote authentic communication through real-world

scenarios requiring effective language use in practical contexts, allowing students to speak more naturally and spontaneously. They also offer structured opportunities for applying new knowledge before moving to complex topics (Dewey, 1938).

PSTMs include Problem-Based Learning, Task-Based Learning, Inquiry-Based Learning, Case-Based Learning (CBL), Collaborative Problem-Solving, Simulation-Based Learning, Project-Based Learning, Brainstorming, and Role-Playing. By bridging theoretical knowledge with practical application, they allow learners to observe how principles function in real contexts, outperforming traditional lecture-based methods that often lack contextualization and active participation (Mayer, 1983). Their main aim is to encourage active engagement and speaking practice, helping students express ideas confidently. Sage and Torp (2002) describe PSTMs as experiential learning approaches centered on investigating and solving complex real-world problems, fostering critical and analytical thinking—skills essential for effective communication. Incorporating PSTMs into language instruction provides engaging, interactive opportunities for developing speaking skills.

### 3.2. **Verbal Proficiency Skills**

"Verbal" refers to spoken rather than written language (Longman Dictionary of Contemporary English, n.d.). Gordillo (2011) defines verbal skill as the ability to express oneself orally according to a language's rules. It is essential in oral communication and involves studying spoken English as a foreign language. Verbal proficiency means communicating orally in a functional, accurate manner (Omaggio, 1986) and includes fluency, pronunciation, vocabulary, grammar, listening comprehension, and pragmatic competence (Richards & Schmidt, 2010). In medicine, mastering speaking requires both linguistic competence and clinical communication skills to ensure effective interaction in real clinical settings (Occupational English Test, 2023). This study focuses on linguistic competence, assessed through:

a. **Intelligibility** – pronunciation, intonation, and accent aiding clarity.
b. **Fluency** – smoothness and pace of speech.
c. **Appropriateness of Language** – context-suited language use avoiding confusion.
d. **Resources of Grammar and Expression** – grammar and vocabulary accuracy and range.

### 3.3. Previous Studies

Few studies have examined the effectiveness of PSTMs in improving speaking skills in English as a Foreign Language contexts. Kadagidze (2025) evaluated a collaborative teaching model for first-year non-native medical program students, finding high confidence in presenting medical topics in English. Arani, Zarei, and Sarani (2024) showed that Problem-Based Learning (PBL) significantly improved speaking proficiency, pronunciation, and grammar compared to traditional methods. Wahyudin (2017) reported enhanced spoken fluency, coherence, and context-appropriate language through Project-Based Learning. Agustina et al. (2024) found that Case-Based Learning (CBL) improved oral communication by helping students analyze and articulate ideas effectively. Yelahina (2024) emphasized the role of Project-based learning in linking language learning with clinical practice, enhancing relevance and impact. Hong et al. (2022) noted that cooperative learning significantly boosted oral skills, while Salari, Zarifi, and Tarmizi (2021) recommended PBL in nursing curricula for clinical communication, highlighting its adaptability in large classes. Ahlfeldt, Mehta, and Sellnow (2005) demonstrated that PBL develops technical speaking competencies, confidence, and active participation, making it a strong alternative to traditional public speaking methods.

Despite these findings, several gaps remain. Geographically, no studies have assessed PSTMs with ESP students in Yemen. Contextually, there is little research on discipline-specific verbal

proficiency in medical ESP. Methodologically, few studies integrate linguistic and contextual communication criteria. Pedagogically, the feasibility of PSTMs in under-resourced, traditional classrooms is underexplored. So, this study addresses these gaps by:

- Focusing on Yemen to examine PSTMs' adaptation to resource-limited settings and discipline-specific needs of EMP students, such as clinical communication.
- Using the OET speaking rubric to assess grammar, vocabulary, and other linguistic aspects within medical contexts.
- Offering a holistic view of how PSTMs enhance discipline-specific verbal proficiency, enabling educators to design inclusive, effective ESP programs that prepare learners for professional communication.

## 4. Methodology

### 4.1. Setting

This study was conducted at UMAS in Sana'a city, Yemen. The intervention spanned one academic semester (three months), matching the university's curricular schedule, with sessions held two days a week for a total of 90 hours, starting in July and concluding at the end of October 2024 (from July 23 to October 29, 2024), during the first academic semester at the university.

### 4.2. Design/ Sampling/ Participants

This study employed a quasi-experimental design combining quantitative and qualitative methods. The target population consisted of 180 first-year students enrolled in six medical departments in 2024. A cluster sampling technique was used, randomly selecting three departments (50% of the population), amounting to 90 participants (aged 17–18) with comparable baseline English proficiency levels, divided into three groups (two experimental, one control). The balance was ensured to strengthen the internal validity of the sample (see Table 1).

**Table 1**

*Demographic breakdown of the Sample*

| No. | Group | Methods of teaching | No. of participants (Sex) | | | Field/ Dept. |
|---|---|---|---|---|---|---|
| | | | Male | Female | Total | |
| 1 | **1st Experimental Group** | Project-based teaching method and cooperative learning approach | 15 | 15 | 30 | Human medicine |
| 2 | **2nd Experimental Group** | Problem-based learning approach and case-based approach | 15 | 15 | 30 | Clinical Pharmacy |
| 3 | **Control Group** | Lecture method | 15 | 15 | 30 | Dentistry |
| | **Total** | | 45 | 45 | 90 | |

### 4.3. Methods of Data Collection and Instruments

#### 4.3.1. Speaking Subtest of the Occupational English Test (OET)

Speaking OET was adopted as the pre and post-tests to measure students' speaking performance, focusing on the linguistic criteria with some modifications to align with the study's context. The assessors of the test have ESP teaching qualifications and were specifically trained in OET assessment methodology. Performances are rated on the linguistic criteria divided into four categories: intelligibility, fluency, appropriateness of language, and resources of grammar and expression (The Ultimate Guide to the OET Speaking Sub-test). The ratings were weighted and totaled. The scoring rubric was referenced in a table that converts the resulting scores into holistically described level. The descriptions of the components and the methods of scoring and assessment have been modified to fit the context of the present study (See Appendix A, pp. 16).

The test was developed by Cambridge Boxhill Language Assessment (Occupational English Test. 2018). In addition, it was validated by ten university professors with extensive experience and a

strong interest in teaching ESP at the postgraduate levels in the English departments of the universities in Yemen. These professors were asked to provide their insights and feedback on the appropriateness of the tests which aimed to assess the linguistic content. They unanimously agreed on the validity and suitability of the tests. After that, a pilot study was conducted on 20 students. The *Cronbach Alpha* confirmed high inter-rater reliability as follows*:* Pre-test = 0.881 and Post-test = 0.940. The format of the test has role-play cards which consisted of three sections: the setting, the scenario, and the tasks (See Appendix B, pp. 17).The test lasted a maximum of 15 minutes. During the role-plays, the student engages with an interlocutor who assumes the role of a patient, while the student takes on the role of a doctor.

#### 4.3.2. Interview

The semi-structured interview was conducted with seven EMP teachers (4 females and 3 males) at UMAS to evaluate their satisfaction levels regarding the impact of PSTMs on the verbal proficiency skills in medical field. All seven teachers participated voluntarily in the interview which, consisted of seven questions designed to gather information about PSTMs and their attitudes toward teaching of these methods. The interviews were conducted in English by the researcher over a span of 2 days. Each interview lasted approximately 30 minutes. Due to feeling apprehensive about the presence of a tape-recorder, all participants declined to be audio recorded; therefore, the researcher was only permitted to take notes during the interviews. The interview questions were validated by ten university professors with extensive experience and a strong interest in teaching EMP at the postgraduate level in the English departments of the universities in Yemen. They unanimously agreed on the validity and suitability of the interview questions.

### 4.4. Procedure

A plan was prepared and devoted for improving learners' speaking proficiency skills, taught in ten lectures lasted for three months, starting from July 23 to October 15, 2024, in the first academic term at UMAS**.** Each lecture lasted for three hours. One lecture of three hours before beginning the treatment was assigned for the pretest, and one lecture of three hours after finishing the treatment was mainly allotted for the posttest. As for speaking proficiency, each lecture included the following six aspects: grammar, pronunciation, vocabulary, fluency, comprehension and clinical communication skills.

The sessions of the experimental groups presented a medical scenarios. Students analyzed problems in groups, drafted solutions, and performed role-plays. peers and instructors provided feedback using a validated rubric. The control group received the traditional instruction (Lecture method): lectures on medical vocabulary and memorization of scripted dialogue, without interactive components and collaborative problem-solving or speaking practice.

Each lecture was divided into two parts: theoretical and practical. In the first theoretical part of the lecture, the teacher used lecturing and discussion. He enriched discussion with questions and scenarios to stimulate the students' critical thinking and motivate them to speak and participate in the class actively. In the practical part, he used different activities and work group to create a competitive environment in which they can participate actively in the class.

The materials used in this study includes the first ten units of an English course book, *Nursing (1): Oxford English for Careers*, as EMP with exactly similar content taught by three different teachers in different teaching methods, namely, PSTMs and lecture method (Grice, 2009).

Generally, the researcher has followed the following procedures:

- Reading up on the previous studies related to the research.
- Reading up on the books that were taught and conducted in the study as well as getting to know the units of the books well.
- Choosing the units that were applied in the treatment.
- Preparing the teaching plans for the selected units.
- Getting an official consent (Permission) for conducting the study at 21 UMAS.
- Coordinating with the departments of the targeted samples, and getting them to know the plan of exams and teaching.

- Conducting the pilot study.
- Conducting pretests for each group separately before the treatment.
- Conducting the treatment.
- Conducting the posttests of the three groups separately after the treatments.
- Correcting the posttests.
- Listing, tabulating and analyzing students' scores.
- Conducting the interview with EMP English teachers at 21 September UMAS.
- Discussing the results and responses, then suggesting the practical suggestions and recommendations accordingly.

## 5. Analysis

### 5.1. Quantitative Analysis

Before analyzing the data gathered, we needed to make sure that the data met two prerequisite tests: normality and homogeneity, using SPSS.

**Table 2**

*Shapiro-Wilk Normality Tests*

| Tests | Groups | Shapiro-Wilk | | |
|---|---|---|---|---|
| | | Statistic | df | Sig. |
| Pretest | first exp. group | .943 | 30 | 0.112 |
| | second exp. group | .952 | 30 | 0.188 |
| | control group | .931 | 30 | 0.153 |
| Posttest | first exp. group | .915 | 30 | 0.200 |
| | second exp. group | .968 | 30 | 0.484 |
| | control group | .958 | 30 | 0.271 |

According to Shapiro-Wilk normality test, the *p* value is greater than 0.05, indicating that all variables exhibit a normal distribution. Therefore, it can be inferred that all groups conform to normal distribution assumptions.

Furthermore, it is important to conduct a homogeneity test to draw accurate conclusions. The homogeneity test, also known as homoscedasticity, assumes that if the variances are homogenous (based on mean > 0.05), the variability within groups is approximately the same across all groups of the independent variable(s).

**Table 3**

*Levene's Test of Homogeneity of Variances*

| Test | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|
| pretest | 1.171 | 2 | 87 | 0.315 |
| Posttest | 4.336 | 2 | 87 | 0.116 |

Table 3 shows the Levene's test of homogeneity of variances' results for all groups as follows: pre-test = 0.315 and post-tests = 0.116. These results show that the data from both tests for all groups were homogenous.

Since the data met the assumptions for parametric tests (normality via Shapiro-Wilk and homogeneity of variance via Levene's test), the study's results were analyzed measuring the effect size through using descriptive statistics in SPSS to calculate the total pretest and posttest scores and means before and after the intervention, providing crucial insights into the intervention's effectiveness.

To quantify the improvements evident in the mean values of pretests and posttests scores for each group, Table (4) reveals the differences among groups taught medical English using PSTMs and those taught through the traditional method.

**Table 4**
*Descriptive Statistics of Pretest and Posttest Results*

| Group | Sex | Pretest | | Posttest | |
|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Mean | Std. Deviation |
| 1st Experimental group | Male | 63.26 | 14.03 | 81.00 | 11.86 |
| | Female | 67.00 | 13.46 | 80.00 | 12.03 |
| | Total | 65.13 | 13.65 | 80.50 | 11.75 |
| 2nd Experimental group | Male | 70.26 | 6.40 | 80.93 | 5.50 |
| | Female | 66.60 | 14.37 | 80.13 | 7.82 |
| | Total | 68.43 | 11.09 | 80.53 | 6.66 |
| Control group | Male | 68.20 | 11.75 | 74.53 | 9.01 |
| | Female | 68.26 | 10.03 | 73.26 | 8.87 |
| | Total | 68.23 | 10.73 | 73.90 | 8.81 |

Table 4 displays the mean values achieved in each group before and after the intervention period as follows: pretest mean value of first experimental group = 65.13 ; posttest mean value of first experimental group= 80.50; pretest mean value of second experimental group=68.43; posttest mean value of second experimental group=80.53; pretest mean value of control group= 68.23; posttest mean value of control group= 73. 90. Regarding sex mean values, they are also provided for each group. As shown in table (), the mean values of the posttest are higher than that of the pretest in all groups. The difference in mean values between the pretest and posttest indicates that participants in all groups achieved substantial improvements following the intervention. To verify the significance of this difference, a paired t-test (also known as a difference test) was utilized in Table 5to assess the significance of the mean differences. Such a test is typically appropriate for before-and-after intervention evaluations.

**Table 5**
*Paired Samples Test*

| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | *t* | Df | Sig |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lower | Upper | | | |
| **Pair 1** | Pre and posttests of first experimental group | -15.36667 | 8.37683 | 1.52939 | -18.49463 | -12.23871 | -10.048 | 29 | .000 |
| **Pair 2** | Pre and posttests of second experimental group | -12.10000 | 6.65582 | 1.21518 | -14.58533 | -9.61467 | -9.957 | 29 | .000 |
| **Pair 3** | Pre and posttests of control group | -5.66667 | 3.67032 | .67011 | -7.03719 | -4.29615 | -8.456 | 29 | .000 |

As shown in Table 5, the groups exhibited notable improvements after the intervention, as the mean differences between pretest and posttest scores are statistically significant with a p-value of .000.

To determine the effect size of the intervention, analysis of Covariance (ANCOVA) was utilized as in the following table:

**Table 6**

*Tests of Between-Subjects Effects ( Effect Size)*

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Corrected Model | 6293.917[a] | 6 | 1048.986 | 40.926 | .000 | .747 |
| Intercept | 2902.951 | 1 | 2902.951 | 113.259 | .000 | .577 |
| pretest | 5393.962 | 1 | 5393.962 | 210.447 | .000 | .717 |
| Intervention | 1212.318 | 2 | 606.159 | 23.649 | .000 | .363 |
| Sex | 24.895 | 1 | 24.895 | .971 | .327 | .012 |
| Intervention+ Sex | 98.121 | 2 | 49.061 | 1.914 | .154 | .044 |
| Error | 2127.372 | 83 | 25.631 | | | |
| Total | 560358.000 | 90 | | | | |
| Corrected Total | 8421.289 | 89 | | | | |

The table above shows the overall model is highly significant ($p < .001$) with a large effect size (partial $\eta^2 = 0.747$), explaining 74.7% of the variance in posttest scores, indicating that the combined predictors (teaching methods, pretest scores, and sex) substantially influenced medical verbal proficiency. Pretest scores emerged as the strongest predictor (partial $\eta^2 = 0.717$, $p < .001$), confirming their crucial role in determining post-test performance. Most importantly, teaching methods showed a significant large effect (partial $\eta^2 = 0.363$, $p < .001$), demonstrating that problem-solving approaches substantially improved medical verbal skills compared to the lecture method. However, neither sex (partial $\eta^2 = 0.012$, $p = .327$) nor the interaction between teaching methods and sex (partial $\eta^2 = 0.044$, $p = .154$) were significant, indicating these methods worked equally well for both genders. Therefore, it can noticed that the learners' speaking proficiency were affected by PSTMs, regardless of their gender.

**Table 7**

*Main effects of Treatment*

| Groups | Sex | Mean | Std. Error | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| **1st Experimental group** | male | 81.00 | 1.700 | 77.120 | 83.880 |
| | female | 80.00 | | | |
| | Total | 80.50 | | | |
| **2nd Experimental group** | male | 80.93 | 1.700 | 77.154 | 83.913 |
| | female | 80.13 | | | |
| | Total | 80.53 | | | |
| **Control group** | male | 74.53 | 1.700 | 70.520 | 77.280 |
| | female | 73.26 | | | |
| | Total | 73.90 | | | |

Based on the table above, the main effects of the teaching methods assigned to experimental groups showed nearly identical mean values (80.50 and. 80.53), both substantially higher than the control

group (73.26), demonstrating the effectiveness of PSTMs. This confirms that the improvement of PSTMs over the lecture method can be considered tangible enough to necessitate their adoption.

Regarding sex, the first experimental group males scored slightly higher (81 vs. 80) with comparable variability (SD≈12). In the second experimental group, males again scored marginally higher (80.93 vs. 80.13) but with notably lower variability (SD=5.50 vs. 7.82). The control group showed minimal gender differences (74.53 vs. 73.26), with similar variability (SD≈9)

Accordingly, these findings indicate that both experimental groups outperformed the control group, suggesting that the PSTMs were more effective than the lecture methods in teaching medical verbal proficiency skills. Additionally, The lack of the meaningful sex differences supports universal application of these methods.

To identify and reveal the source of the differences among the methods of teaching, Bonferroni's test was used for multiple comparisons.

**Table 8**
*Bonferroni's test for multiple comparisons*

| Pairwise Comparisons | | | | | | |
|---|---|---|---|---|---|---|
| **(I) Groups** | **(J) Groups** | **Mean Difference (I-J)** | **Std. Error** | **Sig.[b]** | **95% Confidence Interval for Difference[b]** | |
| | | | | | **Lower Bound** | **Upper Bound** |
| **First Experimental Group** | Second Experimental Group | -.033 | 2.405 | 1.000 | -5.903 | 5.837 |
| | Control Group | 6.600* | 2.405 | .022 | .730 | 12.470 |
| **Second Experimental Group** | First Experimental Group | .033 | 2.405 | 1.000 | -5.837 | 5.903 |
| | Control Group | 6.633* | 2.405 | .021 | .763 | 12.503 |
| **Control Group** | First Experimental Group | -6.600* | 2.405 | .022 | -12.470 | -.730 |
| | Second Group | -6.633* | 2.405 | .021 | -12.503 | -.763 |

The statistical findings in table 8, indicate that the mean differences between the control group and the experimental groups are statistically significant, favoring the latter. Consequently, PSTMs assigned to the second experimental group rank first followed by those assigned to the first group while the traditional method ranks third. Overall, PSTMs are more effective than the traditional method in teaching verbal proficiency skills in medicine

### 5.2. Qualitative analysis

***Q1: Do you teach EMP? How long have you been teaching EMP?***
The interviewed EMP teachers exhibited a range of teaching experience, spanning from two to eight academic years, reflecting a mix of emerging and established expertise in (EMP) instruction. This diversity in tenure aligns with Richards' assertion that teaching experience significantly shapes pedagogical strategies, as educators accumulate context-specific knowledge over time, particularly in specialized domains like EMP. Overall, the collective experience of the teachers highlights a well-

rounded pool of knowledge, which is crucial for understanding the impact of PSTMs on students' verbal proficiency skills in medical contexts.

*Q2:* ***Do you use PSTMs to teach medical students' verbal proficiency skills? If yes, what types of activities do you use (e.g., case studies, role-plays, simulations)? If no, what barriers prevent you from using them?***
All of them reported using PSTMs , such as role-plays, simulations, and case studies, to promote verbal proficiency skills in medical contexts.

***Q3: How do PSTMs differ from traditional methods (e.g., lectures) in terms of student engagement and effectiveness for improving verbal proficiency?***
Three of teachers highlighted that "student-centered, interactive nature" of PSTMs. Two teachers noted interesting and increased participation through activities like pair work. The others stressed the importance of "active speaking practice, asserting that verbal proficiency develops through meaningful, context-driven communication rather than passive reception. Their emphasis on clarity and ease of understanding echoes that the PSTMs enhance retention by linking language structures to practical scenarios, unlike traditional methods that isolate grammar from application.

*Q4:* ***Have you observed improvements in students' verbal proficiency after implementing problem-solving methods? If so, in what areas (e.g., fluency, pronunciation, medical terminology)?***
The teachers consistently reported observable improvements in medical students' verbal proficiency after implementing PSTMs , particularly in "pronunciation, fluency, medical terminology retention, and syntactic accuracy". They implicitly tied these outcomes to the active, participatory design of PSTMs, which compel students to articulate concepts in context, thereby solidifying verbal skills more effectively than passive learning. Generally, the responses demonstrate that the implementation of PSTMs not only fosters engagement but also significantly enriches students' verbal skills in critical areas necessary for their medical education.

***Q5: Do students demonstrate better confidence and accuracy when discussing medical topics in English after engaging in problem-solving tasks?***
EMP teachers' responses revealed a "strong consensus" that PSTMs significantly enhance medical students' confidence and accuracy when discussing medical topics in English. They attributed these improvements to "hands-on practice" in simulated scenarios, which mirrors Barrows' findings on problem-based learning (PBL), where active engagement in clinical tasks fosters both competence and self-assurance in professional communication. They also linked accuracy and fluency to repeated participation in activities that reinforce the discipline-tailored language use. Their unanimous agreement on heightened confidence reflects the motivational strategies framework, where collaborative, goal-oriented tasks reduce anxiety and build linguistic self-efficacy.

***Q6****: Do you believe problem-solving activities enhance students' ability to articulate medical concepts and improve their understanding of medical terminology?*
The EMP teachers unanimously agreed that PSTMs significantly improve students' ability to articulate medical concepts and enhance their understanding of medical terminology. The teachers noted that these methods promote active learning, encourage students to apply their knowledge in practical contexts, and facilitate a deeper understanding of medical terminology. They also highlighted that the problem-solving activities enable students to successfully respond to medical scenarios, use medical terminology appropriately in medical contexts, and describe medical conditions effectively.

*Q7:* ***Have your medical students expressed a preference for problem-solving methods over traditional teaching methods? What feedback have they provided about their learning experience?***
The EMP teachers reported that their medical students overwhelmingly prefer PSTMs over traditional methods, citing increased motivation, enjoyment, and engagement. The students provided positive feedback, expressing appreciation for the practical applications, collaborative nature, and interactive activities that PSTMs offer. The teachers noted that students find these methods more relevant to their

future careers and enjoy the hands-on experience of working on presentations, case studies, and other activities. The students also reported feeling more engaged and motivated when actively participating in problem-solving activities, rather than passively listening to lectures

## 6. Discussion

The integrated analysis of quantitative and qualitative data provides strong evidence supporting the effectiveness of PSTMs in enhancing medical students' verbal proficiency skills. Both statistical results and teachers' insights consistently demonstrate that PSTMs yield superior outcomes compared to the lecture method, proving their value in enhancing students' medical verbal proficiency skills.

The quantitative analysis verified the data's suitability for parametric testing. The Shapiro-Wilk test confirmed normality of distribution across all variables ($p > 0.05$), while Levene's test established homogeneity of variances for both pretest ($p = 0.116$)and posttest ($p = 0.315$) scores, suggesting that the assumptions of normality and homogeneity were met, allowing for the application of parametric statistical tests to evaluate the intervention's impact.

. A paired samples t-test comparing pretest and posttest scores demonstrated statistically significant gains ($p = .000$). Descriptive statistics revealed marked improvements in medical verbal proficiency following the PSTMs intervention, with the two experimental groups achieving substantially higher mean scores of posttest (80.50 and 80.53) than the control group (73.26). The mean scores of posttest for males and females within each group are relatively similar, with males scoring slightly higher in most cases. Notably, gender differences were negligible across groups, suggesting PSTMs' universal applicability.

According to ACNOVA, the effect size of the overall model, which included teaching methods, pretest scores, sex, and interactions, was highly significant ($p < 0.001$) and explained 74.7% of the variance in post-test verbal proficiency. This indicates that the predictors collectively have a major impact on verbal skills. The intercept was also statistically significant ($p < 0.001$), with 57.7% of the variance in post-test scores explained by the baseline post-test score. PSTMs had a large and significant effect on verbal proficiency ($p < 0.001$), with 36.3% of the variance due to teaching method differences. This indicates that PSTMs significantly improved medical verbal skills compared to the lecture method. However, sex did not have a significant impact on verbal proficiency ($p = 0.327$), with only 1.2% of the variance explained by sex. Additionally, the interaction between teaching methods and sex was not significant ($p = 0.154$), indicating that PSTMs work equally well for both males and females. These results suggest that while PSTMs are highly effective, verbal proficiency remains the strongest determinant of outcomes, and the methods' effectiveness is consistent across genders.

Post hoc Bonferroni tests pinpointed the source of differences, showing statistically significant advantages for both experimental groups over the control group. The second experimental group, in particular, ranked highest, followed by the first experimental group, solidifying PSTMs' superiority over the lecture method in enhancing medical verbal proficiency.

Accordingly, the effectiveness of using Problem-Solving Teaching Methods in developing linguistic aspect of EMP students' verbal proficiency skills can be interpreted in terms of the following points:

**1. Intelligibility**: EMP students taught by PSTMs showed clearer pronunciation and articulation, particularly in the complex medical terminology.

**2. Fluency:** EMP students in the experimental groups demonstrated fewer pauses and greater coherence in speech.

**3. Appropriateness of Language:** EMP students taught by PSTMs employed the register-specific language (e.g., empathetic vs. technical tones) more effectively.

**4. Resources of Grammar and Expression:** Experimental groups utilized syntactically complex structures with fewer errors.

In the light of the qualitative analysis, the teachers, who have varying levels of experience in teaching (EMP), reported utilizing problem-solving techniques such as role-plays, simulations, case studies, and pair work to enhance verbal proficiency skills among medical students. The teacher 'reported that PSTMs are more interactive, student-centered, and engaging, encouraging collaboration, critical thinking, and practical application of language skills. They observed measurable improvements in students' fluency, pronunciation, and medical terminology usage, attributing these gains to PSTMs' emphasis on practical, collaborative learning.

It is worth noting that the findings of the tests and interview are in line with previous studies concerning students' achievement scores, attitudes, and the teachers' opinions regarding the adequacy of the PSTMs in enhancing medical students' verbal proficiency skills. According to Wahyudin's study(2017), PBL is a highly effective method for ESP instruction, as it enhances students' oral proficiency, particularly in fluency, coherence, and context-appropriate language. It also cultivates ESP learners' ability to articulate complex concepts confidently and competently, thereby preparing them for global professional environments. The outcomes of the study align with Agustina's study that showed the effectiveness of applying CBL in enhancing ESP student's oral communication skills, enabling them to analyze and articulate ideas more effectively (2024). The same results reported by Yelahina's study that revealed the effectiveness of the project-based learning in developing English speaking skills among medical students, emphasizing its alignment with real-world healthcare communication needs (2024). Additionally, Kadagidze (2025), Arani (2024), Aryanti and Artini (2017), Rosalina (2013), and Ahlfeldt (2005) reported similar findings that PSTMs foster measurable improvements across critical dimensions of speaking proficiency. Their findings reveal that problem-solving activities enhance "grammatical accuracy, "pronunciation clarity, and "lexical diversity, thereby holistically advancing learners' speaking competence.

In conclusion, the findings of the data; objective test results and teacher insights, collectively support each other, validating the effectiveness of PSTMs on developing verbal proficiency skills in medical sciences. They indicated that PSTMs are interactive, engaging, and effective in promoting verbal proficiency. Additionally, they enhance the medical students' verbal proficiency skills, particularly in linguistic aspects and clinical communication.

## 7. Conclusion

This study assessed the impact of PSTMs on EMP students' verbal proficiency skills at UMAS in Yemen. Based on the findings of the study, it can be inferred that PSTMs are more effective than the lecture method in teaching speaking skills in the medical field. To prove that, the findings of the interview along with the improvements observed in the posttests, revealing that students taught by PSTMs outperform those instructed using the lecture method, demonstrating improvements in their speaking skills, including pronunciation, grammar, vocabulary, fluency, comprehension, and clinical communication.

The study has two limitations that should be addressed in future research. The first limitation involves the sample which was drawn from one Yemeni university, which may restrict the generalizability of the results to other educational medical contexts. The second limitation relates to the period of intervention when the study was conducted, i.e. 12 weeks. Thus, we suggest the future research to cover these limitations. For further research, it is suggested to investigate the impact of different teaching methods across various medical contexts and examine their effect on medical students' verbal skills.

## 8. Suggestions for Practical Use

- The outcomes of this study have significant educational implications. They may be valuable to educators, researchers, and instructors who teach English for medical purposes. It is recommended that PSTMS be considered when teaching medical students' verbal proficiency skills, as the findings of this study indicate that these methods are the most effective in achieving successful outcomes.

- Universities that teach medical English, including 21 September UMAS are encouraged to motivate their instructors to apply PSTMS for teaching EMP.
- The teachers are encouraged to teach EMP by utilizing PSTMs and employing various strategies to enhance students' verbal proficiency skills.
- The teachers are recommended to foster an engaging environment in the classroom to utilize teaching methods more effectively.
- It is recommended that supervisors provide EMP teachers with additional guidance by conducting practical workshops. These workshops should help teachers gain a better understanding of PSTMs and how to use them effectively.
- It is recommended that researchers conduct further studies on PSTMs and other methods for teaching EMP across all faculties of medicine at Yemeni universities.

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## Appendix (A) Scoring Assessment System of Linguistic Criteria (OET)

| Scores | Intelligibility | Fluency | Appropriateness of Language | Resources of Grammar and Expression |
|---|---|---|---|---|
| | 25 | 25 | 25 | 25 |
| 25 | •Pronunciation is easily understood and prosodic features (stress, intonation, rhythm) are used effectively. • L1 accent has no effect on intelligibility | •Completely fluent speech at normal speed. •Any hesitation is appropriate and not assign of searching for words or structures. | •Entirely appropriate register, tone and lexis for the context.• No difficulty at all in explaining technical matters in lay terms. | • Rich and flexible. Wide range of grammar and vocabulary used accurately and flexibly. .• Confident use of idiomatic speech |
| 20 | •Easily understood. •Communication is not impeded by a few pronunciation or prosodic errors and/or noticeable L1 accent. •Minimal strain for the listener. | •Fluent speech at normal speed, with only occasional repetition or self-correction. •Hesitation may occasionally indicate searching for words or structures, but is generally appropriate. | •Mostly appropriate register, tone and lexis for the context. •Occasional lapses are not intrusive. | •Wide range of grammar and vocabulary generally used accurately and flexibly. •Occasional errors in grammar or vocabulary are not intrusive. |
| 16 | •Easily understood most of the time. Pronunciation or prosodic errors and/or L1 accent at times cause strain for the listener. | •Uneven flow, with some repetition, especially in longer utterances. •Some evidence of searching for words, which does not cause serious strain. • Delivery may be staccato or too fast/slow | •Generally appropriate register, tone and lexis for the context, but somewhat restricted and lacking in complexity. .•Lapses are noticeable and at times reflect limited resources of grammar and expression. | •Sufficient resources to maintain the interaction. • Inaccuracies in vocabulary and grammar, particularly in more complex sentences, are sometimes intrusive. •Meaning is generally clear. |
| 12 | •Produces some acceptable features of spoken English. • Difficult to understand because errors in Pronunciation /stress/intonation and/or L1 accent cause serious strain for the listener. | •Very uneven. •Frequent pauses and repetitions indicate searching for words or structures. •Excessive use of fillers and difficulty sustaining longer utterances cause serious strain for the listener. | •Some evidence of appropriate register, tone and lexis, but lapses are frequent and intrusive, reflecting inadequate resources of grammar and expression. | Limited vocabulary and control of grammatical structures, except very simple sentences. •Persistent inaccuracies are intrusive. |
| 8 | •Often unintelligible. Frequent errors in pronunciation/stress/intonation and/or L1 accent cause severe strain for the listener. | •Extremely uneven. • Long pauses, numerous repetition and self-corrections make speech difficult to follow. | •Mostly inappropriate register, tone and lexis for the context | •Very limited resources of vocabulary and grammar, even in simple sentences. •Numerous errors in word choice. |
| 4 | •Almost entirely unintelligible | •Impossible to follow, consisting of isolated words and phrases and self-corrections, separated by long pauses. | •Entirely inappropriate register, tone and lexis for the context. | • Limited in all respects. |
| 0 | Candidate does not provide any response. | | | |

**Linguistic Criteria Assessment Sheet of OET (Speaking Test)**

| Linguistic Criteria | Maximum score | Score |
|---|---|---|
| A. Intelligibility | 25 | |
| B. Fluency | 25 | |
| C. Appropriateness of Language | 25 | |
| D. Resources of Grammar and Expression | 25 | |
| **Total** | 100 | |
| **Grade** | | |

**Name:** **Specialization:**

**Appendix (B) Speaking Test (OET)**

**ROLEPLAYER CARD NO. 4** — **MEDICINE**

| | |
|---|---|
| SETTING | Emergency Department |
| **PARENT** | You are the parent of a four-year-old boy who came to the Emergency Department two hours ago, after 36 hours of recurrent vomiting and stomach pain. The doctor told you that your son had viral gastroenteritis. He was kept in for two hours on oral re-hydration fluids. Your son is not present for your discussion with the doctor. |
| TASK | • When asked, say you still don't really understand what viral gastroenteritis is.<br>• Say you don't know how your son got viral gastroenteritis.<br>• Say your son looks very weak; you really think he needs to be kept in hospital.<br>• When asked, say you're concerned about taking your son home; you just don't know what to do if he starts to feel worse at home.<br>• Say you feel better about taking your son home now that you know what to look for and when to come back to the Emergency Department. |

 SAMPLE TEST

**OET** SAMPLE TEST

**CANDIDATE CARD NO. 4** — **MEDICINE**

| | |
|---|---|
| SETTING | Emergency Department |
| **DOCTOR** | The parent presented two hours ago at the Emergency Department with his/her four-year-old son. The child had a 36-hour history of recurrent vomiting and stomach pain which was diagnosed as viral gastroenteritis. He was given oral re-hydration fluids and observed for two hours. He is now ready to be discharged. The child is not present for your discussion with the parent. |
| TASK | • Confirm child is ready to be discharged. Find out about parent's concerns.<br>• Explain viral gastroenteritis (e.g., irritation of stomach or intestines due to viral infection, etc.).<br>• Give information about how gastroenteritis is spread (e.g., contact with vomit/faeces of infected person: shaking hands, contaminated foods/objects, etc.).<br>• Resist request to keep child in hospital (e.g., oral re-hydration therapy usually effective, etc.). Advise on hydration and appropriate clear fluids (e.g., watered down unsweetened fruit juice, electrolyte drinks, etc.). Find out any other concerns.<br>• Advise when to seek medical advice (e.g., signs of severe dehydration: extreme thirst, lethargy, irritability, pale/sunken eyes, etc.). |

 SAMPLE TEST