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TEACHING SELF-EFFICACY: VISUALIZING A COMPARATIVE STUDY ANALYSIS USING t-SNE

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Abstract: Effective teaching is a multifaceted professional activity that necessitates specialized knowledge, skills, and characteristics. Studies show that self-efficacy is not stable but is subject to change according to exposure and experiences. The study aimed to compare English teachers' self-efficacy beliefs across Oman and Kerala, focusing on three dimensions: engaging students, classroom management, and instructional strategies. Additionally, it examined the factors influencing self-efficacy among Indian teachers working in both regions. A quantitative approach was employed using a survey administered to 312 teachers (200 from Kerala and 112 from Oman). Data were analysed by a qualitative method using the t-SNE clustering technique. Results revealed significant differences in self-efficacy levels, with teachers in Kerala exhibiting higher efficacy in student engagement and classroom management while teachers in Oman scored better in instructional strategies. The findings suggest that context-specific support and training are crucial to enhance self-efficacy among teachers in diverse educational settings. Future research should explore these factors further to develop tailored interventions for improving teaching effectiveness.

IndexTerms – Teaching efficacy, self-efficacy, student engagement, classroom management, instructional strategy, t-SNE

I. INTRODUCTION

Great nations are built in four-walled classrooms. Educational development is directly proportional to national development with advanced skills from teachers. Individual teachers' character, qualities, qualifications and professional efficacy are essential to the ultimate success of human, social, national and educational progress. Efficient teachers are essential to the effective functioning of the education system and the quality of the learning process in a country. Teachers' role in preparing individuals for social life is enormous.

In the rapidly evolving landscape of 21st-century education, the role of teachers has undergone significant transformations. In an era of information overload, teachers play a crucial role in developing students' critical thinking abilities. They encourage students to analyze, evaluate, and synthesize information, promoting higher-order thinking skills that are essential for success in Education 5.0 system. This modern educational framework skillfully integrates innovative technology, tailored educational experiences, and the development of crucial competencies, placing an emphasis on individual empowerment, creativity, and flexibility to equip students for the realities of the digital era.

The concept of teacher self-efficacy has been central to educational research. Self-efficacy becomes even more significant in the context of English language teaching due to the dynamic nature of language instruction, which involves fostering student engagement through communication skills, managing diverse classrooms, and adapting instructional methods. For teachers working in varied geographical and cultural contexts, such as India and Oman, the understanding and application of self-efficacy may be influenced by regional factors, including educational systems, cultural expectations, and teacher development opportunities. Much research has been done in this field but a comparative study among Indian teachers in Oman and Kerala is less explored. Hence the following research questions will be addressed for the study.

1)What are English teachers' self-efficacy beliefs in a) engaging students, b) classroom management, and c) instructional strategies comparing Oman and Kerala?
2) What are the factors that affect the self-efficacy of English teachers from India who are working in Oman and in Kerala

II. LITERATURE REVIEW

2.1. Self-Efficacy

Bandura (1997) considers self-efficacy as a "psychological variable" in which a person believes he can successfully do a particular task. He also adds that self-efficacy connects to one's self-confidence in one's capacity to develop appropriate competence to bring out the ideal and expected result. Putman noted that there is always a positive correlation between self-efficacy and teacher effectiveness (2012). Moersch (1995, p 40) stated, "Individuals with high levels of self-efficacy are most inclined to accept change and choose the best option". Bandura (1997) contends that self-efficacy expectations differ in ability to prevail over others. People with comparatively more self-efficacy have shown easiness to act upon challenges with perseverance, whereas people with low self-efficacy neglect given challenges that they may not be capable of completing. Chien (2012) reports that positive learning is a matter of subject with subject-to-efficacy expectations. Experiences increase self-efficacy, which improves the effectiveness of training.

2.2 Sources of Self-efficacy

According to Bandura (1997), the four main factors influencing self-efficacy are "mastery experiences, vicarious experience, social and verbal persuasion and effective state". Studies show that self-efficacy is not stable but is subject to change according to exposure and experiences. Keeping this ever-changing nature of self efficacy Desimone (2009) proposes a four-step model which highlights " interactive, no recursive relationships between the critical features of professional development, teacher knowledge and beliefs, classroom practice and student outcomes" (p.184). Bandura (1997) also adds self-efficacy is not only personal efficacy as mentioned earlier, but it involves outcome efficacy which focuses on one's belief that "given behaviour will lead to specific outcomes"

2.3. Importance of Teaching Self-efficacy for Teachers

Kumari and Srivastava (2005) articulated that an exemplary educator is one who manifests pedagogical excellence, possesses profound knowledge, and demonstrates exceptional personal competence in their interactions with students. The invaluable insights of practitioners with hands-on experience in the educational domain are undeniably pertinent to the complex interactions among language, culture, pedagogy, and learning. A significant corpus of scholarly literature illustrates that educators' beliefs exert a direct influence on their interpretations of teaching and learning within the classroom context (Clark & Peterson, 1986; Clark & Yinger, 1987). Additionally, research indicates that teacher self-efficacy is associated with elements intrinsic to schools and institutions that promote positive teacher behaviors (Woodcock, 2011), which concurrently facilitates student achievement (Cakiroglu, Cakiroglu, & Boone, 2005). Klassen and Tze (2014) further assert that teacher self-efficacy contributes to heightened motivation and effectiveness among educators (Stripling et al., 2008).

2.3. Teacher Technology Self-efficacy

Teachers' capability to incorporate technology effectively into their lessons is known as teacher technology self-efficacy (TTS). Teachers are vital in helping students develop and improve their skills, so they must access 21st-century tools. Teachers are less likely to use technical abilities in their lessons if they lack the confidence to deliver teaching that focuses on them. Moreover, to attain the best outcome from technology usage, it is necessary to have instructors' passionate participation (Naqvi, Khan & Mahrooqi, 2014). Compeau and Higgins (1995) agree with this viewpoint, by stressing individuals having higher computer self-efficacy would use computers more frequently without any self-consciousness, and they find it enjoyable when using them. Compeau and Higgins (1995), in accordance with Bandura (1997), refer to Computer self-efficacy as any individual's judgment on their capacity and skill to carry on any work using a computer.

III. OBJECTIVES :

The study will focus on the following objectives**:**

To understand English teachers' perception of their self-efficacy in a) engaging students, b) classroom management, and c) instructional strategies.

To compare self-efficacy beliefs of English teachers from India teaching in Oman and Kerala

!V. RESEARCH METHODOLOGY

The current research was expertly executed among English teachers employed in Government, Private, Aided schools, and International schools in Oman and Kerala. For this research, random sampling techniques were effectively employed to derive a representative sample of 312 educators from primary, secondary, and senior secondary schools located in Oman and Kerala. For this significant study, 110 Indian ESL teachers from Oman and 200 ESL teachers from Kerala were systematically selected through random and cluster sampling.

4.1. Teachers' Sense of Efficacy Scale

The Teachers' Sense of Efficacy Scale, developed by Tschannen-Moran, M., & Woolfolk Hoy, A. (2001) from Ohio State University, was strategically adopted for the present study as the second tool. The scale consists of 24 items divided into three subscales under Long Form Efficacy. Teacher's Self-Efficacy. Each item is scored on a 5-point Likert scale as follows. The instrument asked participants to evaluate their capabilities: "How much can you." utilizing the anchored scale below: Nothing -1, Very little -2, Some influence-3, Quite a bit-4, A great deal -5. The questionnaires were meticulously created using Google Forms, and the link was distributed. The obtained data were efficiently computed and subjected to thorough statistical analysis.

4.2. Statistical Techniques Used – t- SNE

t-SNE, or t-distributed Stochastic Neighbour Embedding, is a dimensionality reduction technique often used for visualizing high-dimensional data. Developed by Maaten, L & Geoffrey, E, H (2008). By applying t-distributed Stochastic Neighbor Embedding (t-SNE), a dimensionality reduction technique, the study seeks to uncover underlying patterns in high-dimensional survey data, which

encompasses responses to 24 questions related to teaching practices and efficacies in three sections: Student Engagement, Instructional Strategies and Classroom Management. t-SNE allows for complex, high-dimensional data visualization by reducing it to two or three dimensions, thus enabling the identification of potential clusters within the data. This method is effective at grouping similar data points while preserving the local relationships between them. For example, teachers with similar views on digital integration may appear closer together in the t-SNE plot, while those with contrasting perspectives might be more separated.

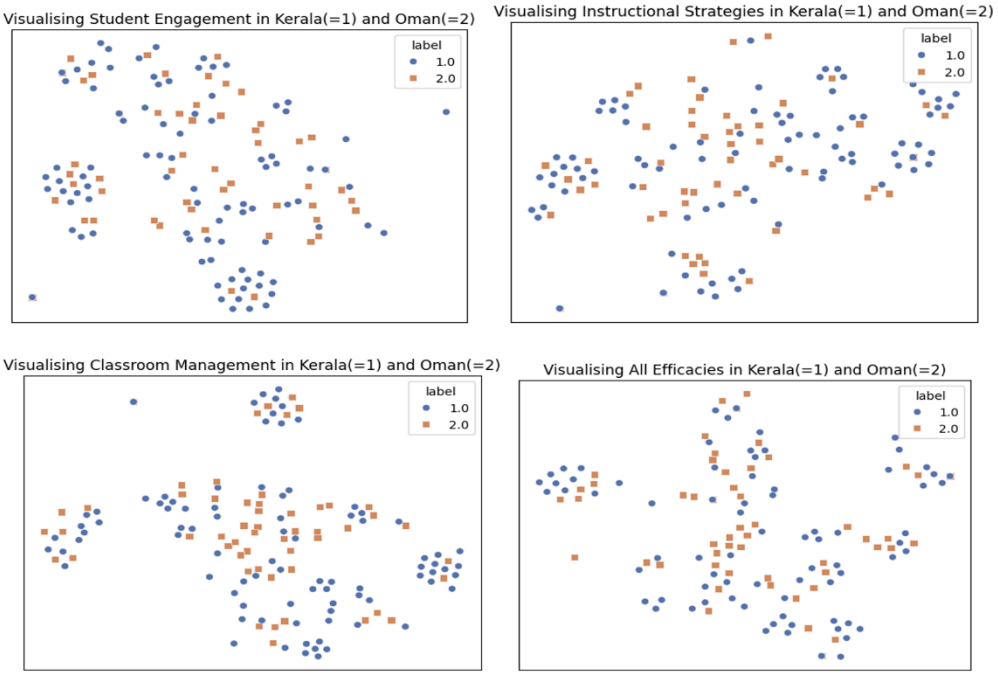
In the study, t-SNE reveals potential clusters that indicate varied perceptions of teaching efficacy. For instance, some clusters may highlight teachers who perform different instructional strategies like integrating digital tools and observe significant benefits in student engagement, while others may group teachers with traditional methods, showing little digital reliance.

Overall, t-SNE helps us understand how educators vary in the three areas of student engagement, classroom management, and instructional strategies and how these variations relate to teaching efficacy. The visualizations bridge quantitative data with qualitative insights, contributing to a more comprehensive understanding of regional differences and pedagogical practices in digital tool integration.

V. RESULT AND DISCUSSION

The t-SNE visualization powerfully illuminates teacher self-efficacy in student engagement, instructional strategies, and classroom management, decisively comparing responses from Kerala (labelled 1) and Oman (labelled 2).

Pic- 1- t-SNE visualization



Regarding student engagement (top-left), the distinct clusters present a compelling narrative of stronger consistency among Kerala teachers, while Oman's responses exhibit a more scattered distribution. It exhibits striking clustering, particularly among Kerala teachers, showcasing their shared and consistent views and approaches. In contrast, Oman's responses reveal greater variation, suggesting less uniformity in the perceptions or implementations of student engagement strategies among its teachers. The tight clustering for Kerala undoubtedly reflects the significant influence of targeted regional training or educational policies that cultivate a cohesive approach to student engagement. This clearly indicates that Kerala teachers possess a unified perspective on student engagement, whereas Oman's responses reveal a broader range of interpretations and approaches.

In the domain of instructional strategies (top-right), the noticeable overlap between the two groups asserts that teachers from both Kerala and Oman embrace similar methodologies and perceptions regarding instructional practices. In this realm, the plot demonstrates substantial overlap between the two regions, indicating that common pedagogical practices are prevalent in Kerala and Oman. While minor clusters showcasing regional distinctions exist, the overlap strongly implies that teachers in both areas generally embrace a similar approach to teaching strategies. This alignment may stem from shared global educational trends or widely embraced teaching frameworks. However, the minor clustering clearly points to regional nuances shaped by local curriculum or cultural elements which suggests local educational policies or practices indeed influence teaching methods in unique ways.

The classroom management plot (bottom-left) showcases shared similarities between the regions, yet it also reveals clearer clusters that indicate significant differences in management styles. These differences undoubtedly reflect regional variations in classroom environments or teacher training, with Kerala teachers exhibiting a more consistent approach, while Oman's responses reveal a diverse array of strategies. Kerala teachers consistently cluster together, indicating their tendency to adhere to more uniform classroom management techniques. Conversely, Oman's responses are more dispersed, reflecting varied perceptions and approaches to

classroom discipline and control. These differences are likely rooted in diverse classroom environments or cultural attitudes towards authority and discipline present in each region.

Finally, the combined visualization of all three efficacy domains (bottom-right) confidently demonstrates a blend of similarities and differences. While Kerala and Oman teachers share a foundation in teaching efficacy patterns, the distinct clusters indicate that certain practices or perceptions are characteristically unique to each region.

VI. CONCLUSION

In summary, the t-SNE results emphatically underscore both commonalities and regional variations in teacher self-efficacy between Kerala and Oman, particularly in the areas of student engagement and classroom management. Instructional strategies, however, reveal a broader overlap, suggesting that similar pedagogical approaches are indeed prevalent across both regions. These findings assertively imply that while teachers may share comparable teaching experiences, localized influences such as cultural context or educational policies play a crucial role in shaping specific teaching practices.

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