Effect of an Inclusive Education Course Delivered Through a Flipped Learning Approach on Pre-Service Teachers' Self-Efficacy: A Randomized Controlled Trial

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ABSTRACT
The discrimination and exclusion of children with special educational needs from mainstream classrooms can be attributed to inadequate preparation of pre-service teachers for inclusive teaching. Teachers' self-efficacy, which refers to beliefs about their ability to implement inclusive strategies, is widely recognized as a crucial factor in preparing pre-service teachers to perform confidently and effectively in mainstream classrooms. This article, part of a broader study exploring the mediating role of pre-service teachers' beliefs about inclusive education in the relationship between an inclusive education course intervention- delivered through a flipped learning approach- and teachers' self-efficacy, reports only the direct effects. The sample consisted of 240 Tamil-speaking pre-service teachers randomly selected from initial teacher education institutions across Sri Lanka. A randomized controlled trial with pre- and post-tests, employing an experimental design with a control group, was conducted. Data were collected using the culturally adapted Tamil version of the Teacher Efficacy for Inclusive Practices scale and analyzed through MANCOVA in IBM SPSS and PLS-SEM in SmartPLS4. The results revealed the differential impact of the intervention on the three domains of teacher efficacy: inclusive instruction, behaviour management, and collaboration, with the intervention significantly predicting these efficacy dimensions. These findings contribute to initial teacher education programs by providing structured, institution-level, course-based exposure to inclusive education through practical approaches, thereby better preparing pre-service teachers for inclusive classrooms.
Keywords: Inclusive education course, Inclusive practices, Pre-service teachers, Randomized controlled trial, Teacher efficacy.

INTRODUCTION
The global movement towards inclusive education (IE) has created significant challenges for pre-service teachers (PSTs), especially as increasing numbers of students with special educational needs (SEN) are integrated into mainstream classrooms. PSTs are expected to address long-standing discriminatory attitudes and exclusionary practices that continue to persist within inclusive settings (O'Neill, 2015; UNESCO, 2008). The adequate preparation of PSTs has become imperative, requiring the development of IE-related knowledge, practical skills, and positive professional dispositions, a concern that remains global in scope (UNICEF, 2013). Evidence from reviews of initial teacher education (ITE) programs across the Asia-Pacific region further indicates that many systems continue to face substantial challenges in equipping graduates with the essential competencies needed to manage learner diversity effectively (UNICEF, 2013). This gap can largely be attributed to ITE programs that have historically provided limited exposure to IE alongside university-based coursework, thereby leaving PSTs insufficiently prepared for the practical challenges of their future classrooms (Alazemi & Larkins, 2025; Avramidis et al., 2000; Carroll et al., 2003; Lancaster & Bain, 2010; Lucena-Rodríguez et al., 2025).

Like many developing countries, Sri Lanka has demonstrated strong policy commitments to IE. However, a considerable gap persists between policy mandates and actual practice in ITE. Despite significant efforts by ITE institutions to prepare PSTs to implement IE effectively, many of them report feeling overwhelmed by student diversity and concerned about meeting the varied needs of students with SEN. They attribute these concerns to ITE programs, perceiving them as overly theoretical and insufficiently connected to their future classroom requirements (Hettiarachchi & Das, 2014; Yogaranee, 2024, 2025). A recent nationwide survey by Peries et al. (2021) involving 705 primary teachers revealed that although most held positive attitudes towards inclusion, many did not feel prepared to identify and support students with dyslexia, underscoring the need to enhance ITE with more structured, practical experiences with students with SEN and IE. To this end, this study employs a randomised controlled trial (RCT) to examine how an IE course, aligned with the Sri Lanka Qualifications Framework and delivered via a flipped learning approach, can improve PSTs' confidence in applying inclusive methods, particularly in teaching, behaviour management, and collaboration.

LITERATURE REVIEW

Teachers' sense of efficacy (TSE), introduced in Bandura's (1997) social cognitive theory, refers to teachers' belief in their ability to achieve teaching goals. Bandura suggests that TSE is influenced by four primary sources of information: mastery experiences, physiological and emotional states, vicarious experiences, and verbal persuasion. ITE programs are expected to provide some or all of these experiences to help develop TSE. Bandura highlighted that mastery experiences are the most crucial; therefore, measures of self-efficacy should be sensitive to how such experiences during ITE affect PSTs' attitudes and confidence in supporting students with SEN.

Developing TSE for inclusive practices among teachers is a crucial endeavour, supported by evidence linking it to teachers' retention, students' academic adjustment, and teachers' professional fulfilment (Bandura, 1997; Zee & Koomen, 2016). TSE is also negatively associated with burnout, a state characterized by emotional exhaustion, depersonalization, and reduced personal achievement, which can cause teachers to leave the profession prematurely (Brouwers & Tomic, 2000). High-efficacious teachers tend to demonstrate greater resilience when facing classroom challenges. Conversely, those with lower TSE are more likely to adopt punitive, authoritarian classroom management strategies that limit student autonomy and engagement.

It is widely reported that the early years of pre-service training are the most effective time to influence PSTs' beliefs and confidence towards IE (Woolfolk-Hoy & Spero, 2005). Experts argue that this period is ideal for fostering positive attitudes and developing TSE through high-quality training (Lambe & Bones, 2007). To prepare PSTs as inclusive practitioners, ITE programs must equip them with sufficient inclusive knowledge and skills to challenge their assumptions about fairness and equity. Beyond just knowledge, teachers need to develop positive values, supportive ideals, and a strong sense of responsibility for educating all children, regardless of their diverse needs (Forlin, 2010). Without this foundation, teachers are unlikely to commit to inclusive classrooms fully, highlighting the importance of reforms that realign ITE with inclusive goals.

The shift towards fully inclusive school systems requires that ITE institutions revise their curricula to incorporate IE courses, either as standalone modules or embedded content, to prepare PSTs better (Forlin, 2010; Kurniawati et al., 2014). However, many curricula failed to fulfil their requirements, instead relying heavily on a single compulsory IE course, which offered limited opportunities for extended practicum experiences, electives, or in-depth study (Carroll et al., 2003). Consequently, many new teachers report feeling anxious about their ability to teach students with diverse learning needs and attribute these concerns to inadequate preparation for inclusive practice (Forlin & Chambers, 2011; Hemmings & Weaven, 2005; Lambe & Bones, 2007; Sharma & Nuttall, 2016; Yogaranee, 2024).

TSE in inclusive practices has been the central area of most international studies examining how courses on IE or special education influence PSTs' TSE. They consistently demonstrated that participation in a special or IE course positively impacts attitudes and TSE of PSTs (Casarez, 2013; Can, 2015; Forlin et al., 2014; Lancaster & Bain, 2007, 2010; Loreman et al., 2013; O'Neill, 2015; Sharma, 2012; Sharma et al., 2008; Sharma et al., 2015; Sharma & Nuttal, 2016; Sharma & Sokal, 2015; Woodcock et al., 2012; Zundans-Fraser & Lancaster, 2012).

Lancaster and Bain's (2007) study examined the effectiveness of three different design conditions: two involved direct experience with students with SEN, and one followed a university 'subject-only' approach. Significant improvements in TSE were seen across all groups, with no notable differences between the approaches. In their follow-up study in 2010, they compared two versions of a 13-week required IE course, one including a field placement and the other based on complex adaptive systems. Both formats led to significant gains in TSE among PSTs for inclusive teaching, with no differences between them. This indicates that well-structured alternative courses can be as effective as practicum-based experiences.

On the contrary, Nketsia and Saloviita (2013), who conducted a study on PSTs' views on IE in Ghana, found that although nearly all participants had been exposed to the concept of inclusion during their studies, only about one-third reported feeling highly or somewhat prepared to teach learners with diverse abilities. This finding highlights a gap between exposure to inclusion as a theoretical concept and the development of self-efficacy to implement IE.

Despite the growing emphasis on inclusion, research consistently indicates that PSTs often feel inadequately prepared to teach students with SEN, reporting low levels of TSE for inclusive practices (Forlin & Chambers, 2011). It has also been shown that ITE programs are increasingly including modules on IE, which tend to be theoretical and offer limited opportunities for practical application, thus restricting their impact on the development of TSE (Sharma et al., 2013). Furthermore, there is insufficient experimental evidence to determine whether structured IE courses can effectively enhance PSTs' TSE.

The current study identified several gaps, including conceptual, methodological, and statistical issues within the reviewed literature. Firstly, the targeted intervention of the IE course aimed at developing TSE is missing in the Sri Lankan context, particularly for Tamil-speaking PSTs. Secondly, empirical evidence does not demonstrate the inclusion of experimental interventions, especially in an RCT with a pre- and post-test controlled-group design. Thirdly, research examining the effect of the IE course on PSTs' TSE has consistently employed a pre- and post-test design, using various inferential statistics, such as paired-sample t-tests, one-way ANOVAs, one-way MANCOVAs, and repeated-measures ANOVAs, without employing structural equation modelling (SEM) techniques. Lastly, the study highlights the design of IE, which is widely emphasised in most studies, involving both faculty-led course-based exposure and a practicum that facilitates mastery of the experiences gained through the targeted intervention of the IE courses. However, some studies focus solely on the design of the intervention, using course-based exposure alone, which has been reported to be sufficient for improving TSE in inclusive practices.

This study addresses these gaps by investigating how effective the targeted experimental, course-based intervention of the IE course is in fostering TSE for inclusive practices among PSTs, evaluated across three areas: efficacy for inclusive instruction (EII), efficacy for managing behaviour (EMB), and efficacy for collaboration (EC). The following research questions were formulated: (1) Does the IE course lead to higher post-test EII scores in the experimental (EXP) group compared to the control (CON) group, after adjusting for baseline EII scores? Does the intervention also significantly predict post-test EII scores? (2) Does the IE course result in higher post-test EMB scores in the EXP group compared to the CON group, after adjusting for baseline EMB scores? Does the intervention also significantly predict post-test EMB scores? (3) Does the IE course generate higher post-test EC scores in the EXP group compared to the CON group, after adjusting for baseline EC scores? Does the intervention also significantly predict post-test EC scores? It was hypothesised that the IE course intervention would significantly predict improvements in PSTs' overall TSE for inclusive practices, such as EII, EMB, and EC, with the EXP group showing higher post-test mean scores than the CON group for the total Teacher Efficacy for Inclusive Practices (TEIP) scale and its three dimensions—EII, EMB, and EC—after adjusting for the corresponding pre-test scores.

The findings of this study are important in showing how targeted interventions in the IE course, especially in their design and delivery, can improve PSTs' TSE for inclusive practices. Although the IE course is an institutional-level, course-based programme, implementing it in simulated environments without enough real classroom experience notably helped boost teaching confidence, including instructional techniques, behaviour management, and collaboration among PSTs. The implication is that mastery experiences, a key source of efficacy information, can be recreated through well-structured microteaching and other simulated activities; when the course is delivered effectively, these simulated mastery experiences can enhance PSTs' TSE (Bandura, 1997; Pendergast et al., 2011). These findings show the potential of carefully designed, simulation-based IE coursework to serve as an effective alternative to direct classroom experience in preparing PSTs for inclusive teaching.

METHODS

Research Design

This longitudinal study, part of a broader project examining the mediating role of PSTs' beliefs about IE in the relationship between the IE course intervention, delivered through a flipped learning approach, and TSE, specifically investigated the direct effect of the course intervention on TSE. An RCT design with a pre- and post-test control group was selected, following the Consolidated Standards of Reporting Trials (CONSORT) 2010 guidelines (Moher et al., 2010). The RCT is considered the most rigorous method for evaluating causal effects of educational interventions, with the EXP versus CON group serving as a categorical independent variable and the TSE as the outcome variable (Moher et al., 2010; Schulz & Grimes, 2002).

Participants

The target population includes all Tamil-speaking PSTs enrolled at ITE institutions across Sri Lanka. Three institutions were randomly chosen to create a sampling frame of cohorts from the 2023/25 batches. A total of 240 teacher candidates were randomly selected from this frame as the sample. Although the relatively small proportion of male participants (24%) in the sample might raise concerns about bias, this distribution reflects the national teacher population, in which females are predominant.

Measures

Data were gathered using the Tamil version of the adapted 18-item TEIP scale (TEIP-TM), with permission from the first author (Sharma et al., 2012). The original TEIP scale assesses TSE across three domains: EII, EMB, and EC, each comprising six items, rated on a 6-point Likert-type scale, from "Strongly Disagree" to "Strongly Agree",

with total scores ranging from 18 to 108, where higher scores indicate greater efficacy. Although the TEIP scale developers reported satisfactory internal consistency for the three subscales and the total scale, with Cronbach's alpha values of .93 for EII, .85 for EC, .85 for EMB, and .89 for the overall scale, they did not include comprehensive analyses for factorial structure and construct validation. Therefore, although the 18-item TEIP demonstrates acceptable reliability, further validation is required to establish its measurement properties fully. Nonetheless, the extensive international use of the TEIP scale to assess perceived TSE for teaching in inclusive classrooms supports its relevance and practical utility, rendering it a suitable and well-established instrument for evaluating PSTs' TSE in this study.

The cross-cultural adaptation and validation of the 18-item TEIP-TM scale were undertaken using EFA in IBM SPSS (version 25) and CFA in IBM AMOS (version 23), following established guidelines by Beaton et al. (2000) and the International Test Commission (2016) to assess TSE for inclusive practices among Tamil-speaking PSTs (Sakthivel, in press). EFA, employing principal axis factoring and Direct Oblimin rotation, yielded a three-factor structure for both pre- and post-test scores, aligning with the theoretical factor structure and demonstrating that participants distinctly differentiated among the latent factors of the TEIP-TM: EII, EMB, and EC.

EFA revealed a three-factor structure of the TEIP-TM scale, consistent with the theory, with initial eigenvalues of 7.713 for EII, 2.046 for EMB, and 1.439 for EC. Parallel analysis further supported this three-factor solution. All items on the TEIP-TM scale loaded adequately onto their respective latent constructs, with loadings ranging from .646 to .742 for EII_POST, from .600 to .801 for EMB_POST, and from .592 to .794 for EC_POST, most exceeding the .70 threshold (Hair et al., 2019). Although a few items performed poorly in EFA (EII1_POST, EII3_POST, EMB1_POST, EMB2_POST, and EC1_POST), they were retained for the validation process. EII explained 40.40%, EMB 9.03%, and EC 5.41% of the variance, accounting for 54.84% in total, with EII as the dominant factor. Inter-factor correlations ranged from .454 to .617, indicating related but distinct factors and supporting the use of oblique rotation. All correlations were below .70, indicating no multicollinearity (Field, 2018).

Notably, the previous study adapted the factor structure of the TEIP-TM by including an item from EMB_POST (EMB1 - "I have confidence in my ability to avoid disruptive behaviour in the classroom.") in the EII, due to its cross-loading, while maintaining its dimensionality. This adaptation is both statistically and theoretically justified, as statistically, the primary loading value exceeds the secondary loading by more than 2.0. Theoretically, EMB1_POST is more relevant to include in the EII, as it reflects a preventive management strategy whose function differs from a punishment-oriented, response-based behaviour management strategy. It can be explained that PSTs may have perceived preventive management behaviour as part of inclusive instructional practices rather than as reactive (Sakthivel, 2025; Yogaranee, 2025).

The factorial validity of the three-factor TEIP-TM scale was confirmed using the 7-item EII_POST (including EMB1_POST), the 5-item EMB_POST, and the 6-item EC_POST, performed in IBM AMOS. The model fit indices, including CMIN/df, CFI, TLI, RMSEA, and SRMR, indicated excellent fit to the data. The standardized lambda values were significant, ranging from .615 to .806 for EII_POST, from .629 to .791 for EMB_POST, and from .603 to .793 for EC_POST.

Composite reliability (CR) indices of .877 for EII_POST, .859 for EMB_POST, and .886 for EC_POST all exceeded the recommended threshold of ≥ .70 (Hair et al., 2019; Fornell & Larcker, 1981). Cronbach's alpha values were .880 for EII_POST, .857 for EMB_POST, .884 for EC_POST, and .920 for the total scale, exceeding the ≥ .70 thresholds, indicating strong internal consistency of the scale and subscales (Nunnally & Bernstein, 1994; Hair et al., 2019; Sharma et al., 2012). The average variance extracted (AVE) values, which reflect convergent validity, were .515 for EII_POST, .551 for EMB_POST, and .564 for EC_POST, all exceeding the ≥ .50 threshold, suggesting that each construct explained more than 50% of the variance in its indicators. Furthermore, discriminant validity was confirmed through the heterotrait-monotrait (HTMT) ratio and the Fornell–Larcker (F-L) criterion in the previous study (Fornell & Larcker, 1981; Sakthivel, in press).

As all the factors and the scale met the validity and reliability criteria, it was decided to retain the items with low loadings extracted from the EFA and the adapted factor structure. Overall, previous international studies have consistently confirmed the dimensionality and psychometric soundness of the 18-item TEIP scale. The culturally adapted validation results further aligned with this evidence, supporting the TEIP-TM scale's suitability for assessing TSE for inclusive practices among Tamil-speaking PSTs in Sri Lankan ITE contexts (Sakthivel, in press).

Procedure

Participants were randomly assigned to either the EXP group (N = 120), which received the intervention, or the CON group (N = 120), which followed the standard teacher education courses. Random assignment ensured comparability between groups and minimized selection bias (Torgerson & Torgerson, 2008). Both the EXP and CON groups completed the cross-culturally translated and adapted TEIP-TM scale before (pre-test) and after the intervention (post-test). This design enabled the assessment of both within-group changes over time and between-group differences at post-test, while adjusting for initial TSE levels.

Randomization, allocation concealment, and attrition management

A random sequence was generated for 240 participants, who were randomly assigned to the EXP and CON groups using a computer-generated random number sequence in IBM SPSS (Version 25). A simple randomization method was applied to ensure an equal probability of assignment. The randomization list was prepared by an independent researcher not involved in participant recruitment or data collection. Allocation concealment was maintained through sealed, opaque, and sequentially numbered envelopes prepared by a research assistant not involved in the intervention or data analysis. The envelopes were opened only after participants consented, preventing selection bias.

To minimize contamination between the EXP and CON groups, participants were drawn from different institutions and received instruction through separate online sessions conducted on different days. Communication about course materials and activities was restricted via clear instructions and monitoring of online platforms. The intention-to-treat (ITT) principle, which emphasizes that all participants are analyzed in their initially assigned groups regardless of intervention completion, adherence, or dropout, was not applicable, as all participants completed both pre- and post-tests. Although some participants missed online sessions, make-up sessions were held in person to ensure full delivery of the intervention. Consequently, all participants were included in the analysis, and no attrition or missing data necessitated the use of ITT analysis.

The EXP group took part in a structured 30-hour, 2-credit IE course designed for this study to improve their knowledge, skills, and beliefs about inclusive practices. The course content covers the foundational ideas of IE, basic identification of children with SEN by their specific traits, how they are supported in classrooms to meet their diverse needs, IE policies and laws enacted internationally and locally, inclusive teaching methods, classroom management strategies with proactive and reactive approaches, formative and informal assessment techniques with the development of rubrics, and collaboration skills for supporting students with SEN. The course content was reviewed by IE experts using a 4-point Likert-type rating scale to assess its relevance, clarity, and comprehensiveness, thereby ensuring content validity.

Conducted by the chief investigator in a hybrid format combining in-person and Zoom sessions, the course employed a flipped learning approach. Designed in accordance with the Sri Lanka Qualifications Framework, this course can be incorporated as a standalone component into ITE programs, subject to approval from the relevant authorities. Since the practicum was institutionally determined, the intervention was limited to coursework and workshops.

The instructional intervention was carried out using a flipped learning approach in three stages. Zoom-recorded video lessons and related open-ended questions were shared before class to encourage independent exploration. Participants attended synchronous sessions, prepared to discuss and apply concepts through interactive activities such as group work, role-playing, presentations, debates, and quizzes. In-class practice focused on microteaching and simulated classroom tasks that developed key skills, like the use of teaching aids, reinforcement, classroom and behaviour management, formative assessment, stimulus variation, and questioning, which were deemed crucial for meeting the diverse needs of learners. Each session included structured peer and instructor feedback to enhance instructional competence. Simulated classroom sessions were organized in small groups to provide practical experience in applying the competencies gained through microteaching, including lesson planning, preparing teaching aids, designing behaviour and classroom management strategies, and developing formative and summative assessment methods.

Fidelity checks were carried out using a checklist, online feedback from sessions, and session observations. Specifically, participants' pre-class engagement was indirectly assessed through their written reflections and their ability to respond to guiding questions during subsequent in-class discussions. Additionally, participants' reflective learning logs and Know–Want to Know–Learned (KWL) charts, completed after each lesson, were reviewed with feedback to track their engagement with pre-class learning.

Data analysis

The hypotheses were tested using IBM SPSS (version 25) and SmartPLS 4. Descriptive statistics (means, standard deviations, and internal consistencies) were calculated for all study variables. To assess baseline equivalence, pre-test scores were compared between the EXP and CON groups across all outcome variables (EII, EMB, EC, and TEIP), as well as between the online and onsite delivery groups, to verify that the groups were comparable before the intervention. Paired-samples t-tests were used to examine within-group changes from pre- to post-tests for the EXP and CON groups across all outcome variables. Post-test scores were then compared between the EXP and CON groups and between the online and onsite groups to determine whether the intervention produced significant improvements and whether delivery mode influenced outcomes.

To test the study hypotheses, two complementary analytical procedures were employed. First, a one-way MANCOVA in IBM SPSS was performed to examine whether TEIP post-test subscale scores differed between the EXP and CON groups, controlling for baseline scores. Although independent-samples *t*-tests showed no significant pre-test differences between the groups, preliminary analyses indicated that the pre-test scores of EII, EMB, and EC significantly predicted their respective post-test scores. As a result, MANCOVA was used with each post-test score as the dependent variable, group (EXP vs. CON) as the independent variable, and the relevant pre-test scores as covariates to obtain adjusted post-test means. This study favoured MANCOVA over repeated-measures ANOVA because it accounts for baseline differences, reduces error variance, and provides a more accurate and less biased estimate of the intervention effect (Field, 2018; Dimitrov & Rumrill, 2003).

Additionally, PLS-SEM was conducted in SmartPLS4 to estimate the predictive relationships between the intervention and post-test outcomes, while accounting for pre-test scores as covariates. PLS-SEM extended the analysis by validating the measurement model (outer model) of the TEIP and by assessing standardized path coefficients, effect sizes, and explained variance (R^2) in the structural model (inner model). Together, these procedures allowed the hypotheses to be tested both at the classical group-level and within a predictive modelling framework.

RESULTS

Descriptive Statistics for Outcomes Before and After the Intervention

Table 1 presents the mean scores, standard deviations, and post-intervention gains in the mean scores for the pre- and post-test data, grouped by the EXP and CON conditions, for the overall TEIP construct and its dimensions, EII, EMB, and EC. The EXP group showed significant improvements across all outcomes after the intervention, with gains of 1.92 for EII, 1.18 for EMB, 1.31 for EC, and 1.52 for the total TEIP. The CON group showed only minor changes, with gains of .53 for EII, .17 for EMB, .08 for EC, and .29 for the TEIP. Overall, the descriptive statistics indicate that gains in the EXP group were consistently larger and accompanied by moderate variability, as reflected in the standard deviations. In contrast, the CON group showed minimal changes and greater variability. This pattern indicates that the intervention had a pronounced and relatively consistent impact on participants in the EXP group, while the CON group remained considerably stable.

Table 1. *Mean Scores and Standard Deviations for Pre- and Post-Tests by Group*

Outcome	Group	N	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Difference
EII	EXP	120	3.31(.307)	5.23(.296)	+1.92
	CON	120	3.32(.335)	3.85(.398)	+0.53
EMB	EXP	120	3.20(.405)	4.38(.791)	+1.18
	CON	120	3.24(.315)	3.41(.317)	+0.17
EC	EXP	120	3.07(.450)	4.38(.739)	+1.31
	CON	120	3.07(.449)	3.15(.491)	+0.08
TEIP	EXP	120	3.20(.217)	4.72(.330)	+1.52
	CON	120	3.21(.262)	3.50(.256)	+0.29

Baseline Equivalence Checks Between Groups

EXP versus CON Groups

To ensure comparability between the EXP and CON groups before the intervention, independent-samples *t*-tests were conducted on pre-test scores for EII, EMB, EC, and TEIP. Establishing baseline equivalence is essential in experimental designs, as significant pre-intervention differences can confound treatment effects and threaten internal validity (Field, 2018; Tabachnick & Fidell, 2019). By confirming that there are no significant baseline differences, post-test results can be interpreted with greater confidence (Pallant, 2020). The results indicated that the groups were equivalent at pre-test: EII, $t(238) = –0.40$, $p = .688$; EMB, $t(224.30) = –0.82$, $p = .414$; EC, $t(238) = 0.05$, $p = .962$; and total TEIP, $t(229.98) = –0.36$, $p = .721$. In all cases, the mean differences were minimal, and

the 95% confidence intervals included zero, indicating no statistically significant differences between groups at baseline. In addition to randomization, these results support that the groups were equivalent before the intervention.

Online versus Onsite Groups

To assess baseline equivalence between the online (N = 48) and onsite (N = 72) groups, an independent-samples *t*-test was conducted to compare pre-test scores for EII, EMB, EC, and TEIP separately. The results indicated no significant differences for total TEIP_PRE ($t_{(118)} = –.856$, $p = .394$), EII_PRE ($t_{(118)} = .190$, $p = .850$), or EMB_PRE ($t_{(118)} = 1.347$, $p = .181$). However, for EC, the analysis revealed a significant difference between online ($M = 2.97$, $SD = .435$) and onsite ($M = 3.14$, $SD = .450$) modes of delivery ($t_{(118)} = −2.127$, $p = .036$), indicating that the onsite group reported slightly higher levels of EC prior to the intervention. However, the magnitude of this difference was small, and subsequent PLS-SEM analyses accounted for baseline EC differences, reducing the likelihood that this imbalance unduly influenced the intervention effects. Nevertheless, this factor should be considered when interpreting the findings.

Post-Intervention Checks Between Groups

Online versus Onsite Groups

To ensure that any observed effects could be attributed to the intervention rather than the delivery mode, an independent-samples *t*-test was conducted to compare post-test TEIP scores across its three dimensions and the overall TEIP between the online (N = 48) and onsite (N = 72) groups. With a statistically significant Levene's test, which indicated that equal variances between the online and onsite delivery groups for EII post-test scores were not assumed, $F_{(1,238)} = 13.338$, $p < .001$, the *t*-test results showed a non-significant difference between the groups, $t_{(73.43)} = −0.645$, $p = .521$, indicating that delivery mode did not influence EII outcomes.

Assumption of equal variances was satisfied for EMB post-test scores, $F_{(1,238)} = 1.149$, $p = .286$, as shown by the independent-samples t-test, which indicated no significant difference between the online and onsite delivery groups, $t_{(118)} = 1.738$, $p = .085$, suggesting that the mode of delivery did not significantly influence EMB outcomes. Similarly, the F statistic for EC post-test scores confirmed that the assumption of equal variances was met, $F_{(1, 238)} = 1.071$, $p = .303$.

The independent-samples t-test results showed no significant difference between the online and onsite delivery groups, $t_{(118)} = −0.608$, $p = .544$, indicating that delivery mode did not significantly affect EC outcomes. Levene's test supported the assumption of equal variances for TEIP post-test scores, $F_{(1, 238)} = 0.239$, $p = .626$, with an independent-samples t-test, which showed no significant difference between the online and onsite delivery groups, $t_{(118)} = 0.388$, $p = .699$, suggesting that delivery mode did not influence TEIP outcomes.

Overall, the delivery mode did not influence post-test outcomes, suggesting that participants' performance was consistent regardless of whether the IE course was delivered online or onsite. Therefore, for SEM, it is reasonable and statistically justified to collapse the delivery modes and analyze the intervention group as a whole, simplifying the model and focusing on the effect of the IE course itself.

EXP versus CON Groups

Post-intervention gains in the outcome variables within the EXP group were analyzed separately using paired-samples t-tests. The results revealed significant improvements: EII increased by 1.53 points, $t_{(119)} = 42.556$, $p < .001$; EMB increased by 1.06 points, $t_{(119)} = 21.273$, $p < .001$; EC increased by 1.17 points, $t_{(119)} = 35.896$, $p < .001$; and overall TEIP advanced by 1.27 points, $t_{(119)} = 53.591$, $p < .001$. These findings demonstrate that the intervention effectively improved participants' skills and perceptions.

In comparison, the CON group showed negligible and statistically significant gains in the mean scores with EII increased by 0.37 points, $t_{(119)} = 10.963$, $p < .001$; EMB by 0.17 points, $t_{(119)} = 6.121$, $p < .001$; EC by 0.09 points, $t_{(119)} = 3.465$, $p = .001$; and TEIP by 0.22 points, $t_{(119)} = 11.678$, $p < .001$. These results indicate that while the CON group experienced minor improvements, the intervention produced substantially larger gains in the EXP group.

Post-test comparisons between the EXP and CON groups were conducted using independent-samples *t*-tests. Levene's tests indicated that the assumption of equal variances was violated for EII and EMB ($p < .001$) but met for TEIP and EC ($p > .05$). Therefore, Welch's *t*-test was used where necessary, indicating significant differences between the EXP and CON groups across all outcome variables: TEIP, $t_{(238)} = 30.776$, $p < .001$, mean difference = 1.04; EII, $t_{(213.30)} = 24.949$, $p < .001$, mean difference = 1.14; EMB, $t_{(162.38)} = 13.090$, $p < .001$, mean difference

= 0.86; and EC, $t_{(238)} = 15.538$, $p < .001$, mean difference = 1.08. These results indicate that the intervention group outperformed the control group on all post-test measures.

Assumption Checks for MANCOVA

The normality of the post-test scores for all variables was evaluated using the Shapiro–Wilk and Kolmogorov–Smirnov tests, both of which were significant ($p < .05$); however, with large sample sizes (N = 120 per group), such significance is expected because these tests are highly sensitive and can detect trivial deviations from normality (Ghasemi & Zahediasl, 2012). An objective review of histograms and Q–Q plots showed that both groups had approximately normal distributions, with no extreme skewness or kurtosis. Since MANCOVA is robust to moderate breaches of normality assumptions, especially with large, balanced groups, the results support the assumption of approximate normality, allowing the analysis to proceed without data transformation or non-parametric alternatives (Tabachnick & Fidell, 2019).

The homogeneity of regression slopes was initially tested using a GLM by examining interactions between the independent variable (EXP_CONT) and each covariate (EII-pre, EMB-pre, EC-pre) for each dependent variable. The results showed that this assumption was violated for EII-post and EMB-post, with significant interactions observed (EII-post: EXP_CONT × EII-pre, $F_{(1,236)} = 17.24$, $p < .001$; EXP_CONT × EMB-pre, $F_{(1,236)} = 8.201$, $p = .005$; EMB-post: EXP_CONT × EMB-pre, $F_{(1,236)} = 8.201$, $p = .005$), while it was met for EC-post (EXP_CONT × EC-pre, $F_{(1,236)} = 3.525$, $p = .062$). Because regression slope homogeneity was not consistent across all outcomes, a standard MANCOVA could not be used. Although ANCOVA could be applied to EC-post, the analysis was transitioned to PLS-SEM to ensure methodological consistency across all variables and to account for baseline differences observed only for EC in the delivery method.

Main Effect of the IE Course Intervention on the EII, EMB, and EC

Hypotheses that the intervention would positively predict EII, EMB, and EC were tested using PLS-SEM in SmartPLS 4 with a non-parametric bootstrapping procedure (10,000 resamples) and two-tailed t-tests, generating robust standard errors and confidence intervals for the path coefficients. The PLS-SEM analysis allows for the simultaneous modelling of multiple dependent variables, covariates, and their interactions without assuming slope homogeneity. This offers a robust framework for examining the direct effects of the IE course on EII, EMB, EC, and the overall TEIP, using two structural models—one with covariates and one without—where the intervention (EXP = 0, CON = 1) is the independent variable and post-test scores are outcomes, controlling for pre-test scores for each construct.

An initial PLS-SEM analysis was performed by excluding pre-test scores as covariates to assess the direct, unadjusted effect of the intervention on post-test outcomes, establishing a baseline estimate before considering potential confounders. The path model and coefficients are illustrated in Figure 1. Results showed that the intervention significantly improved all three dimensions of self-efficacy. With the EXP group coded as '0' and the CON group as '1', negative coefficients indicate better performance by the EXP group: EII, $B = –1.713$, $t = 64.490$, $p < .001$, 95% CI [–1.757, –1.649]; EMB, $B = –1.296$, $t = 18.295$, $p < .001$, 95% CI [–1.425, –1.147]; EC, $B = –1.423$, $t = 19.818$, $p < .001$, 95% CI [–1.550, –1.264]. These findings confirm that the IE course statistically and significantly predicted PST's TSE across its three dimensions: EII, EMB and EC.

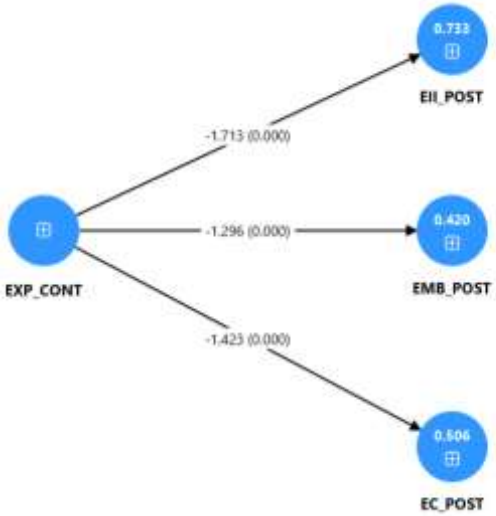

Figure 1. *The Path Model Excluding the Pre-Test Scores as Covariates*

Including pre-test scores as covariates in the PLS-SEM model showed (Figure 2) that the intervention had a significant positive effect on all TEIP dimensions, estimating the net impact adjusted for initial differences. With the EXP group coded as '0' and the CON group as '1', negative unstandardized coefficients indicate higher post-test scores for the EXP group: EII (B = –1.676, t = 41.138, p < .001, 95% CI [–1.779, –1.607]), EMB (B = –1.333, t = 20.204, p < .001, 95% CI [–1.468, –1.206]), and EC (B = –1.416, t = 24.286, p < .001, 95% CI [–1.530, –1.301). Presenting both adjusted and unadjusted results enhances transparency and interpretation of the intervention's effect.

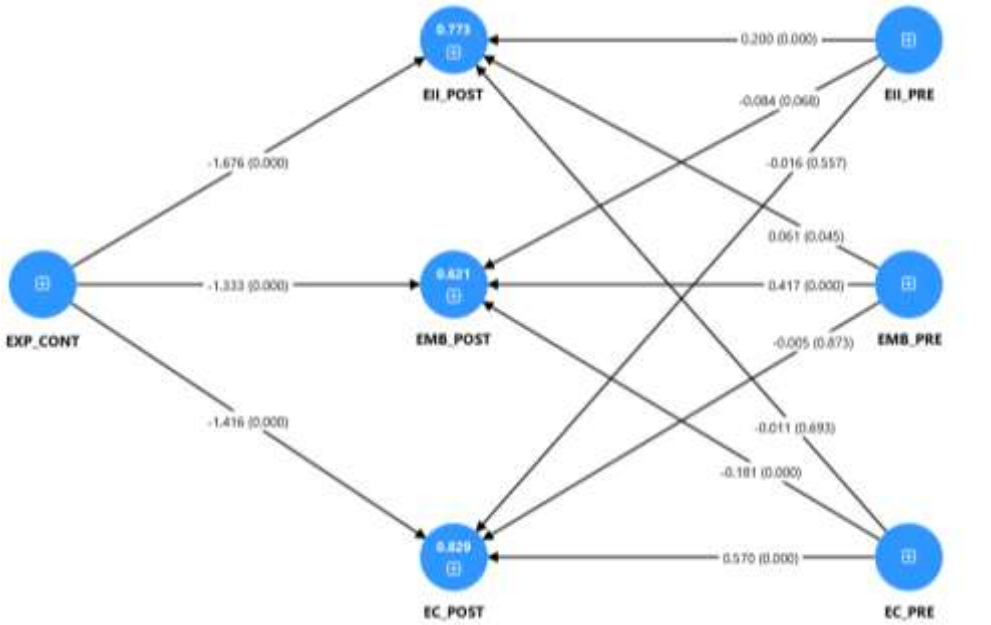

Figure 2. *The Path Model with the Pre-Test Scores Functioned as Covariates*

Furthermore, the unstandardized path coefficients indicated that pre-test scores significantly predicted their respective post-test scores, demonstrating baseline stability of each construct (Table 2). Specifically, EII-pre positively and significantly predicted EII-post (B = 0.200, t = 4.673, p < .001, 95% CI [0.099, 0.263]), EMB-pre positively and significantly predicted EMB-post (B = 0.417, t = 8.606, p < .001, 95% CI [0.314, 0.504]), and EC-pre positively and significantly predicted EC-post (B = 0.570, t = 12.295, p < .001, 95% CI [0.476, 0.657]). These findings demonstrate that higher baseline levels of each construct were linked to higher post-test scores for the same construct, after controlling for the intervention.

Table 2. *Path Coefficients, Significance, and 95% BCa Confidence Intervals for the Effects of the IE Course and Pre-Test Scores on Post-Test Self-Efficacy Outcomes*

Path	*B*(O)	*M*	*SD*	*t*	*p*	95%CI(BCa)
Intervention Effect						
GROUP → EII_POST	–1.676	-1.673	0.041	41.14	.000	-1.779, -1.607
GROUP → EMB_POST	–1.333	-1.333	0.066	20.20	.000	-1.468, -1.206
GROUP → EC_POST	–1.416	-1.418	0.058	24.29	.000	-1.530, -1.301
Covariate Effects of Their Own Post-Test Scores						
EII_PRE → EII_POST	0.200	0.196	0.043	4.67	.000	0.099, 0.263
EMB_PRE → EMB_POST	0.417	0.416	0.048	8.61	.000	0.314, 0.504
EC_PRE → EC_POST	0.570	0.570	0.046	12.30	.000	0.476, 0.657
Cross-Construct Pre-Test Effects						
EC_PRE → EII_POST	–0.011	-0.012	0.029	0.39	.693	-0.070, 0.045
EC_PRE → EMB_POST	–0.181	-0.180	0.033	5.57	.000	-0.247,-0.120
EII_PRE → EC_POST	–0.016	-0.015	0.027	0.59	.557	-0.070, 0.037
EII_PRE → EMB_POST	–0.084	-0.080	0.046	1.83	.068	-0.169, 0.010
EMB_PRE → EC_POST	–0.005	-0.004	0.032	0.16	.873	-0.068, 0.056
EMB_PRE → EII_POST	0.061	0.059	0.030	2.01	.045	0.003, 0.122

Some cross-construct effects of pre-test scores were also observed: EC-pre negatively predicted EMB-post (B = –0.181, t = 5.57, p < .001, 95% CI [–0.247, –0.120]), and EMB-pre positively predicted EII-post (B = 0.061, t =

2.01, p = .045, 95% CI [0.003, 0.122]), suggesting that pre-existing levels of one construct had a small but significant influence on changes in another construct. Other cross-construct effects of pre-test scores (e.g., EC-pre → EII-post, EII-pre → EC-post) were not significant, indicating limited spill-over effects. Overall, these findings confirm that the intervention, combined with the IE course, significantly improved PSTs' TSE in inclusive instruction, behaviour management, and collaboration, even after controlling for baseline scores.

When comparing the effects of the IE course on post-test outcomes with and without controlling for pre-test scores, it is clear that the intervention significantly improved all three dimensions of TSE in both analyses. Without covariates, the effects were slightly stronger. After including pre-test scores as covariates, the effects remained significant but were slightly smaller. This comparison indicates that part of the intervention's effect overlaps with baseline differences in TSE. However, the IE course still shows a significant impact, even after accounting for baseline influences. The slight decrease in effect sizes after covariate adjustment suggests that pre-test scores account for only a small part of the post-test variance. Nonetheless, the intervention itself remains the primary factor affecting post-test TSE.

DISCUSSION

As part of a larger project examining the mediating role of PSTs' beliefs about IE in the relationship between completing a structured IE course delivered through a flipped learning approach and the TEIP dimensions (EII, EMB, and EC), this article focuses solely on the intervention's direct impact. The hypotheses that the intervention would demonstrate predictive effects on the mean post-test gain scores for EII, EMB, EC, and TEIP, adjusted for pre-test differences, were supported, specifically, with the EII dimension demonstrating the highest unstandardized path coefficients and being most strongly influenced by the intervention.

These findings align with Bandura's (1977, 1997) sources of efficacy principle, where the mastery experiences, gained through multiple microteaching experiences, and practicing inclusive lesson plans, vicarious experiences, gained through observing their peers successfully performing teaching in simulated classrooms and obtaining 360-degree constructive feedback from their co-participants and the instructor, together contributed to the development of TSE. Previous empirical findings further support the findings. For example, Lancaster and Bain (2007) found that PSTs' TSE improved after an IE course regardless of the type of experience. However, Can (2015) emphasized that both school-based experiences and faculty-led courses are key components in enhancing TSE.

Notably, in the present study, significant gains were observed in EII, EMB, and EC, despite the intervention being delivered entirely through coursework, including simulated teaching and microteaching, without a practicum component. This diverges from Bandura's emphasis on mastery experiences as the primary source of efficacy, yet aligns with Lancaster and Bain, suggesting that well-designed simulated coursework can effectively enhance PSTs' confidence in inclusive instruction.

Nevertheless, there are contradicting outcomes regarding the impact of the IE course on TSE. Tait and Purdie (2000) found that a 12-month teacher training course did not change PSTs' views on disabilities and inclusion. Stella et al. (2007) reported that even after completing a brief instructional module on inclusive philosophy and practices, participants' attitudes toward inclusion changed very little. Importantly, Nagata (2005) argues that a single subject on inclusion cannot adequately prepare new teachers to handle the many tasks involved in inclusive practice or meet the demands of an inclusive classroom.

These different patterns of outcomes suggest that the effectiveness of IE courses heavily depends on their design and the practical experiences they provide. For many authors, brief modules or single-subject courses may be insufficient to bring about meaningful changes in PSTs' TSE or attitudes towards inclusion (Nagata, 2005; Stella et al., 2007; Tait & Purdie, 2000). Conversely, a well-structured coursework with simulated and microteaching, along with guided reflection, as implemented in the present study, can substantially boost confidence in PSTs' abilities in inclusive practices, even without a field-based practicum (Mergler & Tangen, 2010). This emphasizes that meaningful, practice-oriented experiences, rather than mere content exposure, are essential for developing practical, inclusive teaching skills.

The study also found that the intervention with the IE course was a significant predictor of each TEIP factor. The most notable improvements were in the EII, while the smallest were in the EMB, indicating that the course effectively increased participants' confidence in using inclusive instruction. This varied impact of the intervention suggests that PSTs showed greater confidence in their abilities in inclusive instructional planning and design, including the implementation of Universal Design for Learning, differentiated instruction, and backward design. Additionally, their confidence in applying inclusive practices, such as providing accommodations and making curriculum modifications, also appeared to be enhanced after the intervention. Notably, these improvements were

evident following the course-based learning experience delivered through simulated environments, despite participants not having direct teaching experience in actual inclusive classrooms.

This finding aligns with previous research, suggesting that structured IE training tends to have a greater influence on instructional efficacy than on other domains (Forlin et al., 2014). Gains in EMB and EC were more modest (+1.18 and +1.31, respectively), though still exceeding those of the CON group (+0.17 and +0.08). These comparatively lower gains reflect the greater complexity involved in developing behavioural management and collaborative competencies, which often require extended practice and systemic support. Overall, the pattern suggests that short-term interventions are more effective in strengthening instructional efficacy than in fostering behavioural or collaborative capacities, aligning with international evidence on the domain-specific development of TSE (Loreman et al., 2013).

The findings further extended Bandura's (1997) self-efficacy framework by illustrating how course delivery methods, such as a flipped learning approach, combined with simulation, can operationalize the sources of efficacy information. Simulated environments created quasi-mastery experiences by enabling participants to practice inclusive teaching in realistic yet low-risk contexts. Peer modelling provided vicarious experiences, while feedback from peers, the instructor and reflection functioned as verbal persuasion, reinforcing participants' confidence. Together, these elements offer a contemporary model for developing TSE to support inclusive practices through experiential, learner-centered pedagogy.

Although the control group showed small but statistically significant increases from pre- to post-test, this pattern is expected in educational studies. Participants, in general, gain confidence as they progress through their regular coursework, become more familiar with teaching concepts, or become used to the measurement tool. Such maturational or testing effects can produce moderate improvements even in the absence of a targeted intervention. Importantly, these gains were comparatively negligible compared to those observed in the intervention group, indicating that the substantial increases in TSE were driven by the IE course intervention rather than general program exposure.

SmartPLS reports unstandardized path coefficients in the structural model, which explains the large numerical values observed in this study. These coefficients depend on the original metric and the variance of each latent variable. Therefore, constructs with minor variances will naturally produce larger unstandardized coefficients. SmartPLS does not automatically generate standardized coefficients *(β)* in the structural model output; instead, standardization is typically reflected only in measurement model loadings. Therefore, the large unstandardized values should not be interpreted as powerful effects. Standardized coefficients—when computed—would provide a more comparable indication of effect size across constructs.

The current findings have several implications. First, the course design and delivery, including the use of flipped learning and a learner-centered approach, provide empirical evidence of a practical method for enhancing PSTs' confidence in implementing inclusive practices. In curricular reforms, such findings suggest that structured IE courses with such delivery approaches can be feasibly integrated into ITE programs without overloading schedules, providing PSTs with both theoretical knowledge and practical skills to support diverse learners effectively. Second, from the policy perspective, the study supports the intensive implementation of flipped learning-oriented IE courses, highlighting the need for faculty training and resources to implement these pedagogies, thereby contributing to more inclusive teaching practices nationwide. Finally, the results encourage future research on mediating factors, such as PST beliefs and long-term retention of TSE, and comparisons with traditional lecture-based IE courses to optimize teacher preparation for inclusive classrooms further.

LIMITATIONS AND RECOMMENDATIONS

The interpretation of the findings of this study should be approached with caution in light of the following limitations. Its findings may have limited generalizability to the broader population of PSTs in Sri Lanka, as it employed only Tamil-speaking PSTs. The short duration of the flipped learning course may not have allowed enough time for lasting changes in TSE to develop. Additionally, reliance on self-reported quantitative measures may have introduced social desirability and response biases, and novelty effects linked to the instructional approach may have temporarily elevated confidence. Most importantly, participants' inconsistent attendance and engagement during online sessions may have limited the extent to which they benefited fully from the intervention.

Despite random assignment, other extraneous variables, such as prior exposure to IE concepts, children with SEN or institutional learning culture, could have influenced participants' TSE development. Diffusion of treatment across institutions may also have reduced group distinctions. These factors call for a cautious interpretation of the findings and highlight the need for more robust research designs in future studies. In addition, the lack of delayed

post-tests restricts conclusions about the sustainability of the outcomes, as the post-test was conducted immediately after the intervention. Consequently, it remains unclear whether the observed increases in TSE were maintained over time.

Although the IE course demonstrated a significant positive impact on TSE for inclusive practices within a longitudinal design, several methodological refinements are recommended for future research. First, future studies could employ multilevel modelling to account for clustering within ITE institutions. This effort would enable more precise estimates of the intervention effects at both the individual and institutional levels. Second, adopting longitudinal designs with delayed post-tests would help determine whether gains in TSE are sustained during practicum or early teaching. Third, it is recommended to adopt qualitative research approaches, including phenomenological interviews, focus group discussions, classroom observations, or behavioural assessments, as complementary measures of self-report, to rule out the effects of social desirability and response bias on the outcomes, thereby triangulating and strengthening the validity of the findings.

CONCLUSIONS

The study found that the IE course intervention significantly enhanced PSTs' TSE in inclusive instructional practices, behaviour management, and collaboration, with the most potent effect on instructional practices. The structured, theory-based, modular IE course, delivered through a flipped learning approach without a practicum, directly improved TSE. Using an experimental pre- and post-test control-group design ensured a rigorous comparison, confirming the intervention as a significant predictor of TSE gains across all teacher efficacy dimensions.

Author Contributions

The principal author, Y.S., is responsible for all aspects of the study, including the development of the IE course, conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, drafting and revising the manuscript, visualization, and project administration, with the co-author, K. A. C., providing supervision.

Declarations

Competing interests

The authors declare that they have no competing interests.

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