Infiltrating Functional English for Technical Students with the Concomitant of Project Transcripts: A Paradigm in Education

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Abstract

A powerful communication strategy plays a key role in professional settings, all the while demonstrating its ability to garner admiration and respect. Over time, Language is an ever-evolving system from a usage standpoint. Despite several existing methods, the quality of knowledge of technical communication remains a persistent challenge for non-native speakers at the instructional level. This paper explores how engineering students can acquire an understanding of and practice functional technical English by preparing micro and macro projects. This study examined 200 student projects, each comprising 20 pages and approximately 300 lines. These projects serve for statistical analysis and are evaluated based on specific five test areas, such as usage of tense, change of voice, concord, vocabulary, and connectors. The two groups (EG & CG) were offered pretest and post-test. The result of the analysis is interpreted with the help of line graphs that assess the comparability of the two groups. Remedial measures with sequence flow charts were suggested to the participants that served the purpose of mending their deficient areas, which, if believed, would enhance their career progression. This method would assist tertiary-level students in breaking language barriers, enabling them to express their ideas in writing and speaking more effectively using technical language, especially in the ordinary usage of technical means to explain complex technical principles. A language is language, when reflected in the correct sense with the ability to use ifunctionally rather than learning it for years.

Keywords: Functional English, Project-based learning, Enhancing writing skills, Technicalcommunication, Language Learning

1. Introduction

In the two-way process of communication participants not only encode and decode ideas and feelings but also, create and share meaning. Communication becomes proficient only when the sent and the received messages receive clear attention. In the process of teaching, the strategies of educating thrive every moment, welcoming innovation and transformation. In the present technological era of stiff competition, teaching English imposes radical methods to be conversant with emerging trends in the educational arena that are conducive to student's career upliftment. The objective of teaching English to students is to enable them tohandle the language with ease and comfort, that is, to use it both instrumentally and functionally.

Technical Communication in a broader aspect aims to convey technical ideas and acquire technical information that help to supplement in technical domain. It is 'specific' which indeed is directed to a specific audience about a particular technical subject for a discrete purpose. Technical graduates explore unknown areas meeting the requirements of technical demands. Strong language skill is an asset that promotes the standard of students' career. English teachers have a diverse purpose to serve in suggesting viable ways to familiarize students with the rhetoric functions of technical English. In assimilating information students pass through a 'stage of transition' during each year of their study period. In a four-year technical degree programme, first two-years are often considered as a prefatory phase in learning and the next two years are a performance phase which pushes them to the need – based areas. Students acquire appreciable grades in their semester examinations nevertheless they lack spontaneity in transferring their thoughts. When the nuances of technical English are exposed to functional paradigms, an ease in language arises. However, it is also essential to undo inhibitions of learners to navigate through diverse fields.

Technical writing implies rules and guidelines 'what' to write and 'what not' to write and this can be measured by linguistic aspects (Fabio Parente et al.,2020). Unfortunately, there are no colleges in India that offer a course in technical writing. For engineers, a combination of both educational background and technical writing would help them grow in their field and profession. Most of the advertisement requirements in this present scenario are"engineers with a flair for writing". This study explores a novel approach to being conversant with technical communication particularly to non-native speakers of the language of instruction that would further aim at teaching-learning practice to assimilate technical wording, phraseology and usage of functional English.

1.1 Dynamic and Variable Nature of Language in General Aspects

People around the world highly recognize the power of communication. Language is a very important part of human intelligence. Language is consciously created, so that simple utterance of the language will purify the language system in our body. Every language is richin its literary as well as grammatical tradition. Tracing the historical development of a language with its earliest extant literature and a critical evaluation of literary works, are all indispensable predictions in order to be successful in language acquisition. English is a fantastic language, in terms of its simplicity. English has a narrow phonetic range. This ability to use sound to stimulate and trigger one's intelligence and energy is something that we should not give up. English with its linguistic milieu has its own formidable rules governing the language. Later-day learners have attempted to find rules therein even to explain the developments of the language. Its sheer solidity is highly admired not only by all indigenous speakers but also by non-native speakers who have had the opportunity to pursue them. The Internet and modern technology have taken us to English Language which has become a part of us.

Language also varies depending on the functionality to which it is placed. In some sense, the native speakers of a language 'own' it and form their language. On the other hand, non-native users who specifically access their education in the technical stream find problemsin English grammar and usage. There is growing evidence that L2-medium-educated studentsstruggle with comprehending, learning and using subject-specific terms in the course of their studies (Evans & Green,2007; Evans & Morrison, 2011; Mezek, 2013; Lessard- Clouston,2006; Ryan,2012). Technical students set language demarcation when using it functionally. Though they have been learning English for years, they knit them into a confined range in expressing their ideas and concepts. We cannot ignore that in India, most of the business connections are linked with Western countries. So, a degree of perfection in technical communication is a must to keep pace with scientific and technological advancements. Other than the native language, gaining mastery over English is an indispensable factor for universal employment and private communication. New generation is losing their language so rapidly due to their lack of recognition of 'language-perfection'. Assiduously, extreme care in learning the L2 (English) and its functional implementation are looked at from several perspectives depending on different contexts in this article. Undeniably, language is a linking product of world culture and greater emphasis must be laidon it.

2. Review of Related Literature

2.1 Learner Factors During The Course of Teaching Technical Communication

The main concern of language teaching is not only to impart knowledge and information about the learning process, but to develop students' ability to use the language for a variety of communicative purposes. It is very much expected that teaching methods must change from dispensing information to creating activities that engage students' minds and offer problems with numerous solutions (David, 1991). Also, it has been shown that interactivity in the form of lectures and tutorials is more effective in teaching such concepts than a book, and simple programs alone can provide (Aveling, Smith & Wilson,1992). In the case of technical words, it is the semantic dimension that is arguably of particular importance as these words serve to denote concepts with accuracy and precision (Pearson, 1998). Serious research has been undertaken in analyzing and teaching English to students at the college level. Task-Based Language Teaching acts as a lectern for technical language teaching. Learners exhibit their ideas explicitly in task-based activities. David Nunan (2004) points out this activity as "experiential learning or learning by doing. To become successful in this highly competitive market and dynamic atmosphere, a fresh engineering university graduate essentially cultivates a complete vision of the entire business procedure from drawing board to distribution (Sackett and McCluney, 1992). In another aspect, the development of advanced and low-cost techniques is so rapid that, in the past 10–15years, manufacturing industries have had to develop a number of new vocabularies to address the new process and differentiate them from old ones (Flynn,2012). In the advancing industrial field, there should be augmentation in technical vocabulary to fulfill the working needs of the competing business world and also to enhance their marketability and suitability to current work scenarios. Multidisciplinary team communication has led to discipline-focused activities that support the team's overall performance; strengthened problem-solving ability; and created a thematic multifunctional learning experience that represents a revolutionary approach to engineering education (Fornaro et al., 2001).

In the process of educating, 'Instructional scaffolding' (Goldenberg, 2008), assists learners in escalating the complexity of language processing and literacy development (Geva, 2006). Furthermore, in the context of language learning, learners' topic familiarity with their respective disciplines helps them in dissemination of information;(Swaffer, 1988) language recognition, recall of concepts and inferential learning. All students obtain and use learning resources. Projects are a good idea for successful team building as all members are valued for their contribution, and they must be led to see themselves as a successful team of winners (Atkinson, 2001). When students encounter anxiety, low levels of motivation and boredom, their active consciousness becomes stilted in acquiring information. Learners should be kept focused and attentive in the learning-teaching process. The project- based learning approach is proven to be more effective in dealing with some of the impediments regarding language learning when the students reach the plateau effect and stop showing a noticeable progress (Richards, 2015). In the case of engineering education, comprehensive technical vocabulary and grammar focus (Richards, 1969) will have effectiveness on the success of any exchange (Van Duzer, 1997). Research on educational technology in English language teaching has identified several factors that network teaching activates the free flow of information among different teachers and learners; and improves theefficiency of information search to help learners practice   and ultimately   acquire listening, speaking, reading, writing and translating skills (Gaoda,2002). Moreover, the reality is that the language should engage learners consciously and initiate the learning process (Seidlhofer, 2011) where the learners indulge in creating their terms and meanings that are believed to build language proficiency as a whole making communication effective and

unintimidating. In a study observing L2 classrooms, it was identified that language transparency 'broadens the range of permitted interactional patterns within the classroom' (Cook, 2000). Real context projects can be productive in inculcating specific technical knowledge in students and also bringing out creative exploration relevant to the professional arena (Capraro, 2009). Inculcating scientific literacy and literacy in the technical domain is a significant educational goal for students pursuing engineering courses in India, as well as in many other countries. English is the medium of instruction for technical and scientific studies; henceforth, a lack of linguistic proficiency can indeed have significant implications for knowledge acquisition and literacy in the technical domain among aspiring engineers.

2.2 Research Questions

Language teaching is still an area of exploration. In the learning-teaching process, technological devices act as facilitators and teachers act as reservoirs of ideas in infiltrating knowledge. Yet learners have a dull impact on language acquisition over flawlessness. So farthe methods and approaches in ELT have been fixated on the idea of making language learning persuasive. Specifically, ESP is an approach to language teaching in which all decisions as to content and method are based on the learner's reason for learning (Hutchinsonet al., 1987). To evaluate functional technical skills in communication procurement, the basement of learning is likely to be made strong for extended constructive future use. In this study, a great deal of descriptions explains the know-how of the base of functional technical learning to engineering students before intervening with other methods; as the basement is the starting point of any search, no matter what. Four specific questions are addressed:

Research question 1: What are the differences in the nature of errors between technical presentation and writing?

Research question 2: Is language proficiency related to academic achievement?

Research question 3: Where does the thread of langauge variation lie primarily in the preparation of the project, presentation and functional usage?

Research question 4: Does the proposed method in this research study afford functional usage over theoretical learning? How far the outcome is predicted using statistical sample analysis?

3. Methodology

3.1 Participants

Participants chosen in this study were 200 students from multi-disciplines in an engineering college in a rural area of south Tamil Nadu. The participants are categorized based on their mode of education in the school period and they are represented using the following notations: n1-ICSE, n2-CBSE, n3-Matric, and n4-State. Concurrently, 200 projects from differentdisciplines were drawn to analyze their knowledge on a specific domain with five test factors and its functional application in varied contexts. To test the accuracy, parametric testing can be used and the data are presented on a statistical scale using line graphs. The test factors are abbreviated as follows: Tense- TNS, Voice - VOI, Concord - CON, Vocabulary - VOC and Connectors- CNCT. The participants are divided into two groups – one is the Control Group (CG) and the other is the Experimental Group (EG). The difference between these two groups constitutes tenable assessment values. The selected number of candidates taken for this study is considered as Samples (Singh, 1997). Pre-test and post-test are administered to the two groups and the scores are obtained.

The average is calculated using the formula,

$$\frac{1}{n1} \left(\Sigma \left(\frac{Number\ of\ correct\ Test\ Factor}{T} * 10 \right) \right)$$

and   Accuracy is calculated using the formula,

$$Accuracy = \frac{Correct\ classification}{All\ classification}$$

As seen from Table 1.1, an independent–sample test exhibited no statistically significant difference among categories in terms of utilitarian proficiency. Several types of research in language teaching, particularly to non-native speakers have shown that task-based and project-based learning is exponentially valid in imparting a genre of communication. PBL method improves persistent communication challenges of engineering students (Eggleston et al., 2018). Technical communication in functional aspects is the need of Indian engineering students to navigate their research ideas across various disciplines. The main objective of this study is to counterpoise technical writing among students who come from various streams of education.

3.2 Materials

Materials used were 200 mini projects which are preferably common to engineering departments like ECE (Electronics & Communication Engineering), EEE (Electrical & Electronics Engineering, CSE (Computer Science & Engineering) and ME (Mechanical Engineering). The title of the project is 'Processing of Digital Systems'. It encompasses several sections such as the objective, procedure, working principle, analysis as well as discussion, and conclusion. A total of 200 projects were reviewed based on their content and the basic variation of presenting ideas across the five test areas: content, voice, tense, concord, vocabulary, and connectors.

These test areas are considered the skill set for technical writing since most of the project reports follow format, language, and style based on these five elements. In the 200 mini projects of samples revealed undulations in the description of how the project ideas functioned and what they were like. The results showed that the majority of the projects contained serious errors in the five areas. The samples presented their mini-project with a mix of improper tense usage, a lack of proper connectives, inappropriate vocabulary, and excessive verbosity. The samples also revealed flaws in the structure of the project report and the language used to describe it. An evaluation sheet is prepared and the scores are recorded. The data obtained depict individual differences in technical English acquisition. The five test areas can be used as a guide to make sure that all the important aspects are adequately addressed in the technical writing.

3.3 Pre-test

The given period for this pre-test spanned two months during which the participants were tasked with collecting relevant sources related to the project titled 'Processing of Digital Systems'. Simultaneously, their weekly reports on the collected data were monitored for work progression. The samples were instructed to prepare a mini report of their project which includes the crux of ideas and working principles. After completion, the reports were interchanged to check the repetition and sentence structure with grammatical agreements. The samples found the reports convincing as they believed their reports were less prone to errors. On assessment of their mini project report with test areas such as tense, voice, concord, vocabulary and connectors, at an average of about 60%, the sentence construction is found weakened with no proper focus on organized format and restrictive writing. The variations in the data are explicated in Table 1.1 and Figure 1.1.

Table 1.1. Pretest data with the test areas outlined in this study

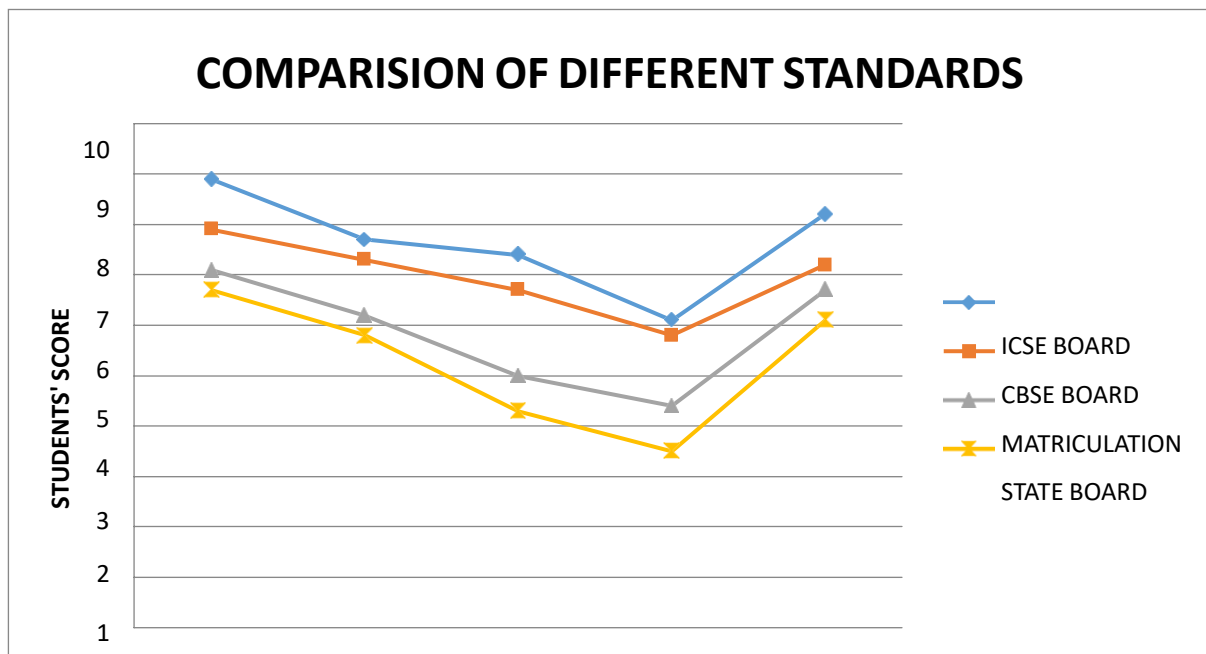| CATEGORY	NO. OF STUDENTS	TENSE (10)	VOICE (10)	CONCORD (10)	VOCABULARY (10)	CONNECTOR S(10)	ACCURACY (%)
ICSE BOARD	50	8.9	7.7	7.4	6.1	8.2	**76.8%**
CBSE BOARD	50	7.9	7.3	6.7	5.8	7.2	**69.9%**
MATRICULATION	50	7.1	6.2	5.0	4.4	6.7	**59.1%**
STATE BOARD	50	6.7	5.8	4.3	3.5	6.1	**52.9%**

Figure 1.1. Test area differences seen in different modes of education in the pretest

3.4 Post-test

The two groups (CG and EG) were administered a treatment before the preparation of the macro project. Fifty students (CG) were set ready in a room with two clue cards, one with an outline of the data gathered for their given study and the other with technical vocabulary for the expansion of ideas. They were distributed sheets of paper and were asked to jot down their project ideas on five focus areas: objective, procedure, working principle, discussion and results. They were given a maximum of three hours to complete the test. After the test an individual scoring sheet was given to analyze their level of writing.

The other 100 students (EG), in another room, were given three clue cards. One with the outline of the project, the second containing technical vocabulary and connecting words and the third one on the basic pattern of writing a project report. For writing, the explanation was given as follows:

Objective: State the purpose clearly in

·   Simple present tense (using only the base form of action words).

·   It must be in a line or two with no solecism or parallelism.

Procedure: Describe the process using,

·   Simple present tense (or)

·   Imperative mood for instructing steps involved in operating (or)

·   Present passive form.

Working Principle: Apply

·   Present tense to describe ongoing processes (or)

·   Past tense to explain historical developments (or)

·   Verbs in its third form (present passive form)

Discussion:

·   Utilize past tense to analyze the findings and observations

Results & Conclusion:

    Use the present passive form or past tense to describe the observed outcomes and summarize results.

To narrow it down, it is shown in a '**sequence flowchart technique,** for quickcomprehension:
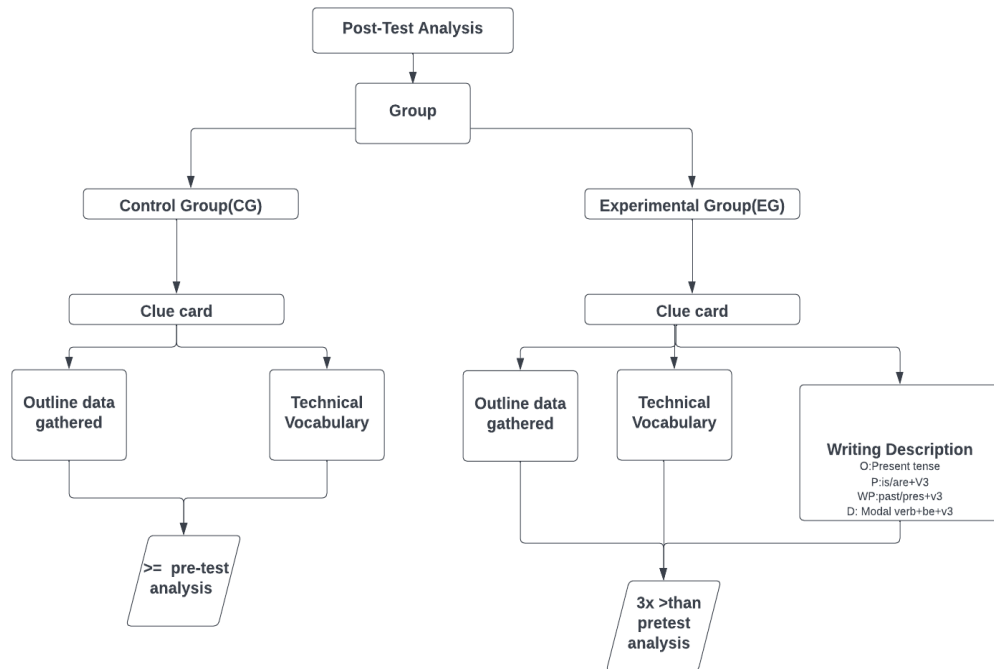
O-Objective, P-Procedure, WP-Working Principle, D-Discussion, R- Results

Figure 1.2. Post- test analysis in the Sequential Frame based on the test for EG & CG

In addition to this, manner and matter should go hand in hand. Along with this a manual was given to frame sentences. With these concrete procedures, when the samples finished writing their reports, the scoring sheet was given for individual analysis. When these intricate lines of differences are made aware, the post-test results showed a soaring percentage for the experimental group. However, individual differences exist among these group members. The data difference in writing principle is delineated in Table 1.2.

Table 1.2. Post test data obtained for Experimental and Control Group

CATEGORY	NAME OF THE GROUPS	NO.OF STUDENTS	TENSE(10)	VOICE(10)	CONCORD(10)	VOCABULARY(10)	CONNECTORS(10)	ACCURACY (in percentage)
ICSE BOARD	EG	25	9.4	9.2	8.6	9.4	9.0	**91.1%**
	CG	25	8.5	7.5	7.1	7.2	8.3	**77.3%**
CBSE BOARD	EG	25	9.1	8.7	8.3	8.6	8.3	**86.1%**
	CG	25	7.9	7.4	6.5	6.2	7.6	**71.3%**
MATRIC. BOARD	EG	25	8.2	8.0	7.9	8.3	8.2	**81.1%**
	CG	25	7.6	7.0	5.3	5.0	7.4	**64.6%**
STATE BOARD	EG	25	8.1	8.1	7.1	8.0	8.3	**79.3%**
	CG	25	7.2	6.8	4.6	3.9	7.1	**59.2%**

*EG–Experimental Group

*CG– Control Group

4. Analysis and Interpretation

The samples were later encouraged to speak about their project ideas. The control group had errors while speaking as they were not conscious of the sequence flowchart application, while the experimental group found it easy to interact and were able to narrate any technical topic with the help of the sequence chart given. Though ICSE and CBSE are students directed for international standards, this particular procedure helped them a whole lot in improvisations. Even students who had their medium of study in State Board and Matric Board were also able to speak confidently and present their ideas functionally in varied contexts using this technique.

Concerning functional English learning, working with a supportive project document, the results showed that providing explicit language focus areas can result in relatively high levels of implementation among L2 speakers. On the other hand, the findings also substantiate the notion that repeated exposures or deeper involvements (Rott, 1999; Webb, 2007) with learning contribute to flawless usage on a contextualized basis. As evident in Table 1.1, the previous knowledge among sample participants was not found to be satisfactory for interpreting and scripting the ideas effectively. It is important to acknowledge that in pedagogical practice, incorrect inferences are retained in the long term, as highlighted by (Laufer & Yano, 2001). This is specific to learners when they are not made aware of the practical correctness of what they are acquiring.

The paramount of technical communication relies on precise and clear language usage. This includes 'methods of interpretation in its simplest terms with correct grammatical sense' ensuring that the language is straightforward and unambiguous. The post results observed with the experimental respondents are satisfactory in terms of conveying ideas when the respondents become aware of their areas of inadequacies or limitations, which are corrected within the conceptual and contextual sequential flowchart framework of the study. A considerable degree of variation is seen when their prior knowledge is contrasted with functional clues provided in the study, that help bridge the gap between what they already know and what they need to learn or understand. Figs. 1.1 and 1.2 depict this comparison and are illustrated based on the collected data represented in Table.1.2
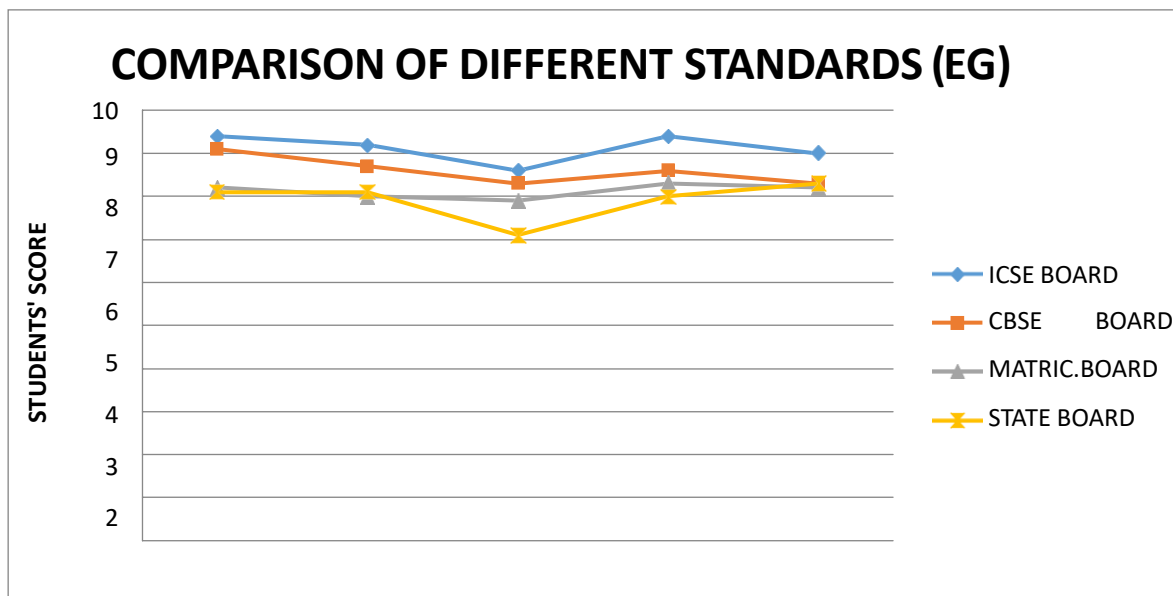

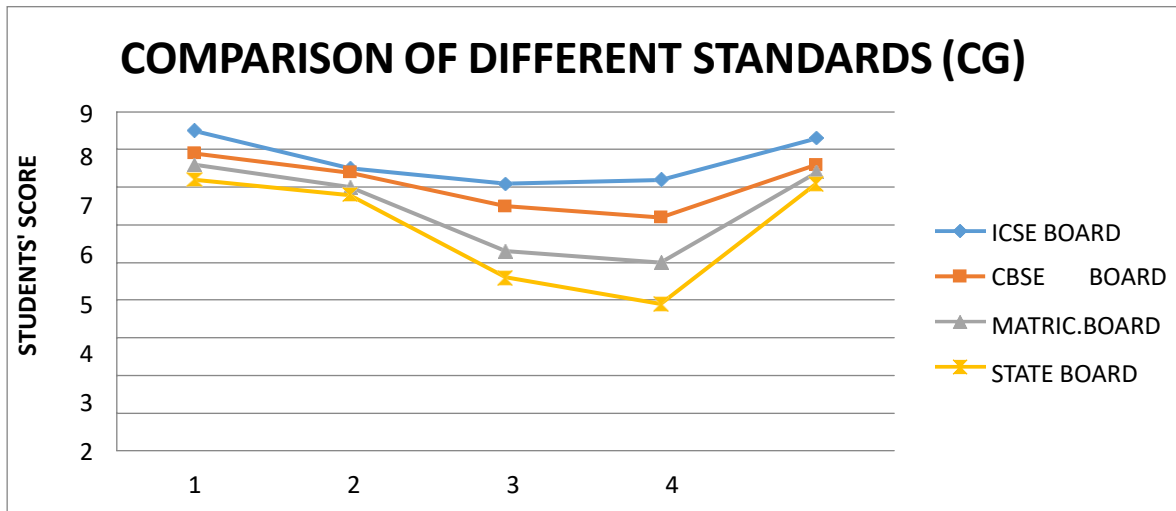Figure 1.3. Analysis graph of Experimental Group after the post-test

Figure 1.4. Analysis graph of Control Group after the post-test revealing the areas to be focused

5. Teacher's Evaluation of This Method

Teachers pointed out a few advantages of the method. This particular sequence flowchart technique for technical writing is easy to understand and helps learners construct flawless sentences. What is all-important in technical writing is giving precise details, using the right words at the right place and error free-no typo sentences. This method is highly preferable for learners if they pay close attention to the steps outlined for writing a project report. It is proven that writing skill promotes effective speaking skills. Furthermore, this 'sequence flowchart technique' method helps analyze defects in technical writing and will present improved forms of technical communication that is, 'Known to the Unknown'.

6. Learner's Autonomy

6.1 Writing Scoring Sheet

A majority of students (i.e.,87%) believed that this method served as a basis for technical writing. 85% of students had a strategy of correcting themselves. Their autonomy in learningtechnical English was influenced by the familiarity of their project which allowed them to take on their concepts to the next level.

Table 1.3. Self- analysis test sheet after the preparation of project reports.

S.No.	Methods & Resources	1	2	3	4	5
1	The amount of effort that I put into this method was excellent					
2	The allotted time was sufficient to practice and present					
3	This sequence flowchart technique is a special attention to shape information					
4	The basic concepts of technical writings were fulfilled					
5	It enabled me to be more interested in expanding technical ideas					
6	I have encountered this kind of method earlier					
7	This method was fruitful to learn with the familiarity of our subject					

1 – Strongly disagree, **2**- Disagree, **3**- Partially agree, **4** – Agree, **5** – Strongly agree

7. Conclusion

Technical knowledge is necessary for the people of the present century, for they live and breathe the air of electronic chips and software codes. In the past, technical knowledge was the privilege of a select group of professionals like scientists, engineers, and technocrats. Today, technology is democratized and disciplined to serve the masses. It was not widely accessible to the general population. It is now pervasive, influencing every single aspect of our lives. Hardcore scientific knowledge, though valuable, is not necessary, but simple applied, functional, or practical knowledge is more essential for the people of this 'mobile world'. Technocrats are extremely rich in their subjects, but they are mostly poor communicators. The present study suggests a shift in the approach to technical communication from the earlier attempt to solely enhance the communication skills of experienced professionals; the focus is now on young engineering graduates. With the help of sequential flow chart strategies, the young ESL (English as a Second Language) students leave the campus as good communicators and easily navigate technical knowledge to the general population in a successful manner, thereby benefiting society at large. Writing and speaking skills are complementary. When young engineering students work on improving their writing skills, it can enhance their speaking skills significantly. Thus this study aims to create a platform for engineering students to gain insight into their understanding of technical usage in both academic and situational contexts through the suggested techniques.

Competing interests

We declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Sciedu Press.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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