



Challenges and Willingness of B.Ed. Students to Implement BSCS 5E Design: A Study in Odisha

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Abstract: The present study examined the problems pre-service teachers (PSTs) or B.Ed. students came across while using the 5E design in classroom. Also, their willingness to adopt it in future classroom practice is examined. Grounded in Constructivist Learning Theory (CLT) and the Theory of Planned Behavior (TPB), the study investigated the relationship between perceived implementation difficulties and behavioral intention toward using inquiry-based pedagogy. A descriptive–correlational research design was employed. Data were collected from 172 B.Ed. students in Odisha. Two Likert-type instruments namely the Difficulties in Teaching with 5E Scale (DT-5E) and the Willingness to Use 5E Scale (WU-5E) were used. Reliability analysis showed high internal consistency for both instruments ($\alpha = .884$ and $\alpha = .882$ respectively). The results clearly show that preservice teachers face moderate difficulties in all five steps of 5 Explain is the most difficult step to implement. Still participants demonstrated high willingness to adopt the model mainly due to institutional support and perceived behavioral control. The Correlation results showed a significant negative relationship between perceived difficulty and willingness ($r = -.370$, $p < .001$). Regression analysis further showed that perceived difficulty significantly predicts willingness to use the 5E model ($R^2 = .137$). The present investigation has shown the importance of strengthening constructivist teacher training, institutional mentoring, and inquiry-based pedagogical support within B.Ed. programs.

Index Terms - 5E instructional model, pre-service teachers, constructivist learning, willingness to adopt, inquiry-based teaching, teacher education

1. INTRODUCTION

The main focus of today's teacher education is student-centered and inquiry-based teaching approaches. Modern approaches are aligned with constructivist learning principles. 5E instructional model is one of such approaches. 5E consists of 5 steps which are Engage, Explore, Explain, Elaborate, and Evaluate. The 5E has gained considerable attention for promoting active learning, conceptual understanding, and reflective thinking. Biological Sciences Curriculum Study (BSCS) has created this design. BSCS 5E model enables students to construct knowledge mainly through exploration and meaningful engagement. passive memorization is largely avoided.

Several research have shown that that the 5E model improves conceptual understanding, classroom engagement, and inquiry skills among students. Bybee et al. (2006) and Tanner (2010) argued that the model aligns closely with how learners naturally develop understanding through interaction, reflection, and application. Similarly, Garcia I Grau et al. (2021) reported that classrooms implementing 5E-based instruction achieved stronger long-term conceptual learning compared with traditional lecture-oriented classrooms.

5E model is pedagogically strong but its implementation is a challenge for pre-service teachers (PSTs). Inquiry-based teaching requires teachers to act as facilitators of learning rather than transmitters of information. Previous studies indicate that PSTs often struggle with designing inquiry activities, managing student exploration, guiding conceptual discussions, connecting learning to real-life situations, and conducting authentic assessment (Enugu & Hokayem, 2017; Turan, 2021). These difficulties are frequently intensified by inadequate teaching resources, time limitations, rigid curricula, and limited classroom experience.

At the same time, research suggests that PSTs generally hold positive attitudes toward constructivist pedagogy and recognize the educational value of the 5E model. However, favorable attitudes do not always translate into actual classroom implementation. Factors such as institutional support, self-confidence, and perceived difficulty strongly influence teachers' behavioral intention to adopt innovative pedagogy.

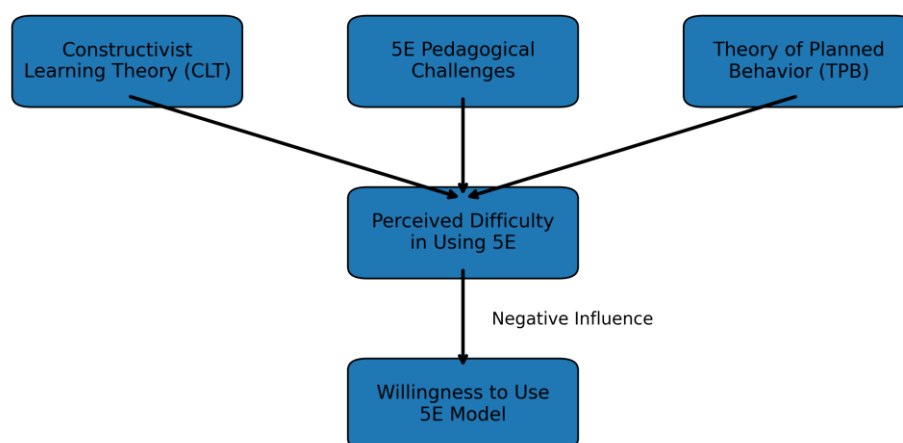
The Indian educational context makes this issue particularly important. NEP 2020 has given importance to learning by experience and leaning through activities. NEP also focus on learner-centered pedagogy within teacher education programs. Similarly, B.Ed. curricula in Odisha increasingly encourage constructivist teaching approaches. However, limited research has examined whether pre-service teachers feel prepared and willing to implement such methods in practice.

Therefore, the present study investigated: 1. The difficulties faced by B.Ed. students in implementing the 5E learning design; 2. Their willingness for adoption the of 5E model in future teaching; 3. The relationship within perceived difficulty and willingness to use 5E.

The study seeks to contribute to teacher education research by examining how pedagogical barriers influence behavioral intention toward inquiry-based teaching.

2.THEORETICAL FRAMEWORK

Figure 5. Conceptual Framework of the Study



The study has its base on Constructivist Learning Theory (CLT) also Theory of Planned Behavior (TPB). Constructivist Learning Theory proposes students actively build their knowledge by interaction, inquiry, reflection, and experience (Vygotsky et al., 1978). The 5E instructional model operationalizes constructivist principles by organizing learning into five sequential phases that promote curiosity, exploration, conceptual understanding, application, and reflection.

However, implementing constructivist teaching requires considerable pedagogical skill. Teachers must design inquiry activities, facilitate discussion, manage classroom interaction, and assess reflective learning. These instructional demands often create implementation challenges for pre-service teachers.

The Theory of Planned Behavior (Ajzen, 1991) explains how behavioral intention is influenced by attitude, subjective norms, and perceived behavioral control. For this study, willingness to adopt the 5E model depends not only on positive beliefs about inquiry teaching but also on teachers' confidence and institutional support. Therefore, the study examined whether greater perceived difficulty reduces teachers' willingness to implement the 5E instructional model.

Methodology

The study used a descriptive–correlational research design to know relationship between perceived implementation difficulties with willingness to adopt the 5E instructional model.

Participants

The participants consisted of 172 second-year B.Ed. students from teacher education institutions in Odisha during the 2024–2025 academic session. Both science and social science streams were represented.

Instruments

Two self-report Likert-type scales were used for data collection.

The first instrument, the Difficulties in Teaching with 5E Scale (DT-5E), consisted of 25 items measuring challenges across the five phases of the 5E model: Engage, Explore, Explain, Elaborate, and Evaluate.

The second instrument, the Willingness to Use 5E Scale (WU-5E), consisted of 15 items assessing five dimensions: attitude, subjective norms, perceived behavioral control, institutional support, and behavioral intention.

Both instruments used a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5).

Reliability

Reliability analysis using Cronbach's Alpha indicated high internal consistency for both instruments. The DT-5E scale recorded $\alpha = .884$, while the WU-5E scale recorded $\alpha = .882$.

Data Collection and Analysis

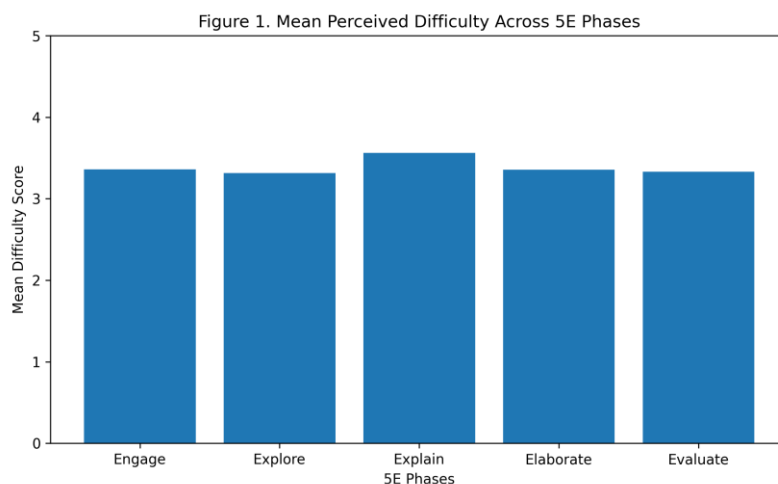
Data were collected through Google Forms. Descriptive statistics were computed to examine the levels of perceived difficulty and willingness. Independent-samples t-tests were conducted to compare science and social science students. Pearson's product–moment correlation was used to examine the relationship between difficulty and willingness. Finally, simple linear regression analysis was performed to determine whether perceived difficulty predicts willingness to use the 5E model.

3.Results and Discussion

Descriptive Statistics Table

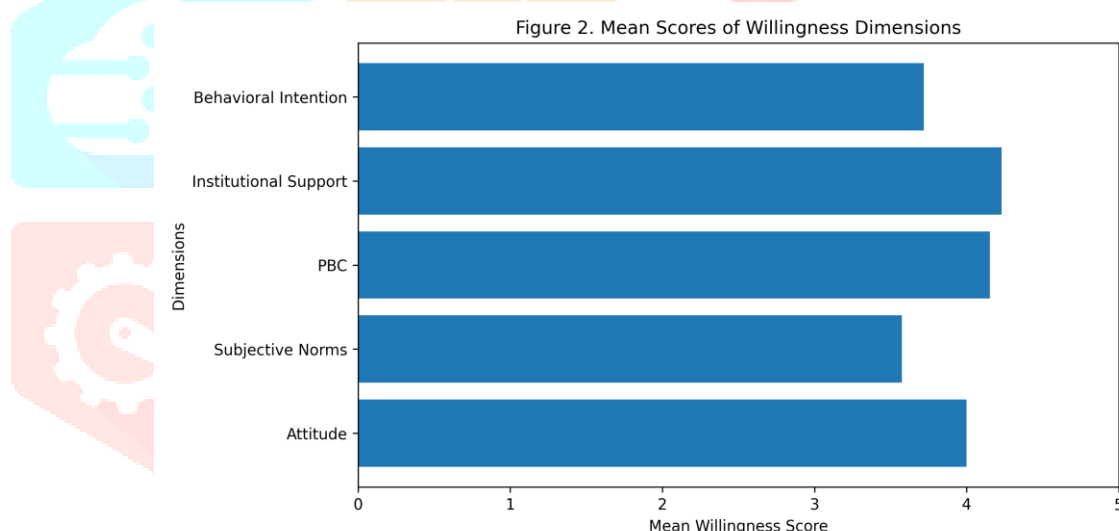
Variable	Mean	SD	Minimum	Maximum
DT Total (Perceived Difficulty)	3.38	0.54	2.04	4.61
Engage	3.45	0.58	2.10	4.60
Explore	3.31	0.63	1.80	4.55
Explain	3.56	0.52	2.25	4.75
Elaborate	3.42	0.55	2.00	4.60
Evaluate	3.25	0.57	1.90	4.40
WU Total (Willingness)	3.93	0.57	2.45	5.00
Attitude	4.00	0.83	2.00	5.00
Subjective Norms	3.80	0.64	2.10	5.00
PBC	4.15	0.54	2.45	5.00
Institutional Support	4.23	0.58	2.40	5.00
Behavioral Intention	3.86	0.52	2.00	5.00

Results revealed that B.Ed. students experienced moderate implementation difficulty for all five steps of the 5E model. Overall perceived difficulty score was moderately high ($M = 3.38$, $SD = 0.54$). Among the five phases, the Explain phase showed the highest level of difficulty ($M = 3.56$), followed by Engage ($M = 3.45$) and Elaborate ($M = 3.42$). The Evaluate phase had lowest mean difficulty score ($M = 3.25$).



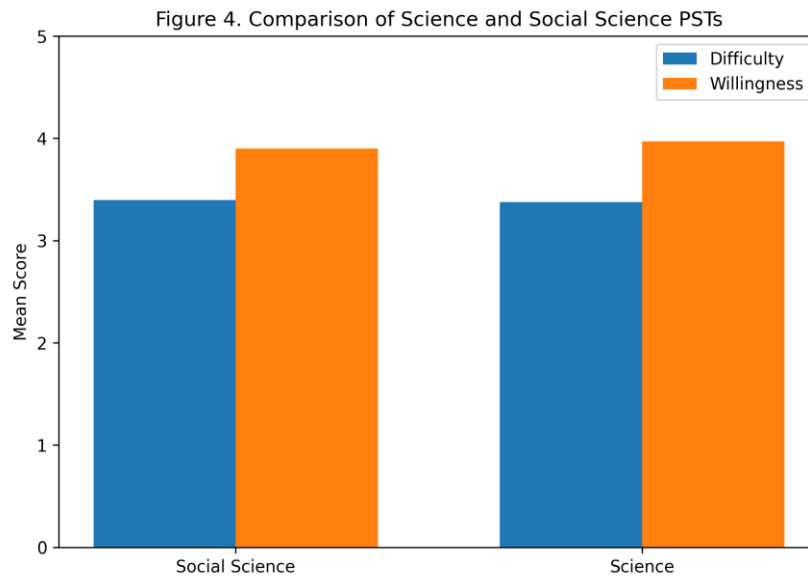
According to the results PSTs particularly struggle with guiding conceptual understanding, addressing misconceptions, and facilitating inquiry-based discussion. Such tasks require strong pedagogical content knowledge and classroom facilitation skills, which many novice teachers are still developing. Difficulties in the Explore and Elaborate phases further indicate challenges related to inquiry management, lesson creativity, and real-life application of concepts.

Although participants experienced moderate implementation challenges, their willingness to adopt the 5E model remained high. The overall willingness score was 3.93 (SD = 0.57), indicating a strong positive orientation toward inquiry-based teaching.



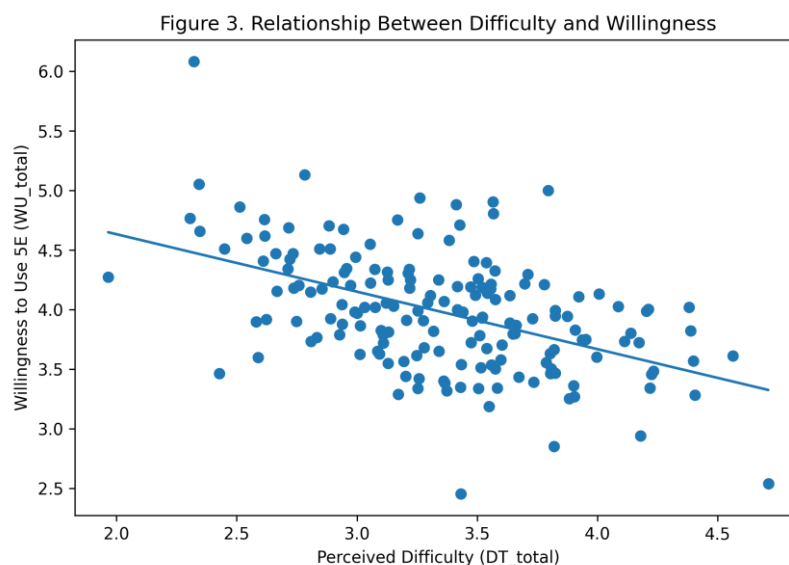
Among the willingness dimensions, Institutional Support recorded the highest mean score ($M = 4.23$), followed by Perceived Behavioral Control ($M = 4.15$) and Attitude ($M = 4.00$). These results suggest that pre-service teachers generally value constructivist teaching and believe they can implement it successfully when sufficient support and resources are available.

The findings also reflect the growing influence of constructivist reforms within teacher education programs under NEP 2020 and the B.Ed. curriculum in Odisha. Institutional encouragement appears to play a major role in strengthening teachers' willingness to adopt inquiry-based pedagogy.



Independent-samples t-tests did not show any differences for science or social science students for either perceived difficulty or willingness. Science students and social science students reported similar levels of implementation difficulty, $t(170) = 0.24$, $p = .811$. Similarly, no significant difference was observed in willingness between science and social science students.

These numbers show that implementation challenges associated with the 5E model are systemic rather than discipline-specific. Both groups appear to encounter similar pedagogical and logistical barriers within teacher education settings.

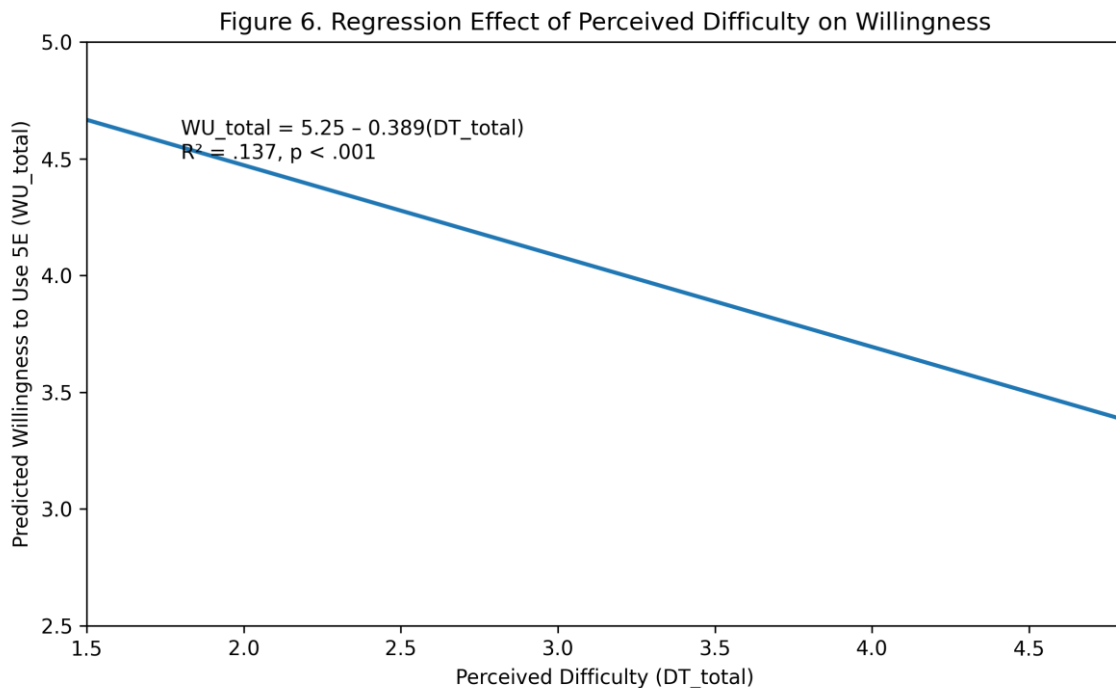


Correlation results have shown negative relationship between perceived difficulty and willingness to use the 5E model, $r(170) = -.370$, $p < .001$. This moderate inverse relationship indicates that as teachers perceive greater difficulty in implementing the model, their willingness to adopt it decreases.

The results firmly support the Theory of Planned Behavior. According to TPB perceived behavioral control significantly influences behavioral intention. Teachers who feel less confident or encounter greater obstacles become less willing to implement inquiry-based pedagogy.

Regression Graph and Interpretation

Figure 6 shows the regression relationship between perceived difficulty and willingness to use the 5E instructional model.



The negative slope of the regression line indicates that willingness decreases as perceived difficulty increases. The regression analysis was statistically significant ($F = 27.01$, $p < .001$) and explained 13.7% of the variance in willingness ($R^2 = .137$). The regression coefficient ($B = -0.389$) suggests that a one-point increase in perceived difficulty reduces willingness by approximately 0.39 points.

$$\hat{Y}_{WU_total} = 5.25 - 0.389X_{DT_total}$$

The unstandardized regression coefficient for perceived difficulty was $B = -0.389$, indicating that a one-point increase in perceived difficulty reduces willingness by approximately 0.39 points on the five-point scale. This finding demonstrates that pedagogical barriers directly influence teachers' readiness to adopt constructivist teaching approaches.

Overall, the findings present an important pattern. While pre-service teachers generally support inquiry-based learning and demonstrate strong willingness to use the 5E model, they continue to face moderate practical and pedagogical challenges. Institutional support and self-efficacy appear to strengthen willingness, whereas perceived implementation barriers reduce behavioral intention.

These findings suggest that teacher education programs should move beyond theoretical discussion of constructivism and provide stronger practical training in inquiry-based lesson design, classroom facilitation, and authentic assessment.

4. Conclusion

The present study examined the difficulties that B.Ed. students came across while using 5E in classroom and their willingness to adopt it in future teaching practice. The findings revealed that although PSTs experience moderate challenges across the five phases of the model, they nevertheless demonstrate strong willingness to use inquiry-based pedagogy.

The Explain phase emerged as the most difficult component of implementation, reflecting challenges associated with conceptual facilitation and addressing misconceptions. At the same time, high scores for institutional support and perceived behavioral control indicate that teacher education institutions play a critical role in encouraging constructivist teaching practices.

The significant negative relationship between perceived difficulty and willingness confirms that implementation barriers reduce teachers' behavioral intention to adopt the 5E model. Therefore, reducing these barriers through practical training, mentoring, collaborative lesson planning, and improved institutional support is essential.

The paper shows that strengthening experiential and inquiry-based teacher preparation within B.Ed. programs. By improving pedagogical preparedness and reducing implementation challenges, teacher education institutions can connect theoretical acceptance and actual classroom practice of constructivist pedagogy.

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