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Chief Editor's Note

The International Journal of Emerging Perspectives in Education (IJEPED) remains committed to publishing high-quality research that advances educational theory, policy, and practice. As a scholarly publication of the **Islamic University of Maldives**, the journal continues to provide a platform for researchers, educators, and practitioners to share innovative and evidence-based contributions to the field of education.

We are pleased to present **Volume 2, Issue 2**, featuring five research articles that address important issues in educational assessment, teaching and learning, school readiness, and child-centered pedagogies. The studies examine the quality of multiple-choice assessments in Bhutan, the integration of design thinking and experiential learning in teaching, the impact of problem-based learning on students' cognitive engagement and achievement in biology, school readiness in Sri Lanka, and the implementation of child-to-child pedagogies in Maldivian preschools. Together, these articles contribute valuable insights for improving educational practice and learner outcomes.

Maintaining academic excellence remains central to IJEPED's mission. All submissions undergo a rigorous peer-review process to ensure the quality, originality, and relevance of the research published.

On behalf of the Editorial Board, I extend my sincere appreciation to the authors, reviewers, advisory board members, and editorial team for their invaluable contributions. Special thanks are due to **Dr. Aminath Shafiya**, Dean of the **Centre for Research and Publications (CRP)**; the CRP team; the Marketing Department; and all supporting departments of the **Islamic University of Maldives** for their dedication and support throughout the publication process.

We thank our readers for their continued interest in IJEPED and look forward to receiving future submissions that will further enrich educational scholarship and practice.

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Evaluating the Quality of Multiple-Choice Assessment: Evidence from Bhutan

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ABSTRACT

The study explored the quality of multiple-choice items used in written tests in the Postgraduate Diploma Programme at Samtse College of Education, Royal University of Bhutan. Although multiple-choice items are widely used in the programme, their quality and tutors' understanding of effective item construction have not been systematically examined. This gap is important because poorly constructed items may affect the accuracy, fairness, and effectiveness of assessment. Using a convergent parallel mixed-methods design, quantitative data were obtained through item analysis of MCIs using difficulty and discrimination indices, while qualitative data were collected through semi-structured interviews and document analysis and analysed thematically. The findings showed that participants demonstrated limited understanding of effective multiple-choice item construction. The items also showed low discrimination and limited adherence to prescribed construction principles. The study recommends targeted training to strengthen tutors' knowledge and skills in writing effective multiple-choice items. The study contributes to assessment literature by linking multiple-choice item quality and educators' item-writing knowledge to professional development.

Keywords: assessment, multiple-choice items, semi-structured interview, document analysis

INTRODUCTION

Multiple-choice items (MCIs) are used in the Postgraduate Diploma in Education (PgDE) programme at Samtse College of Education (SCE), Royal University of Bhutan (RUB). A review of question papers from the previous two semesters showed that twelve modules included MCIs, with weightings ranging from 10% to 20% of overall assessment. MCIs consist of a stem and a set of options from which students select the best or correct answer (Torres et al., 2011). They are attractive to instructors because they can be graded quickly and can cover a broad range of course content. When well-constructed, they can also produce scores as reliable as those from constructed-response tests (Bacon, 2003). However, the quality MCIs used in the PgDE semester examinations has not been systematically evaluated.

Previous research has examined MCI quality in relation to item construction, difficulty, discrimination, distractor functioning, and adherence to established item-writing principles. These studies indicate that poorly constructed items can affect the validity, fairness, and interpretation of assessment results. However, limited evidence is available on the quality of MCIs used in teacher education in Bhutan, particularly in the PgDE programme at SCE. More specifically, there is limited evidence on the difficulty and discrimination of these items, their adherence to item-writing principles, and tutors' understanding of MCI construction. This gap highlights the need for the present study to generate evidence on MCI quality, identify areas for improvement, and inform professional development and assessment practices.

This study explored the module tutors' understanding and practices concerning the construction and utilisation of MCIs. Additionally, it assessed the quality of MCIs used in the semester examinations of the PgDE programme. The anticipated outcomes of this research include gaining insights into the quality of MCIs used in the examinations and identifying gaps in the module tutors' knowledge and abilities in constructing MCIs. Furthermore, the findings have the potential for broader applicability across other colleges within the RUB. Ultimately, the results will aid faculty members in enhancing their expertise in MCI construction, leading to improvements in assessment practices. It will also add to the literature on assessment both nationally and internationally.

The study, therefore, addresses two connected problems: whether the multiple-choice items used in PgDE semester examinations function effectively as assessment tools, and whether module tutors have the knowledge required to construct items that are valid, discriminating, and aligned with established item-writing principles. Clarifying these issues is important because poorly constructed items may distort evidence of student learning and weaken assessment decisions. By examining MCI quality and educators' item-writing knowledge, the study offers insights beyond Bhutan for strengthening the quality, fairness,

and effectiveness of multiple-choice assessment through systematic item analysis and professional development.

RESEARCH QUESTIONS

Primary question

What is the quality of multiple-choice items developed and used by the module tutors in the semester-end examinations of the Postgraduate Diploma in Education programme?

Sub-questions

1. How do module tutors understand multiple-choice items?
2. What are the difficulty indices of the multiple-choice items?
3. What are the discrimination indices of the multiple-choice items?
4. What is the construct validity of the multiple-choice items as reflected in their adherence to established item-writing principles?

LITERATURE REVIEW

Multiple-choice Items

Multiple-choice items are widely used in college and university assessments and often contribute substantially to students' course grades (Mavis et al., 2001; McDougall, 1997). An MCI typically consists of a stem, one correct answer, and several distractors. Because MCIs can be designed to assess cognitive processes ranging from recall to higher-order thinking, their usefulness depends heavily on the quality of item construction (Torres et al., 2011).

Construction of MCIs

Ngaji et al. (2021) contend that specific sets of skills are required to construct MCIs while Gajjar et al. (2014) report that MCIs that accurately measure students' knowledge and differentiate their abilities are imperative. Effective MCIs measure higher-level thinking, improve student learning and performance, strengthen tutor efficiency, and offer a better understanding of assessment outcomes (Simkin & Kuechler, 2005). Several guidelines are required to construct effective MCIs. For instance, Begum and Slavin (2012) propose a clear alignment between the stem and the expected learning outcomes. The test items should be grammatically consistent, maintain focus, and provide adequate information for students to choose the correct answer without relying solely on the distractors. Additionally, MCIs must be framed as direct questions or incomplete statements and use positive language (Sireci et al., 1998). Once the stem is created, the role of distractors becomes crucial (Miller & Erickson, 1985). Distractors should effectively divert uncertain students, with one choice clearly representing the correct response while the remaining alternatives appear plausible. The arrangement of answer choices should follow alphabetical, chronological, or numerical

order (Haladyna et al., 2002). According to Bloom's taxonomy, a well-constructed MCI measures different cognitive skills such as comprehension, application, analysis, and synthesis (Mahjabeen et al., 2017). By conforming to these guidelines and addressing the various cognitive levels, MCIs can effectively assess students' understanding and critical thinking.

Principles of MCI Constructions

A set of principles govern the construction of MCIs (Downing & Haladyna, 1997). Non-adherence to the principles can lead to decreased validity evidence for tests (Downing, 2006) and are often artificially more difficult, leading to lower passing rates and the introduction of construct-irrelevant variance (CIV) into the test (Downing, 2005). CIV refers to the inclusion or exclusion of test scores due to the measurement of constructs or traits not directly targeted by the test itself (Messick, 1989). According to Tara et al. (2022), it is crucial to possess an understanding of the principles for constructing MCIs to ensure that they accurately test candidates' knowledge. One way to equip educators with the necessary knowledge is through training (Emily et al., 2015). Jia et al. (2020) further note that teachers should be trained to develop and construct MCIs as strong writing skills are essential for improving the quality of these items. Their study emphasises the importance of teacher commitment and efforts in quality assurance to meet professional standards and obligations. Haladyna et al. (2002) discovered that flawed item writing can significantly impact students' performance on MCIs, making the items either more or less difficult to answer accurately.

Advantages and Disadvantages of MCIs

The use of multiple-choice items as an assessment tool has both advantages and disadvantages. Parmenter (2009) highlights students' preference for MCIs due to the opportunities they provide for higher scores and their perceived validity compared to other assessment methods. A notable advantage of MCIs is the quick and easy grading process, making them appealing for courses with large enrollments. Well-constructed MCIs can yield reliable test scores while allowing for broader coverage of course topics (Bacon, 2003). Furthermore, MCIs can measure a variety of educational objectives and subject matter at different cognitive levels, ease of administration with large groups, consistent scoring, reliable assessment of student progression, reduced grading bias and test-taking anxiety, and easy implementation with computer-based testing, providing immediate results or feedback (Begum & Slavin, 2012; Boland et al., 2010).

However, MCIs are criticised for their focus on memorisation rather than evaluating higher-order cognitive skills (Walsh & Seldomridge, 2006). Framing MCIs that accurately assess higher-order thinking can be challenging (Tulving, 1967). Additionally, MCIs do not measure students' creativity, articulation of ideas, explanations, or the ability to

justify answer responses (Burton et al., 1991). Guessing and ruling out answers without substantive knowledge are also concerns (Funk & Dickson, 2011). However, thoughtfully written MCIs can be used to assess higher-level cognitive processes, although creating such items requires more skill than writing memory-based items (Buckles & Siegfried, 2006). Another criticism is that the format of MCIs allows for guessing, even when students lack substantive knowledge of the topic being assessed (Biggs, 1999). In contrast, Downing (2003) argues that blind guessing is rare on well-written classroom tests, and informed guessing, based on critical consideration of the question and available options, can provide a valid measure of student achievement. Carneson et al. (2016) express that MCIs with a single correct answer are an effective way to assess students' cognitive knowledge. Despite the merits and demerits, MCIs continue to be widely used to assess student achievement in postsecondary education globally, including across academic programmes at SCE.

Item Difficulty Index

The item difficulty index refers to the percentage of the total number of students who answered the test question correctly (Tavakol & Dennick, 2011). Similarly, Laxman and Vasant (2018) defined the difficulty level/index as the percentage of the total number of students from both the groups, high achievers and low achievers opting for key, i.e. answering correctly representing the difficulty index. It allows for differentiation between students who are high performing and those who are not, or between 'strong' and 'weak' students (Tavakol & Dennick, 2011). However, according to Gajjar et al. (2014), an ideal item will be the one that has average difficulty ranging between 31 and 60 percent with high discrimination index ≥ 0.25 . Menon and Kannambra (2017) pointed out that an item with average difficulty ranging from 30-70 percent and high discrimination 0.2 is considered an ideal MCI.

Construct Validity of MCIs

Construct validity refers to the extent to which a test measures what it claims to measure (Anastasi, 1986). Julie et al. (2005) emphasise that construct validity is closely linked to whether the questions effectively measure the domain of knowledge under examination. To ensure construct validity, several criteria have been identified. Mahmoud (2017) has established 22 item construction principles to evaluate the structure of MCIs, while Marie et al. (2006) provide nineteen guidelines for effective MCI construction. Brady (2005) emphasises that MCIs consistent with educational outcomes can effectively assess students' performance, offer timely feedback, and contribute to independent and self-directed learning. However, it is crucial to note that the construction of high-quality MCIs requires a significant commitment and alignment with curriculum objectives. Brown and Abdulnabi (2017) found that instructor-constructed MCIs in higher education courses often exhibited poor quality, impacting students' overall grades, especially in determining pass/

fail decisions. Hence, it is essential to evaluate MCIs before finalising grading decisions, and eliminate low-quality items prior to the test.

Przymuszała et al. (2020) suggested that providing teachers with a concise guideline document can help reduce the number of item-writing flaws in MCIs. They further recommend continuous professional development to enhance teachers' knowledge and awareness of good practices in MCI writing and item-writing flaws. Similarly, Tarrant and Ware (2008) emphasise the significance of providing training in writing high-quality test items. They advocate for thorough examination and review of MCIs both before and after their administration. Standardising MCIs is considered a mandatory initial step in achieving quality assessment, and one effective approach involves regular evaluation of questions through item and test analysis.

Analysis of the Quality of MCIs

Analysing the quality of MCIs can be approached in various ways. In this study, the approach adopted is based on Item Response Theory (IRT), which assesses the difficulty level and discrimination power of items to determine their quality. Additionally, the study employed well-established principles of MCI development to examine the construct validity of the items. Sajjad et al. (2020) conducted a study that revealed the impact of item writing errors on the efficiency of distractors in MCIs. Analysing MCIs can help identify such errors and improve the overall quality of the examination by enhancing the efficiency of distractors. Mehmood et al. (2021) also highlight the importance of post hoc analysis of MCIs, which allows examiners to identify any shortcomings or flaws encountered during the construction process. By applying the IRT-based analysis and considering established principles of MCI development, this study aimed to assess the quality and construct validity of MCIs.

METHODOLOGY

This study is grounded in pragmatism, a research paradigm that evaluates ideas and beliefs in terms of their practical consequences (Dieleman et al., 2017). A pragmatic orientation supported the selection of methods, techniques, and research procedures suited to the study purpose (Creswell & Creswell, 2018). Guided by this paradigm, the study employed a convergent parallel mixed-methods design. Quantitative and qualitative data were collected concurrently, analysed separately, and then integrated to develop a fuller understanding of the quality of MCIs and tutors' item-construction practices. The quantitative findings were presented alongside qualitative findings to support interpretation, comparison, and validation across data sources.

The study examined module tutors' understanding of multiple-choice items and analysed the quality of MCIs used in PgDE semester examinations. Semi-structured interviews

were conducted with 11 participants who had teaching experience in the programme. The interview questions focused on tutors’ conceptual understanding of MCIs, their uses, and principles of item construction. The study also conducted document analysis to examine the extent to which examination items adhered to established item-writing principles.

MCIs used in 12 PgDE semester examinations papers, comprising 240 multiple-choice items, were analysed. The quantitative data consisted of 72 corresponding students answer scripts for these examinations. For item analysis, students were first ranked according to their total examination scores and then divided using Kelley’s (1939) 27% upper-lower group method. The highest-performing 27% of students formed the upper group while the lowest-performing 27% formed the lower group. The middle 46% were excluded from the discrimination. This method is recommended since it maximises the distinction between the high and low performing students while maintaining adequate sample sizes for item analysis (Tavakol & Dennick, 2011). The upper and lower groups were subsequently used to calculate the Difficulty Index (P) and Discrimination Index (D) for each multiple-choice item.

The quality of the multiple-choice items was analysed by calculating the Difficulty Index (P), Discrimination Index (D), and adherence to item-writing guidelines. The Difficulty Index (P) represents the proportion of students who answered an item correctly and indicates the relative ease or difficulty of the item (Tavakol & Dennick, 2011). The P value was calculated using the formula:

$$P= Ri/N,$$

Where, P is the fraction of the correct answer

R is the total number of students who answered the question correctly

N is the total number of responses (correct + incorrect + blank response) and

i refers to the question number.

The interpretation of the Difficulty Index (P) is outlined in Table 1. In order to determine the P value for each module, the responses of the top and bottom groups using 27% method, the data were computed in an Excel sheet. The P value was calculated separately for the top and bottom groups to assess the difficulty level of the modules for both groups.

Table 1: Interpretation of Item Difficulty (P) Index

P score	Interpretation
< 30%	Difficult
= 30- 70%	Ideal/Acceptable
>70%	Very Easy

Note. Adapted from the study of Difficulty Level and Discriminating Index of Stem Type Multiple Choice Questions of Anatomy in Rajkot by Chauhan et al. (2013, p. 38) and Item Analysis of Multiple-choice Questions: Assessing an Assessment Tool in Medical Students by Chandrika (2016, p. 203).

The item-discrimination index is a value of how well a question is able to differentiate between students who are high performing and those who are not, or between ‘strong’ and ‘weak’ students (Tavakol & Dennick, 2011). According to Kumar et al. (2020), item-discrimination index is interpreted as: $DI \leq 0.20$ (poor), 0.21- 0.24 (acceptable), $DI 0.25-0.34$ (good) and $DI \geq 0.35$ (excellent). This study adopted the formula given by Zaman and Faize (2010) to calculate the Discrimination Index (D).

$$DI = \frac{Ru - Rl}{N}$$

where, DI = discrimination index

Ru = the number of students in the upper group who responded correctly

Rl = the number of students in the lower group who responded correctly.

The study reviewed a list of guidelines and principles for effective MCI item construction used in different studies conducted by Downing (2004), Mahmoud (2017) and Marie et al. (2006). From the list, the study adapted 12 guidelines for constructing effective MCIs items. The MCIs of all the 12 modules were evaluated and coded 1 for adherence to the guidelines and 0 for non-adherence of the guidelines. To enhance the construct validity of the process, the evaluated MCIs were cross-checked among researchers before entering into the final result sheet.

The qualitative data were analysed thematically using the method developed by Braun and Clarke (2018). The detailed procedures are discussed below.

- i. All transcripts were read and reread multiple times. In the process of reading and re-reading, potential codes for each topic were created and recorded.
- ii. Before they were finalised, a rigorous exercise of adding, deleting, renaming, and combining codes was performed. In addition, the codes have been reviewed to see if they are related to the themes and if there are clear differences between them.
- iii. Relevant categories for the codes were created and entered after reading and rereading all transcripts several times.
- iv. All relevant information/data segments were entered into the codes.
- v. A report was generated on the analysis, which also included the data extract.

Although the analysis process was described as linear, it was an iterative process, with stages moving back and forth as needed. Finally, the data obtained from all sources were merged and triangulated to confirm the merging of findings and it aims to reduce biases (Denzin, 1989) and strengthen reliability or dependability of the study.

ETHICAL CONSIDERATIONS

The ethical clearance from the Dean of Research and Industrial Linkage's Office was sought by submitting duly completed ethical clearance application form. All the ethical standards as outlined in the application form were adhered to during the course of the study. In addition, administrative clearance was sought from the Dean of Academic Affair for the use of the semester question papers and students' answer scripts. In the data presentation and discussions, the identity of the module tutors, question papers and students' answer scripts are strictly protected. To maintain anonymity of the participants, pseudonyms were used: PA, PB, PC etc., where P stands for participant.

FINDINGS AND DISCUSSION

This section presents the analyses of the data that are collated, merged, and triangulated to better understand the stated issue.

Understanding of Multiple-choice Items

The qualitative data analysis revealed a diverse range of interpretations among participants regarding their understanding of multiple-choice items. For instance, PA described MCIs as consisting of a stem, correct answer, and distractors, emphasising the need for strong distractors that closely resemble the correct answer to ensure the right answer is not easily revealed. Congruently, literature defines multiple-choice items as assessment items comprising a stem followed by a list of possible responses, where one option is correct while the others act as distractors (Torres et al., 2011). According to PH, MCIs are an effective tool for assessing students' understanding across various topics. Other participants highlighted additional perspectives on MCIs: PA considered them the best form of objective items; PJ noted their inclusivity and ability to cater to individual needs; PE regarded them as a means to assess different levels of thinking; and PD saw them as a summative assessment tool and a suitable substitute for essay-type questions. Literature supports the idea that MCIs measure a wide range of educational objectives and subject matter at different cognitive levels (Begum & Slavin, 2012; Boland et al., 2010). While a few participants acknowledged the difficulty and time-consuming nature of constructing MCIs, they also recognised that MCIs are relatively easy to assess. It was asserted by some participants that well-constructed MCIs can effectively measure higher-level thinking abilities such as comprehension, analysis, and cognitive reasoning. Overall, while most participants recognised the general characteristics and uses of MCIs, their responses revealed gaps in understanding effective item construction. Knowledge of general features does not necessarily imply the ability to construct high-quality items. Effective construction requires understanding how stems, alternatives, distractors, and cognitive demands contribute to valid evidence of learning. The quantitative findings further highlight these gaps, particularly in item difficulty, discrimination, and adherence to item-writing guidelines.

Difficulty Level of MCIs

The difficulty level of multiple-choice items plays a crucial role in accurately assessing students' performance and effectively distinguishing between high and low achievers. One key factor that influences MCI difficulty is the cognitive complexity of the questions. Sato (2015) suggests that questions involving higher-order thinking skills, such as analysis and evaluation, tend to be more challenging compared to those focused on recall or comprehension. This distinction in difficulty allows for the differentiation of high achievers from low achievers (Gierl & Haladyna, 2013). To analyse the quantitative data, the difficulty index (P) from Chauhan et al. (2013) was utilised, as presented in Table 2.

Table 2: Difficulty Index (P) of 12 Modules Offered at SCE

Module		p Value	Average p Value
Top Group		Bottom Group	
M1	85.71	81.43	83.57
M2	82.90	75.00	78.90
M3	70.70	57.90	64.30
M4	81.40	77.90	79.60
M5	87.10	65.70	76.40
M6	90.00	62.86	76.43
M7	98.57	82.14	90.35
M8	82.86	69.29	76.07
M9	78.57	70.00	74.29
M10	72.50	62.50	67.50
M11	51.67	38.33	45.00
M12	78.57	57.86	68.21

As evident from the table, the majority of the modules did not meet the desired difficulty level for multiple-choice items. A total of 240 MCIs were analysed, and it was discovered that 229 items had plausible distractors, with each MCI having four distractors. Out of 12 modules, only four modules (M3, M10, M11, and M12) accounted for 33.33% of the total and fell within the acceptable or ideal category. These modules demonstrated a difficulty index ranging from 45 to 68.21. Literature suggests that questions that are excessively difficult or easy can have a negative impact on student motivation and engagement (Alqahtani, 2015). On the other hand, the remaining eight modules (M1, M2, M4, M5, M6, M7, M8, and M9) accounted for 66.67% of the total and were categorised as "very easy". This classification implies that these modules failed to effectively differentiate between high achievers and low achievers.

The qualitative finding showed that almost all participants reported limited knowledge and skills required to accurately construct multiple-choice items. Consequently, this could result in the creation of MCIs that are either too easy or too difficult. Furthermore, participants expressed their significant challenges in constructing MCIs. This idea is encapsulated in the following quote by PF: "I find the construction of MCIs very challenging." Given their reported inadequate knowledge and skills, participants sought assistance from senior colleagues or referred to past question papers to construct MCIs. They attributed their lack of knowledge to lack of training on the development of MCIs. Therefore, PI suggested that opportunities for professional development would be beneficial in helping them construct robust MCIs. This suggestion aligns with the findings of Emily et al. (2015), who emphasised the importance of training educators in order to equip them with the necessary knowledge to construct MCIs. Simkin and Kuechler (2005) elaborated that proper training in formatting and creating high-quality MCIs can lead to improved student learning and performance, increased instructor efficiency, and a better understanding of assessment outcomes. Hence, constructing effective MCIs that accurately assess students' knowledge and differentiate their abilities is essential (Gajjar et al., 2014). It is evident from the prior discussion that 66.67% of MCIs fell into the "very easy" category, which can be attributed to participants' inadequate knowledge and skills in developing them.

Therefore, the findings highlight the need for tutors to develop items across an appropriate range of difficulty and cognitive demand rather than relying predominantly on items that assess relatively straightforward knowledge and understanding.

Discrimination Power of the MCIs

The discrimination index of 12 modules is shown in Table 3.

Table 3: Discrimination Index (D) of 12 Modules at SCE

Module		pValue	D value (Discrimination Index)
Top Group		Bottom Group	
M1	85.71	81.43	0.043
M2	82.90	75.00	0.079
M3	70.70	57.90	0.129
M4	81.40	77.90	0.035
M5	87.10	65.70	0.214
M6	90.00	62.86	0.271

Module		pValue	D value (Discrimination Index)
Top Group		Bottom Group	
M7	98.57	82.14	0.160
M8	82.86	69.29	0.136
M9	78.57	70.00	0.085
M10	72.50	62.50	0.100
M11	51.67	38.33	0.117
M12	78.57	57.86	0.207

As shown in Table 3, most modules demonstrated weak discrimination. Nine modules, representing 75%, had D values at or below 0.20 and therefore fell into the poor category. Two modules were in the acceptable range, and one module (M6) reached the good category with a D value of 0.271. Overall, the mean D value of 0.13 indicates that the MCIs generally had limited capacity to distinguish between higher- and lower-performing students. This finding is consistent with the high average P value of 73.39%, which suggests that many items were too easy to discriminate effectively among students.

Literature indicates that an effective measure of multiple-choice items is their ability to assess higher cognitive skills, such as data interpretation, synthesis, and knowledge application, rather than solely testing factual recall (Elgadal & Mariod, 2021). However, the qualitative findings showed that the MCIs constructed by the participants focused mainly on lower levels of thinking. For example, one participant mentioned, "When I prepare MCIs, it is mostly from the lower order thinking." The participants justified by stating that questions based on lower order thinking are easier to create, while constructing questions that require higher order thinking is more difficult and challenging. Providing questions that only assess lower order thinking skills will fail to effectively differentiate between high performing and low performing students. The ability of a question to differentiate high achievers from low achievers is crucial for the validity of assessments and decision-making regarding students' growth. Failure to employ testing strategies that accurately represent students' knowledge and skills can lead to flawed interpretations of their performance (Hoban et al., 2017). Thus, the low discrimination observed across most modules represents more than a statistical weakness; it raises concerns about the extent to which examination results provide precise and meaningful evidence of differences in student achievement.

Item construction Guideline Adherence of MCIs

The item construction guideline adherence of MCIs is provided in Table 4.

Table 4: Item Construction Guidelines Adherence

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	Total	
Item Guideline	20	20	20	20	20	20	20	20	20	20	20	20	240	Mean
G1- Present a definite, explicit, and singular question or problem in the stem.	19	20	18	20	19	20	20	20	20	20	18	20	234	19.50
G2- When possible, state the stem as a direct question rather than as an incomplete statement.	7	9	7	6	14	6	5	4	17	18	18	14	125	10.42
G3- Provide clear directions; no ambiguity about what is being asked.	20	20	17	19	20	20	20	20	20	20	20	20	236	19.67
G4- Include in the stem any word(s) that might otherwise be repeated in each alternative.	14	20	14	16	19	14	13	12	20	13	20	16	191	15.92
G5- Use negatively stated stems sparingly, when used, underline and/or capitalise the negative word, capitalise the number.	14	18	18	19	20	7	5	5	16	20	12	16	170	14.17

G6- Avoid unintentional clues to the correct answer such as unmatched grammar, unrelated choices, use of "always/never," "all of the above," "none of the above".	13	6	19	19	18	0	5	6	7	15	10	19	137	11.42
G7- Make all alternatives plausible.	20	17	20	20	15	20	30	19	19	16	16	17	229	19.08
G8- Make alternatives approximately equal in length or arrange them logically, alphabetically, or numerically.	11	10	10	16	14	9	3	17	10	19	12	6	137	11.42
G9- Capitalise the beginning of each answer choice when the stem is an incomplete statement.	7	20	9	16	19	18	15	3	19	17	14	17	174	14.50
G10-End each answer choice that is a sentence with a period.	6	20	20	4	17	14	27	16	20	12	20	15	191	15.92
G11- Balance the placement of key/correct answer.	13	20	16	11	20	12	18	14	20	20	14	20	198	16.50
G12- Avoid questions of the form "Which of the following statements is correct?"	13	20	12	11	18	17	27	28	20	20	20	19	225	18.75
Total														
Total	157	200	180	177	213	157	188	164	208	210	196	199	2247	

The quantitative results indicated that a significant number of questions did not meet the guidelines for constructing MCIs. Among the guidelines, G3 (Provide clear directions; no ambiguity about what is being asked) had the highest guideline adherence (GA) with a mean value of 19.67 (98.3%), followed by G1 (Present a definite, explicit, and singular question or problem in the stem) with a GA value of 19.50 (97.5%). G4 (Include in the stem any word(s) that might otherwise be repeated in each alternative), G5 (Use negatively stated stems sparingly, when used, underline and/or capitalize the negative word, capitalise the number), G9 (Capitalise the beginning of each answer choice when the stem is an incomplete statement), and G10 (End each answer choice that is a sentence with a period) had average GA values of 15.92 (79.6%), 14.17 (70.8%), 14.50 (72.5%), and 15.91 (79.6%) respectively. However, G2 (When possible, state the stem as a direct question rather than as an incomplete statement), G6 (Avoid unintentional clues to the correct answer such as unmatched grammar, unrelated choices, use of "always/never," "all of the above," "none of the above"), and G8 (Make alternatives approximately equal in length or arrange them logically, alphabetically, or numerically) had the lowest GA values with 10.42 (52.1%), 11.42 (57.1%), and 11.42 (57.1%) respectively. This indicates that non-adherence to G2, G6, and G8 is common among the tutors when designing MCIs.

During the qualitative analysis, it was discovered that almost all participants were unaware of the principles involved in constructing multiple-choice items. One participant, PD, explicitly stated, "I have no idea of any principles." Some participants associated the principles with the test blueprint, while others identified the equal distribution of MCIs across the six levels of thinking as the principles. Literature suggests the use of specific research-based principles guide the development of effective MCIs (Downing & Haladyna, 1997) but deviating from established item-writing principles can lead to a decrease in validity evidence for tests (Downing, 2006). Additionally, items that violate one or more of the standard item writing principles tend to artificially increase the difficulty level, resulting in lower passing rates and introducing construct-irrelevant variance (CIV) to the test (Downing, 2005).

Although the participants admitted their lack of awareness regarding the principles of constructing MCIs, they unanimously acknowledged the benefits of employing such principles. They emphasised that following the principles ensures that the questions are flawless, objective, unbiased, and assess the intended content accurately. Clarity of the questions was also highlighted by most participants. Participants expressed the importance of adhering to the principles for the sake of objectivity and authentic assessment. Some participants mentioned that the guidelines help achieve the intended learning outcomes and enhance understanding of the module's content. The design and use of valid and reliable multiple-choice items are crucial for ensuring the validity of assessment results (Amit et al., 2003) so that they accurately test candidates' knowledge (Tara et al., 2022).

The participants also noted that failing to follow the principles would result in poorly constructed MCIs, which would have several negative impacts. These impacts include consuming more time, failing to achieve learning outcomes, increasing the likelihood of guessing correct answers, confusing students, and the questions not measuring what they are intended to measure. Furthermore, participants pointed out that not adhering to the principles increases the chances of students obtaining correct answers (PA) and engaging in malpractices and plagiarism during exams, such as copying, non-verbal communication, and sharing correct answers. Congruent with this finding, Biggs (1999) highlighted that multiple-choice item have the potential to encourage students to make guesses, even when they lack substantial knowledge about the subject being assessed.

Taken together, the quantitative and qualitative findings indicate that weaknesses in item-writing guideline adherence may affect the validity, fairness, and interpretability of MCI-based assessment. The findings therefore suggest that strengthening tutors' knowledge of item-writing principles should be accompanied by systematic review and moderation of assessment items.

LIMITATIONS OF THE STUDY

The study was limited to the Postgraduate Diploma Programme at Samtse College of Education, which may restrict the generalisability of the findings to other programmes and institutions. It also focused on selected indicators of MCI quality and relied on interviews and document analysis. The study did not examine other psychometric indicators such as distractor efficiency and test reliability, which could provide more comprehensive assessment of item quality.

CONCLUSION AND RECOMMENDATION

The study explored the MCIs used in the test of the PgDE programme at SCE. Based on the findings, it is concluded that participants have limited knowledge and skills in framing effective MCIs. For the construction of effective MCIs, educators must be aware of construct validity indicators (e.g., difficulty index, discrimination value), high-quality distractors, and principles of item construction. The ability to construct MCIs that measure deeper thinking can enhance student learning and achievement, and increase teacher effectiveness. Therefore, educators must be proficient in developing effective MCIs which demands specific knowledge and skills. Hence training is recommended to enable them to frame effective MCIs. This training should focus on understanding the key components of MCIs, such as stems, correct answers, and distractors and aligning MCIs with desired learning outcomes and educational objectives. Overall, the findings address the research problem by demonstrating that weaknesses in MCI difficulty, discrimination, and adherence to item-writing principles limit the effectiveness of PgDE assessments, highlighting the

need to strengthen educators' knowledge and skills in MCI construction. The MCIs used in the PgDE assessment were predominantly in the "very easy" category and demonstrated low discrimination, indicating weaknesses in their ability to differentiate students' levels of understanding and adequately assess the intended learning outcomes. The findings also indicate a need to strengthen educators' knowledge and skills in constructing effective MCIs, particularly in developing appropriate item difficulty, plausible distractors, and items that assess both lower- and higher-order thinking. Therefore, targeted and regular professional development on MCI construction and item analysis is strongly recommended. Such professional development should be complemented by opportunities for educators to share good practices and provide constructive feedback on assessment items. Strengthening these competencies is essential to ensure that PgDE assessments are valid, reliable, fair, and aligned with intended learning outcomes. Limited familiarity of the guidelines in framing effective MCIs have resulted in non-compliance with the principles. Failure to follow these guidelines can undermine assessment quality by affecting validity, reliability and fairness and the ability of the MCIs in assessing higher order thinking abilities of the students. Moreover, it may also increase ambiguity and encourage guessing. Therefore, it is imperative for educators to integrate the guidelines into the MCIs to uphold validity, fairness, and reliability.

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Transforming Teaching by Integrating Design Thinking with Experiential Learning

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ABSTRACT

In the contemporary educational landscape, creative approaches are increasingly essential to address the diverse needs of learners and promote inclusive growth. This research explores how design thinking and experiential learning can revolutionize and transform contemporary education. Design thinking, a human-centered problem-solving method, offers educators a structured process to develop critical thinking, creativity, and teamwork in students. The study seeks to determine the effectiveness of design thinking in enhancing student engagement and experiential learning as well as its impact on innovative teaching methods. By examining existing literature, case studies and successful implementations, this research aims to fill knowledge gaps and provide actionable insights. This paper explores the key principles and practical applications of design thinking in educational settings. It highlights how this approach can promote experiential learning and develop a culture of innovation. A learner-centered approach enables teachers to adapt to individual learning styles and challenges, thereby improving student outcomes and engagement. The central research question guiding this study is: How can design thinking be effectively incorporated into contemporary education to increase student engagement and inspire innovative teaching practices? Through the analysis of existing studies, this research reveals a significant gap in understanding the practical implementation of design thinking in educational contexts. The findings emphasize the transformative power of design thinking to foster experiential learning, interdisciplinary connections, and essential 21st century skills. The study also discussed how design thinking with experiential learning aligns current industrial demands by fostering creativity and innovative thinking through integrated pedagogical approach. The recommendations are made based on findings to support educators in incorporating design thinking through professional development and collaborative curriculum development.

Keywords: Design thinking approach, experiential learning, Innovative teaching, learning methods, learner-centered

INTRODUCTION

Education is rapidly changing due to technological advancements, diverse student backgrounds, and the need for modern skills. Traditional teaching methods are falling short, making innovative approaches essential. This research focuses on two promising methods: Design Thinking and Experiential Learning. Design Thinking is a problem-solving approach that puts people at the center. Students learn to understand user needs, develop creative solutions, and test their ideas. This process helps students build essential 21st-century skills. Experiential Learning emphasizes hands-on activities and reflection. By doing and thinking about what they do, students grasp concepts better and learn to think critically and solve problems. Experiential Learning is also provides active engagement through hands-on activities and reflection. By directly experiencing concepts, students gain deeper understanding and develop essential skills like critical thinking and problem-solving. Experiential learning theory describes learning as the process through which knowledge results from gaining experience.

This research delves into the transformative power of Design Thinking and Experiential Learning in education. By focusing on enhancing student engagement and fostering innovative teaching practices, this study aims to uncover effective strategies for integrating Design Thinking into the classroom.

Purpose of the Research Paper

The purpose of this research paper is to examine how integrating Design Thinking and Experiential Learning can enhance educational practices in modern classrooms. As traditional teaching methods often struggle to fully engage today's diverse learners, this paper aims to explore the potential benefits of combining these innovative approaches to transform teaching and learning experiences.

The specific purposes of the paper are:

1. Evaluate the Impact of Design Thinking: To investigate how the principles and methodologies of Design Thinking can enhance student engagement and experiential learning. This includes assessing how Design Thinking fosters critical thinking, creativity, and collaboration among students.
2. Explore Implications for Teaching Practices: To analyse how incorporating Design Thinking can influence innovative teaching practices. This involves examining its effects on curriculum development, teacher training, and adopting a learner-centric approach to address individual learning needs and challenges.

The research seeks to provide insights into the transformative potential of Design Thinking and Experiential Learning in educational settings. The findings are intended to offer actionable recommendations for educators and policymakers, aiming to improve

teaching methods and support the development of crucial 21st-century skills, thereby enhancing overall student outcomes.

REVIEW OF LITERATURE

Integration of Design Thinking in Education

Design Thinking, originally developed for business applications, has emerged as a prominent approach in education. Unlike the analytical thinking prevalent in science, which often results in single-discipline, technical solutions, Design Thinking promotes teaching strategies that incorporate a multidisciplinary approach that incorporates diverse viewpoints.

Apart from teaching, teachers need to tackle various on-time issues and 'Design Thinking' provides a structured approach for educators to tackle complex challenges while fostering creativity and critical thinking among students. By emphasizing a human-centered perspective, this methodology encourages empathy, collaboration, and innovation—essential skills for success in today's interconnected world. Design Thinking empowers students to identify user needs, generate creative solutions, and test their ideas through iterative processes. This approach, often referred to as "design-based learning," is recognized for its ability to enhance creativity, persistence, engagement, and innovation. Essentially, Design Thinking equips learners to address real-world problems through a collaborative and solution-focused mindset. By integrating Design Thinking into education, we can cultivate a new generation of problem-solvers and innovators.

Experiential Learning Pedagogies

Experiential Learning pedagogies, grounded in Kolb's foundational work, emphasize hands-on experiences and reflection as core components of the learning process. This approach fosters active engagement by allowing students to apply theoretical knowledge to real-world scenarios, thereby deepening understanding and knowledge retention. Through project-based learning, simulations, internships, and other practical experiences, students develop robust problem-solving skills, enhance interpersonal abilities, and gain a deeper appreciation for the relevance of their education.

Interconnectedness of Design Thinking and Experiential Learning

The integration of Design Thinking principles into Experiential Learning approaches has become increasingly popular in educational discussions. Meinel and Leifer (2010) suggest that Design Thinking enhances Experiential Learning by offering a structured methodology for students to address complex problems creatively. Through hands-on activities and iterative prototyping, students gain practical

experience and cultivate a mindset geared towards innovation and entrepreneurship . The synergy of Design Thinking and Experiential Learning enables students to actively engage in their learning process, equipping them with the skills and mindset needed to thrive in uncertain and dynamic environments. Design Thinking provides the scaffolding structure to pedagogical approach and experiential learning provides the strategic mechanism for learning from that action. This integration potentially integrated cycle of action, reflection, innovation and knowledge construction.

A critical synthesis of these two approaches represented in table 1. Design Thinking (DT) and Experiential Learning (EL) are complementary rather than identical. Design Thinking is mainly concerned with human-centred problem identification, ideation, prototyping, and the development of solutions, while Experiential Learning places a focus on learning through concrete experience, reflection, conceptualisation, and experimentation. The combination of the two therefore enables a link to be made between creative action and reflective learning, so that learners can move back and forth iteratively between problem-solving, experience, reflection, and experimentation; recent educational research also indicates the potential of combining processes oriented towards Design Thinking with experiential approaches.

Table: 1 Integration of Design thinking and Experiential learning

Dimension	Design Thinking	Experiential Learning	Potential integration
Starting point	Human/user problem	Concrete experience	Authentic problem-based experience
Core process	Empathise → Define → Ideate → Prototype → Test	Experience → Reflection → Conceptualisation → Experimentation	Iterative experience– reflection–design cycle
Main emphasis	Innovation and solution development	Learning through experience and reflection	Innovation through reflective experience
Learner role	Designer/problem- solver	Active learner/ reflection practitioner	Reflective problem- solver
Strength	Creative solution generation	Meaning-making from experience	Creative action + reflective learning
Potential limitation	May focus more on solution than learning transformation	May not explicitly emphasise innovation/ design	Each framework potentially addresses the other's limitation

Challenges in Implementation

Although Design Thinking and Experiential Learning offer valuable benefits, educators face significant challenges in implementing these methodologies effectively. A major issue is the need for thorough training and professional development to equip teachers with the skills needed to effectively integrate Design Thinking and experiential activities into their classrooms. Understanding the relationship between professional development and teachers' knowledge, beliefs, identity, and practice is crucial, as current research on this topic is limited. Furthermore, constraints such as limited resources and inadequate infrastructure can hinder the adoption of hands-on learning experiences, especially in schools and communities with fewer resources. Additionally, traditional educational systems often prioritize standardized testing and rote memorization over innovative and experiential methods, creating obstacles to broader implementation. To overcome these challenges, it is essential for policymakers, school administrators, and educators to work together to emphasize pedagogical innovation, effectively allocate resources, and foster an environment that supports experimentation and risk-taking in education.

Emerging Trends and Innovations

The emergence of technology-enhanced learning tools and digital platforms is creating new opportunities for immersive and interactive learning experiences. Innovations such as virtual reality simulations, gamified environments, and online collaboration tools allow students to engage in hands-on activities and problem-solving tasks within virtual settings, overcoming traditional geographical and resource constraint . Additionally, interdisciplinary collaborations among educators, designers, engineers, and industry professionals are fostering fresh approaches to curriculum design and pedagogy that blend Design Thinking principles with Experiential Learning methodologies. By leveraging these advancements, educators can surmount conventional barriers to innovation and offer transformative learning experiences that equip students for success in the digital age.

Although there is a clear theoretical alignment between these approaches, there is still a lack of this research on their practical outcomes and implications in educational settings. Addressing challenges such as limited resources, institutional barriers, and the need for comprehensive teacher training is crucial for fully realizing the benefits of these methodologies. Nevertheless, emerging trends such as technology-enhanced learning tools and interdisciplinary collaborations offer promising opportunities to overcome these challenges and provide impactful learning experiences. Future research should focus on longitudinal studies, comparative analyses, and the role of teacher training programs and policy frameworks in supporting pedagogical innovation. By filling these research gaps, scholars can advance the development of teaching practices and ensure that all students receive high-quality education that equips them for success in the 21st century and beyond .

Research Gap and the Need for Empirical Evidence

A noticeable research gap in the current research is that systematically evaluates their effectiveness in educational settings. While anecdotal evidence and case studies abound, there is a scarcity of rigorous studies that employ quantitative methods to assess the impact of integrating these methodologies on student outcomes and teacher practices. Furthermore, existing research often lacks generalizability and fails to account for contextual factors that may influence the implementation and effectiveness of among these approaches.

Research Gap

There is a significant identified research gap concerning the practical application and effectiveness of integrating Design Thinking and Experiential Learning approaches. Although theoretical frameworks and conceptual models are available, comprehensive empirical research on the tangible outcomes and implications of implementing these methodologies in various educational settings is lacking. Moreover, existing literature often addresses individual aspects of these approaches separately, rather than exploring their combined effects and potential to enhance student engagement and experiential learning across different disciplines. Therefore, there is a need for empirical studies that examine the interconnectedness of these approaches in educational contexts and evaluate their impact on innovative teaching practices and student outcomes.

Research Question

In response to the identified research gap, this study centers on the question:

“How can the integration of Design Thinking and Experiential Learning approaches enhance student engagement and experiential learning in modern education, and what are the implications for innovative teaching practices?”

The study aims to contribute to the literature by offering empirical evidence and insights into effective strategies for implementation that support comprehensive development and innovation in educational practices.

Research Question and Its Relevance

The above mentioned research question is highly relevant in the context of contemporary education, where there is a growing emphasis on fostering 21st-century skills [18] such as critical thinking, creativity, collaboration, and problem-solving. By examining the integration of Design Thinking and Experiential Learning, this study seeks to address the evolving needs of students and educators in preparing learners for success in a rapidly changing world. The relevance of this research question lies in its potential to inform evidence-based practices and pedagogical innovations that promote holistic development and innovation in education.

METHODOLOGY

This research employs a secondary data analysis methodology to comprehensively investigate the integration of Design Thinking and Experiential Learning as innovative pedagogical approaches. Here, researcher studied and considered total 28 researches and by systematically reviewing and synthesizing academic literature, reports, and case studies, the study aims to develop a comprehensive understanding of the theoretical underpinnings, empirical evidence, and practical applications of these strategies.

Research Design

This study adopted a **systematic literature review (SLR) methodology** to examine the integration of Design Thinking (DT) and Experiential Learning (EL) as innovative pedagogical approaches in education. The review was designed to identify, critically examine, and synthesize existing evidence concerning the theoretical foundations, implementation practices, educational outcomes, enabling factors, and challenges associated with integrating DT and EL.

The review was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines proposed by Page et al. (2021). PRISMA 2020 provides a structured framework for transparently reporting the identification, screening, eligibility assessment, and inclusion of studies in systematic reviews. The PRISMA approach was selected to improve the transparency, methodological rigor, and reproducibility of the literature identification and study-selection process. The review process comprised four principal stages: **identification, screening, eligibility assessment, and inclusion**. A PRISMA flow diagram was used to document the movement of records through these stages and to report the reasons for exclusion.

Information Sources and Search Strategy

A structured search of the academic literature was conducted using the following electronic databases:

- Scopus
- Web of Science
- ERIC (Education Resources Information Center)

These databases were selected because they provide broad coverage of peer-reviewed literature in education, pedagogy, learning sciences, and interdisciplinary research.

The search strategy was developed around the two principal concepts of the study: Design Thinking and Experiential Learning. Boolean operators, phrase searching, and alternative terminology were used to maximize the identification of potentially relevant studies.

Search strategies used for the literature search for Design Thinking and Experiential Learning in educational contexts, depending on the database (Table 2). The conceptual search strategy was uniform across databases, while syntax was modified to the indexing and search functionality of Scopus , Web of Science Core Collection , and ERIC . The search was carried out within three main blocks of concepts: Design Thinking, Experiential Learning and educational context. Complementary searches were also used to identify literature that examined each approach in isolation, thus supporting a comprehensive synthesis of the evidence base and informing the proposed integration of the two pedagogical approaches.

Table 2: Database-wise search strategy

Database	Search Field / Syntax	Search String
Scopus	TITLE-ABS-KEY	TITLE-ABS-KEY(("design thinking" OR "design-thinking" OR "design thinking approach" OR "design thinking methodology" OR "design thinking process" OR "human-centered design" OR "human centred design" OR "human-centered approach" OR "human centred approach") AND ("experiential learning" OR "experiential education" OR "experiential pedagogy" OR "learning by doing" OR "learning through experience" OR "experience-based learning" OR "experience based learning" OR "hands-on learning" OR "hands-on education" OR "active learning") AND (education OR educational OR teaching OR learning OR pedagogy OR "teaching and learning" OR classroom OR curriculum OR "higher education" OR university OR universities OR "school education" OR school* OR student* OR teacher* OR "teacher education" OR "professional education"))
Web of Science Core Collection	TS= (Topic: Title, Abstract, Author Keywords, Keywords Plus)	TS= ("design thinking" OR "design-thinking" OR "design thinking approach" OR "design thinking methodology" OR "design thinking process" OR "human-centered design" OR "human centred design" OR "human-centered approach" OR "human centred approach") AND ("experiential learning" OR "experiential education" OR "experiential pedagogy" OR "learning by doing" OR "learning through experience" OR "experience-based learning" OR "experience based learning" OR "hands-on learning" OR "hands-on education" OR "active learning") AND (education OR educational OR teaching OR learning OR pedagogy OR "teaching and learning" OR classroom OR curriculum OR "higher education" OR university OR universities OR "school education" OR school* OR student* OR teacher* OR "teacher education" OR "professional education"))
ERIC	Keyword / Free-text search	("Design Thinking" OR "Design Thinking Approach" OR "Design Thinking Methodology" OR "Human Centered Design" OR "Human-Centered Design") AND ("Experiential Learning" OR "Experiential Education" OR "Experiential Pedagogy" OR "Learning by Doing" OR "Experience-Based Learning" OR "Hands-On Learning" OR "Active Learning") AND (Education OR Teaching OR Learning OR Pedagogy OR "Teaching and Learning" OR Classroom OR Curriculum OR "Higher Education" OR University OR "School Education" OR Students OR Teachers OR "Teacher Education")

For databases with field-specific search functionality, the search was applied to the **title, abstract, and keywords** fields where available. The search was restricted according to the predefined eligibility criteria concerning publication type, language, and relevance to educational settings.

In accordance with PRISMA 2020 reporting recommendations, the search strategy should be reported in sufficient detail to allow another researcher to reproduce the search, including the databases, search interfaces, dates of searching, complete search strings, and filters or limits applied. The studies published between 2021-2025 in English language were considered for review analysis.

Where appropriate, the reference lists of selected studies were also examined to identify additional potentially relevant literature through backward citation searching.

Eligibility Criteria

Formal inclusion and exclusion criteria were established before the screening of the retrieved records. The criteria were developed to ensure that the selected studies directly contributed to understanding the application or integration of Design Thinking and/or Experiential Learning within educational contexts.

Criterion	Inclusion Criteria	Exclusion Criteria
Topic	Studies addressing Design Thinking, Experiential Learning, or the integration of both approaches in education	Studies unrelated to DT or EL
Educational context	Studies conducted in school, higher education, vocational, professional, teacher education, or other formal/informal educational settings	Studies with no identifiable educational or learning context
Focus	Studies examining pedagogical approaches, teaching-learning practices, implementation, outcomes, or integration of DT and EL	Studies focusing solely on product/business design without educational relevance
Publication type	Peer-reviewed research articles and relevant academic reports/case studies that provided substantive evidence	Editorials, opinion pieces, news articles, promotional materials, abstracts without sufficient information, and non-scholarly web content
Language	Publications available in English	Publications in languages for which an adequate full-text assessment could not be undertaken
Full text	Full-text publication available for detailed assessment	Records for which the full text was unavailable
Relevance	Studies directly contributing evidence to the review objectives	Studies with only incidental references to DT or EL
Duplicate records	First complete record retained	Duplicate records removed

Study Identification and Screening

The process of literature selection has been done using the PRISMA 2020 protocol for identification, screening, eligibility, and inclusion. The initial searches of the databases have resulted in the identification of 28 records being potentially relevant to the research goals.

After the exclusion of those records which did not conform to the basic criteria of the preliminary screening, the titles and abstracts of these records have been reviewed on the basis of the predefined eligibility criteria, after which the full-text analysis was performed on the selected records.

As a result of this process of screening and eligibility, 16 studies/reports were selected for inclusion into the synthesis, whereas the rest were excluded as they did not cover the objectives of the review or did not meet the criteria of the predefined eligibility. A detailed selection process of the studies is shown in Figure 1 (PRISMA flow diagram). PRISMA 2020 provides standardized flow-diagram templates specifically for displaying this study-selection lifecycle.

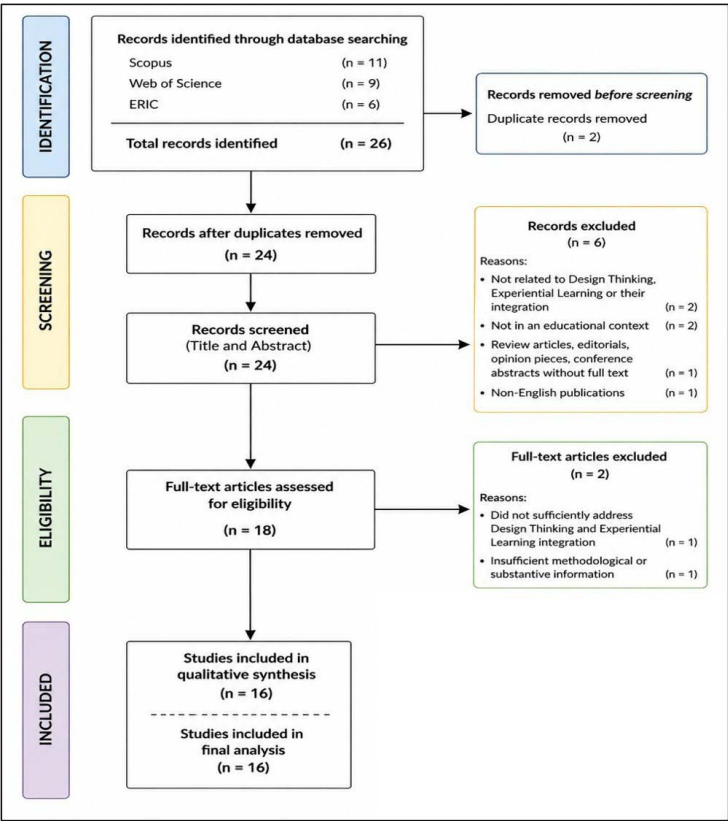


Figure 1: PRISMA Flowchart

Data Extraction

A structured data-extraction framework was used to organize information from the included studies. The extracted information included:

- author(s) and year of publication;
- country or geographical context;
- educational setting and target population;
- study design and methodology;
- application of Design Thinking;
- application of Experiential Learning;
- nature of integration between DT and EL;
- pedagogical activities or intervention characteristics;
- reported learning or educational outcomes;
- factors facilitating implementation;
- barriers and implementation challenges; and
- key findings relevant to the research objectives.

The extracted information was organized into a comparative evidence matrix to facilitate cross-study synthesis and identification of common themes.

Data Synthesis and Analysis

Because the included studies differed in their research designs, educational settings, interventions, and outcome measures, a qualitative thematic synthesis was adopted rather than a statistical meta-analysis. Findings were compared across studies to identify recurring patterns and relationships concerning the integration of Design Thinking and Experiential Learning.

The synthesis focused on four major analytical dimensions:

1. Theoretical integration – how DT and EL complement each other conceptually and pedagogically;
2. Pedagogical implementation – how educators apply DT and EL through activities, projects, problem-based tasks, reflection, prototyping, collaboration, and real-world learning experiences;
3. Implementation conditions – the influence of teacher competencies, institutional support, infrastructure, resources, curriculum flexibility, and learner engagement; and
4. Educational outcomes and research gaps – reported effects on student engagement, creativity, problem-solving, collaboration, critical thinking, experiential learning, and other relevant learning outcomes.

The findings were subsequently synthesized to develop an integrated understanding of how Design Thinking and Experiential Learning can be combined to support transformative teaching practices.

FINDINGS OF THE STUDY

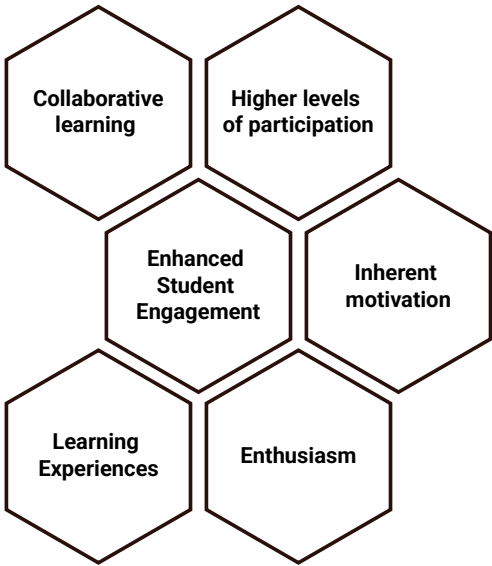
The analysis shows that Design Thinking has the capacity to enhance student engagement by getting learners to move from being passive recipients of knowledge to taking an active role in the learning process. In the various studies examined, Design Thinking was linked to problem identification, idea generation, experimentation, prototyping, testing, and reflection. Through these activities, students were given the chance to interact with real-life problems and put their theoretical knowledge into practical use.

The synthesis also indicates that Design Thinking complements Experiential Learning by getting students to learn through direct experience, reflection, experimentation, and successive improvements. Students are not merely required to understand a problem but also have to develop, test, evaluate, and refine possible solutions.

Four major learning outcomes emerged from the analysis:

a) Improved Problem-Solving Skills

Students who participated in Design Thinking and Experiential Learning activities demonstrated enhanced problem-solving skills, characterized by their ability to identify, analyze, and solve complex problems creatively and effectively. By engaging in iterative processes of ideation, prototyping, and testing, students developed a growth mindset and a willingness to embrace failure as a natural part of the learning process.



b) Development of Critical Thinking Abilities

The integration of Design Thinking and Experiential Learning facilitated the development of critical thinking abilities among students, enabling them to evaluate information critically, make informed decisions, and think critically about real-world issues and challenges. Through reflective practices and hands-on experiences, students learned to question assumptions, consider multiple perspectives, and generate innovative solutions to complex problems.

c) Promotion of Collaborative Skills

Collaborative skills were significantly enhanced through the implementation of Design Thinking and Experiential Learning methodologies. Students learned to work effectively in teams, communicate ideas clearly, and leverage diverse perspectives to co-create solutions to authentic problems. By fostering a culture of collaboration and teamwork, educators nurtured essential interpersonal skills that are crucial for success in the workplace and society.

d) Enhanced Creativity and Innovation

Design Thinking and Experiential Learning activities stimulated students' creativity and innovation, encouraging them to think outside the box, explore unconventional ideas, and take calculated risks. By providing opportunities for open-ended exploration and experimentation, educators inspired students to unleash their creative potential and develop novel solutions to real-world challenges.

The second major finding concerns the influence of Design Thinking on teaching practices. The analysis suggests that the adoption of Design Thinking requires a shift from traditional teacher-centred instruction towards a more learner-centred, participatory, and problem-based approach.

a. Integration enhanced Student Engagement

The integration of Design Thinking and Experiential Learning approaches resulted in increased student engagement, as evidenced by higher levels of participation, enthusiasm, and inherent motivation among students. By providing hands-on, collaborative learning experiences that are relevant and meaningful, educators were able to capture students' interest and foster a deeper connection with the subject matter.

b. Curriculum Development

This study shows that Design Thinking is able to facilitate curriculum development through its incorporation of practical problem-solving, project work, collaboration, experimentation, and reflection. Instead of concentrating only on content acquisition, the curriculum will have components enabling learners to define problems, create solutions, experiment, and learn from mistakes and feedback.

c. Positive Impact on Teacher Practices

The integration of Design Thinking and Experiential Learning had a positive impact on teacher practices, empowering educators to adopt learner-centered approaches, facilitate meaningful learning experiences, and cultivate a culture of innovation in their classrooms. By embracing Design Thinking principles and experiential pedagogies, educators transformed their instructional practices, fostering a learner-centered learning environment that prioritizes inquiry, exploration, and discovery.

Alignment with 21st-Century Skills

The findings of this study align with the broader goals of 21st-century education, emphasizing the development of critical thinking, creativity, collaboration, communication, and problem-solving skills among students. By integrating Design Thinking and Experiential Learning into curriculum design and instructional practices, educators are better equipped to prepare students for success in the digital age, where adaptability, creativity, and innovation are paramount.

21 ST CENTURY SKILLS	CRITICAL THINKING
	CREATIVITY
	COLLABORATION
	COMMUNICATION

Positive Student Feedback

Students overwhelmingly reported positive experiences and perceptions of Design Thinking and Experiential Learning activities. Many students expressed a greater sense of ownership over their learning, a deeper understanding of course content, and increased confidence in their ability to tackle real-world challenges. Additionally, students appreciated the hands-on, interactive nature of these activities, which provided them with practical skills and experiences that are directly applicable to their personal and professional lives.

Alignment with Industry Needs

The integration of Design Thinking and Experiential Learning aligns with the evolving needs of the workforce, where employers increasingly value skills such as creativity, critical thinking, collaboration, and adaptability. By equipping students with these skills, educators are better preparing them for success in a rapidly changing and competitive job market, where innovation and problem-solving abilities are highly sought after.

The overall findings shows how the combination of Design Thinking and Experiential Learning has the capability to change learning from being a process focused mainly on knowledge transfer to a process that is active and learner-centered. While Design Thinking offers a framework for innovation and problem solving, Experiential Learning offers the means through which learners construct, test and refine knowledge through experience and reflection.

RECOMMENDATIONS FOR FURTHER IMPLEMENTATION

The study's findings lead to several key recommendations for effectively implementing Design Thinking and Experiential Learning in educational settings. Ongoing professional development is essential to ensure educators acquire the skills and knowledge needed to utilize these innovative approaches successfully. Adequate investment in resources and infrastructure is vital to support hands-on learning and create effective learning environments. Additionally, establishing collaborative partnerships with industry professionals can offer real-world learning opportunities and connect academic experiences with practical applications. To fully harness the benefits of Design Thinking and Experiential Learning, aligning curriculum, assessment, and learning outcomes with 21st-century skills is crucial.

RECOMMENDATIONS

Investment in Professional Development: Educational institutions should prioritize ongoing professional development opportunities for educators to enhance their knowledge and skills in integrating Design Thinking and Experiential Learning methodologies into their teaching practices. Workshops, seminars, and online courses can provide educators with the necessary training and support to effectively implement these innovative pedagogies in their classrooms.

Creation of Collaborative Learning Spaces

Schools and universities should invest in creating collaborative learning spaces that facilitate hands-on, experiential learning experiences. These spaces should be equipped with flexible furniture, technology tools, and resources to support learner-centered activities, group work, and prototyping exercises. By designing environments that promote creativity, collaboration, and exploration, educators can create a conducive learning environment for implementing Design Thinking and Experiential Learning methodologies.

Integration of Industry Partnerships

Collaboration with industry partners can provide students with authentic learning experiences and real-world applications of Design Thinking and Experiential Learning methodologies. Educational institutions should seek partnerships with local businesses, organizations, and community groups to provide students with opportunities for internships, project-based learning, and mentorship programs. By exposing students to real-world

challenges and industry best practices, educators can better prepare them for success in their future careers.

Alignment of Curriculum and Assessment Practices

Curriculum design and assessment practices should be aligned with the principles of Design Thinking and Experiential Learning to ensure coherence and effectiveness. Educators should design curriculum units and learning experiences that incorporate hands-on, inquiry-based activities, problem-solving tasks, and project-based assessments. Additionally, assessment practices should focus on evaluating students' process skills, critical thinking abilities, and collaborative competencies rather than just content knowledge. By aligning curriculum and assessment practices with the goals of Design Thinking and Experiential Learning, educators can create meaningful learning experiences that promote deeper understanding and engagement among students.

Promotion of a Culture of Innovation

Educational leaders should promote a culture of innovation within their institutions by fostering a supportive environment that values creativity, risk-taking, and continuous improvement. Administrators should encourage educators to experiment with new teaching strategies, technologies, and instructional approaches, providing them with the autonomy and resources to innovate in their classrooms. Additionally, recognition and rewards should be provided to educators who demonstrate exemplary practices in implementing Design Thinking and Experiential Learning methodologies. By fostering a culture of innovation, educational institutions can create an environment where educators and students alike are empowered to explore, create, and innovate.

DISCUSSIONS

The integration of Design Thinking and Experiential Learning emerges as a promising paradigm shift in contemporary education. The findings of this study corroborate the notion that these methodologies are instrumental in cultivating a new generation of learners equipped with the requisite 21st-century skills.

Effects of Design Thinking on Learner Engagement and Experiential Learning

The review of the 16 included articles revealed that through the incorporation of students as proactive agents in problem finding, idea generation, experimentation, prototyping, and reflection, Design Thinking can enhance student engagement and experiential learning. As a result, contrary to being a standalone approach aimed at fostering creativity in learners, Design Thinking seems to offer a framework for turning experiential activities into meaningful learning experiences. It is in line with the study conducted by Razzouk and Shute, where the authors suggested considering Design Thinking as an analytic and creative process that includes experimentation, feedback, and redesign. At the same time,

according to Doğan, the combination of Design Thinking and experiential learning enhanced learner participation, creativity, communication, teamwork, and decision-making. The present review thus extends this research by showing how these two approaches complement each other in the problem-solving process – the framework for solving the problem offered by Design Thinking and learning from experience provided by Experiential Learning. Nonetheless, similarly to Li & Zhan findings stated that the results are highly heterogeneous.

Implications for Innovative Teaching Practices

The results imply that in order to use Design Thinking approach together with Experiential Learning, there is a need for a transition from teacher-focused instruction to learner-centered, cooperative, and problem-oriented instruction. This implies several changes related to curricula design, preparation of teachers, and institutional support. The process of working on real-world problems, iteration of activities, and reflection should become an intentional part of curricula. Creativity, collaboration, problem-solving, and professional development of teachers were considered by Mardiah et al. as important outcomes in the context of Design Thinking approach implementation in education. However, the current review takes another step and claims that these outcomes are possible only if teachers have a skill to promote experiential and iterative learning.

However, the successful implementation of Design Thinking and Experiential Learning is contingent upon several factors. Teacher preparation is pivotal. Educators require adequate training and support to effectively integrate these approaches into their classrooms. Furthermore, institutional support, including resource allocation and infrastructure development, is essential to create conducive learning environments.

CONCLUSION

The present systematic review proves that the integration of Design Thinking and Experiential Learning is a promising model of making teaching an active, reflexive, interactive, and student-centered process. Against this background, the outcomes of the review suggest that Design Thinking is able to provide the structured way of carrying out experiential learning through which students may have the opportunity to get engaged, think critically, be creative, work collaboratively and solve problems. On a pedagogical level, the implementation of the proposed approach will need curriculum reform, teacher training, and institutional commitment. However, because of the lack of literature on this topic and methodological heterogeneity, no strong causal claims can be drawn from the findings.

Future Research scope

In light of these developments, there is a pressing need for future research to explore the evolving landscape of innovative teaching-learning strategies through Design Thinking and Experiential Learning. Longitudinal studies that track the long-term effects of integrating these methodologies on student outcomes, career readiness, and lifelong learning habits are essential to understanding their sustained impact. Additionally, comparative studies that examine the effectiveness of different pedagogical approaches in diverse cultural contexts can shed light on the transferability and scalability of Design Thinking and Experiential Learning practices. Furthermore, research that explores the role of teacher training programs, school leadership, and policy frameworks in supporting pedagogical innovation is crucial for fostering systemic change in education. By addressing these research gaps, scholars can contribute to the ongoing evolution of innovative teaching-learning practices and ensure that all students have access to transformative educational experiences that empower them to thrive in the 21st century and beyond.

Future investigations should focus on various specific contexts to fully understand their effectiveness. For instance, examining how these approaches perform across different age groups can reveal how they impact learners at various stages of their educational journey. Similarly, exploring their application in diverse subject areas will help determine their versatility and effectiveness in various academic disciplines. Furthermore, studying the impact of these methodologies on students from different socioeconomic backgrounds is crucial to ensure that they benefit all learners equitably and identify any necessary adjustments to accommodate varying needs. Also, conducting long-term impact studies is essential to evaluate the enduring effects of Design Thinking and Experiential Learning on student outcomes. These studies should aim to track students over extended periods to assess how well these approaches contribute to their academic achievements, skill development, and overall educational growth. By understanding the long-term benefits and potential challenges associated with these methodologies, educators and policymakers can make informed decisions about their implementation and refinement, ensuring they provide meaningful and sustained improvements in educational practices.

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Improving Cognitive Engagement and Achievement in Biology through PBL: A Mixed Methods Exploration

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ABSTRACT

This study investigates the impact of Problem-Based Learning (PBL) on enhancing student understanding of high school biology, specifically focusing on the topic of biodiversity. This research is grounded in constructivist and inquiry-based pedagogical theory, addressing common issues of low engagement and underachievement in biology classrooms. As Maldivian schools transition toward more active learning paradigms, this study offers timely insight into how student-centered strategies such as PBL might improve both comprehension and motivation. A mixed methods approach was used, involving a single Grade 12 student selected through purposive sampling. Quantitative data were gathered using pre- and post-tests to measure changes in conceptual understanding and engagement. Qualitative data emerged from interviews, reflective discussions, and analysis of student work. The results showed improved student performance, with a 20% increase in post-test scores. The participant demonstrated an enhanced ability to apply biological concepts in unfamiliar contexts. Beyond academic gains, the PBL strategy also fostered metacognitive skills, critical thinking, and development of transferable skills. Student reflections highlighted increased engagement and a deeper connection to the learning process. Despite the single-subject scope and limited sample size, the findings provide compelling evidence supporting the effectiveness of PBL in promoting meaningful, student-centered learning in biology classrooms. The study suggests broader implementation of PBL in Maldivian classrooms and contributes to the literature advocating innovative, inquiry-based approaches in science instruction.

Keywords: Problem-Based Learning (PBL), biology education, constructivism

INTRODUCTION

Biology is an important subject for students who intend to pursue careers in science. However, many high school students do not find biology enjoyable because they often experience it as a subject that requires memorizing a large volume of information. This emphasis on memorization can lead to boredom, reduced concentration, and weaker interest in learning biology (Husna et al., 2023; Wang et al., 2023).

Memorizing concepts without understanding is insufficient because students are then unable to apply knowledge to new scenarios, which is a central goal of science education (Kaminske et al., 2020). Surface-level memorization restricts the deeper knowledge needed for real conceptual change (McDaniel et al., 2022). This transfer gap can persist even in courses designed around active learning and conceptual thinking when students' memorization-based approaches override the intended deep-learning goals (McDaniel et al., 2022).

Transfer of biological concepts requires learning strategies that move students beyond memorization and toward applying knowledge in unfamiliar contexts. This study therefore examines Problem-Based Learning (PBL), a student-centered strategy designed to engage learners in sustained inquiry and deeper learning rather than surface learning (Abugri et al., 2026).

PBL in high school biology has often been studied through short-term quasi-experimental designs, while fewer studies combine quantitative and qualitative approaches (Nurhasanah et al., 2024; Nwankwo et al., 2024). As a result, limitations remain in understanding the transferability of findings and the specific mechanisms through which PBL may shift students away from rote memorization (Akçay & Benek, 2024; Uliyandari et al., 2021).

Biology education faces a persistent tension between surface-level learning and the deep conceptual understanding needed to solve real-world problems and sustain interest in the subject (Honra & Monterola, 2026; Uluçınar, 2023). In the Maldives, this concern is reflected in low achievement in A Level biology; in 2017, only 22% of candidates passed the subject (Ministry of Education, 2017). This combination of limited conceptual engagement and low attainment creates a need to examine learning approaches that may help students connect and apply biological ideas.

The Maldives national curriculum calls for incorporating PBL into lessons to make them interactive (National Institute of Education, 2014). While PBL is a widely recognized student-centered approach that fosters authentic student engagement, its effect on cognitive engagement within biology education remains underexplored (Honra & Monterola, 2026). Furthermore, research on problem solving as a fundamental learning outcome in biology remains limited (Nigussie et al., 2025). Moreover, many existing studies use homogeneous designs (Trullàs et al., 2022). Fewer studies have applied mixed methods specifically to

examine whether PBL shifts students from surface-level learning toward abstract concept building (Adah Miller et al., 2025; Honra & Monterola, 2026). This study examines changes in one Grade 12 student's understanding of biodiversity following participation in Problem-Based Learning. Following with the research question: What changes in one Grade 12 student's understanding of biodiversity are observed following participation in Problem-Based Learning?

A key significance of the current study is its contextual specificity. It adds case-based evidence from a Maldivian classroom to research examining how PBL may support conceptual understanding, higher-order thinking, and active participation in biology lessons. Because PBL is flexible rather than one-size-fits-all, evidence from one curriculum setting does not automatically transfer to another (Ivaningias et al., 2024).

This study is grounded in constructivist and inquiry-based learning theories, which view learning as an active process involving questioning, investigation, evidence use, and reflection (Antonio & Prudente, 2023). PBL applies these principles by placing authentic problems at the center of learning. Through this approach, students identify what they need to know, direct aspects of their own learning, and engage with evidence while the teacher acts as a facilitator (Morris, 2025). In the context of this study, the biodiversity topic demonstrates how these theories can be portrayed within local classroom realities. Therefore, the study contributes not only to understanding whether PBL is effective, but also to explaining how constructivist and inquiry-based teaching can be meaningfully localized in biodiversity education (Iwan et al., 2025; Smith et al., 2022).

REVIEW OF LITERATURE

Origins of Problem-Based Learning

Problem-Based Learning (PBL) was pioneered in the mid-twentieth century at a medical school in Canada as an alternative to traditional lecture-based instruction (Hill & Smith, 2005). Although the approach first took hold in medical education, it has since expanded into general education settings, where it is now applied across disciplines and grade levels (Hill & Smith, 2005).

PBL is defined by Ram et al. (1995) as “a constructivist pedagogy in which students learn science and develop critical thinking skills by solving real-world problems in small groups.” Two features of this definition distinguish it from traditional classroom practices: the learning task is an authentic problem, and students drive the investigation while the teacher facilitates. Hence, PBL activities are student-centered, integrating real-world problem solving in ways that conventional, subject-bound instruction does not (Rubrica, 2019).

The rationale for PBL rests on constructivism, which holds that learners build new understanding by interpreting ideas and information in relation to what they already know and believe (Richardson, 2003). PBL translates this principle into practice by asking students to construct knowledge through problem solving rather than receive finished explanations (Ram et al., 1995). This orientation supports its use in high school science because learners must connect prior knowledge, evidence, and new concepts while developing solutions to authentic problems.

Implementing Problem-Based Learning

Vincent R and Lyons (2015) outline six steps for implementing PBL:

1. Identify the intended learning outcomes and prepare assessments aligned with those outcomes
2. Design the scenario: an authentic, real-world problem embedded in the lesson, constructed so that it generates discussion among students
3. Introduce PBL to students, communicating expectations, assessments, rubrics, and timelines
4. Allow students to research the topic, cover the syllabus specifications, and create a product from their research
5. Have students present their research and their proposed solutions to the problem
6. Evaluate students' work

PBL and cognitive improvement

Recent meta-analyses suggest that PBL produces significant cognitive benefits, although the effects are far from uniform. A meta-analysis of 25 studies found a large overall effect of PBL on critical thinking, moderated by teaching method and subject (Lu et al., 2025). However, a synthesis of 50 studies reported a moderate effect with high heterogeneity and little benefit from short interventions (Liu & Pásztor, 2022). At the secondary level, a meta-analysis of 11 studies reported a large positive effect of PBL on science achievement (Funa & Prudente, 2021). High school biology studies show a similar pattern: PBL improved achievement and retention among students in Nigeria (Usman et al., 2023), and Indonesian students improved in argumentation and critical thinking, but only with metacognitive prompting (Marthaliakirana et al., 2022). This evidence is not uniformly positive, however. A meta-analysis of first-year medical students found no significant advantage of PBL over conventional instruction (Manuaba et al., 2022). Moreover, engagement scores in PBL tutorials show no consistent relationship with academic achievement (Kassab et al., 2023). Notably, most studies of PBL concern higher education, while studies conducted in high schools are short-term quasi-experiments in single schools.

PBL and conceptual understanding

PBL is expected to deepen conceptual understanding, and recent secondary-school studies provide partial support for this claim. An intervention integrating STEM and PBL in Grade 11 biology reported gains in conceptual understanding, although it used a limited pretest–posttest sample (Funa, 2026). Similar gains have been reported in Grade 11 physics (Damanik et al., 2024). However, effect sizes vary across studies, samples are often small, and researcher-developed instruments may measure recall rather than conceptual understanding. Outcomes may also depend on teacher scaffolding; without metacognitive prompts, students have demonstrated weaker argumentation and critical thinking (Marthaliakirana et al., 2022). Because much of this evidence comes from single-design studies, further mixed methods research is needed to examine cognitive engagement and conceptual understanding in specific high school biology contexts.

Conceptual difficulties in biodiversity learning

Biodiversity is a major topic in International Advanced Level (IAL) Biology and is addressed in Unit 2 of the programme. It is defined by Fullick and Sochacki (2018) as the variety of organisms, including the species and genes found in a region. Its interrelated subtopics include biodiversity and endemism, measuring biodiversity, adaptation to a niche, gene pools and genetic diversity, speciation, and conservation. Because IAL examination questions cover most of these subtopics, students must understand the concepts fully and relate them to one another.

Recent research shows that biodiversity is a difficult concept because it spans multiple interacting dimensions. Among 10th-grade students' responses to biodiversity items, 29.41% reflected misconceptions and 20.59% were unanswered (Ilhamdi et al., 2022). A diagnostic survey found that just 7.4% of students fully understood biodiversity, with misconceptions arising when comparing genetic, species, and ecosystem diversity (Purba et al., 2026). Since biodiversity conceptions are stable and resistant to correction, transmission-based teaching is unlikely to be sufficient, requiring a more student-centered approach such as PBL.

Theoretical Framework

This study is grounded in inquiry-based learning (IBL), a learner-centered approach in which learners construct knowledge through questioning, investigation, interaction, reflection, and the application of ideas to meaningful problems. The framework is historically associated with Dewey's emphasis on experience and learning through inquiry. It is also consistent with constructivist principles, which view learners as active participants in the construction of knowledge (Suryati et al., 2024).

PBL is an important approach within IBL because it engages learners with authentic problems. It encourages them to ask questions, investigate evidence, collaborate, develop

explanations, and apply possible solutions. Recent evidence indicates that IBL can improve learning outcomes, although its effectiveness may depend on factors such as educational level, instructional design, and learner engagement (Harleni et al., 2025).

The framework guided the data collection process by directing attention to the learner's questions, participation, interactions, investigations, problem-solving activities, and reflections. Data were therefore collected from the learner's experiences and observable engagement with the inquiry-based activities rather than from final outcomes alone. This approach is consistent with Tshering and Yangden (2021), who examined inquiry-based learning using achievement tests, questionnaires, and classroom observations.

The framework guided the analysis of data, as the participant's responses and observed learning process were examined according to the six-step inquiry-based learning model proposed by Vincent R and Lyons (2015). The analysis focused on evidence of the learner's movement through the stages of problem identification, questioning, investigation, collaboration, reflection, and the development or application of solutions.

During interpretation, the findings were understood in relation to constructivist learning principles. Changes in the learner's responses and participation were interpreted as evidence of how she constructed meaning through experience, inquiry, and reflection.

RESEARCH DESIGN

An action research design was adopted to answer the research question. Sagor (2000) defines action research as a disciplined process of inquiry conducted by and for those taking action. This fits the current study as the study is conducted by the teacher researcher to determine whether PBL improves students' understanding of biodiversity. Action research may be individual, collaborative, school-wide or district-wide (Mertler, 2017). This study follows the individual form, as the research was carried out by the teacher herself.

The study used a mixed methods approach. Quantitative data came from pre- and post-assessments administered before and after the PBL lessons, and the scores were compared descriptively. Qualitative data came from the student's reflections after each task, content analysis of her written work and assessment responses, and observations of her presentations.

The single-student sample and the teacher-researcher's dual role limit generalizability and carry a risk of bias. However, individual action research aims to improve the practitioner's own practice, and validity was maximized through triangulation, with conclusions drawn only where qualitative and quantitative sources converged; through repeated measurements across the intervention; and through reflexivity, with the teacher-researcher monitoring her dual role (Johnson et al., 2020). A detailed description of the context, intervention, and data sources further supports transferability to comparable settings (Kakar et al., 2023).

The target population was high school biology students. The sample consisted of one Grade 12 biology student selected through criterion-based purposive sampling, which aligned with the research aim and supported the trustworthiness of the findings (Campbell et al., 2020). Only one student was selected because data were collected during the examination period and the COVID-19 pandemic, when student availability and access were substantially restricted. Single-participant research is appropriate when one participant can be studied intensively and repeatedly over time because it can provide detailed, context-specific insight, although the findings should not be treated as statistically generalizable to all students (Sandars, 2009).

A pre-assessment and post-assessment were used to gather quantitative data and determine whether the student's understanding improved after the PBL lessons. Each assessment contained seven items covering the biodiversity learning objectives, and the items were reviewed by a subject teacher for content validity before administration (Moskal, 2002). Both assessments were scored using a common marking scheme, and a sample of scripts was re-marked by a subject teacher to confirm scoring consistency and reliability (Moskal, 2002). Sample items are provided in Appendix A.

A semi-structured interview was used to collect qualitative data on the student's cognitive engagement and understanding. The interview prompts were derived from the research question and reviewed by an expert following the recommended phases for developing a rigorous interview guide (Kallio et al., 2016). Open-ended questions were used to generate flexible, in-depth responses (Kallio et al., 2016). Interview findings were triangulated with the pre- and post-assessment results and with analyses of the student's written tasks and reflections. Before the PBL lessons were conducted, written consent was obtained from the participant. The participant was fully informed of the purpose of the research, how it would be conducted, and her role in the study, all of which were stated in the consent form.

A pre-assessment was administered through an online platform and sent to the student via Viber. The student was given 20 minutes to complete and return it. The assessment was marked, and the answers were analyzed. Five PBL lessons on biodiversity were then conducted on different days over a four-week period. After each lesson, the student was assigned a task to complete for the next class, where she presented her work. During these presentations, data were collected on her knowledge of the topic, the quality of her work, and her presentation skills. Each presentation was followed by a reflective discussion that generated qualitative data. Finally, a post-assessment was administered, marked, and analyzed using the same procedures as the pre-assessment.

Because all assessments were completed and submitted online, the researcher could not observe the classroom dynamics, body language, or immediate reactions that would accompany face-to-face administration, and the reduced visibility of non-verbal cues in

online settings can limit what the researcher perceives during data collection (Eklund & Isotalus, 2024). The live presentation sessions in which the student presented her tasks helped offset this by allowing direct observation of her explanations and responses during the study.

Because the researcher served as both teacher and data collector, several safeguards were used to reduce bias. A second teacher independently marked the assessments, and the two sets of scores were compared before the results were finalized. The researcher also kept a reflective journal throughout the study to record expectations and assumptions, supporting reflexivity in the qualitative analysis (Johnson et al., 2020). Findings from the assessments, presentations, and reflective discussions were triangulated, and interpretations from the reflective discussions were verified with the participant through member checking before inclusion in the analysis.

The pre- and post-assessment marks were analyzed using descriptive statistics in Microsoft Excel, and the results were presented in tables and graphs. The qualitative data from the reflective discussions and student work were analyzed using thematic analysis. The analysis followed a systematic coding process. First, the reflective discussions were transcribed and typed in Microsoft Word. Second, the transcripts were read several times to gain familiarity with the data. Third, initial codes were generated by identifying and labeling key terms and meaningful segments in the text. Fourth, related codes were grouped into themes, and the themes were reviewed against the data to ensure that they were internally consistent and supported by the evidence. Finally, each theme was defined, named, and illustrated with excerpts from the transcripts. This step-by-step approach follows the systematic thematic analysis process recommended in recent methodological guidance (Byrne, 2022; Naeem et al., 2023).

To increase the trustworthiness of the study, the coding process was checked by a second reviewer, and the researcher's interpretations were triangulated with the assessment scores and student work (Kakar et al., 2023). Illustrative quotes are used in the findings to ground each theme in the participant's own words.

Ethical considerations

The student received written and oral information about the study before the lessons and the reflective discussions and interview, including its purpose, procedures, and use of data. Participation was voluntary, and informed consent was obtained. The student could refuse to answer any question or withdraw from the study at any time without penalty. Confidentiality was maintained by removing identifying information. Data were stored securely and used only for research purposes. Data were reported in a way that protected the student from identification. Interview recordings and notes were handled confidentially.

Reliability and Validity

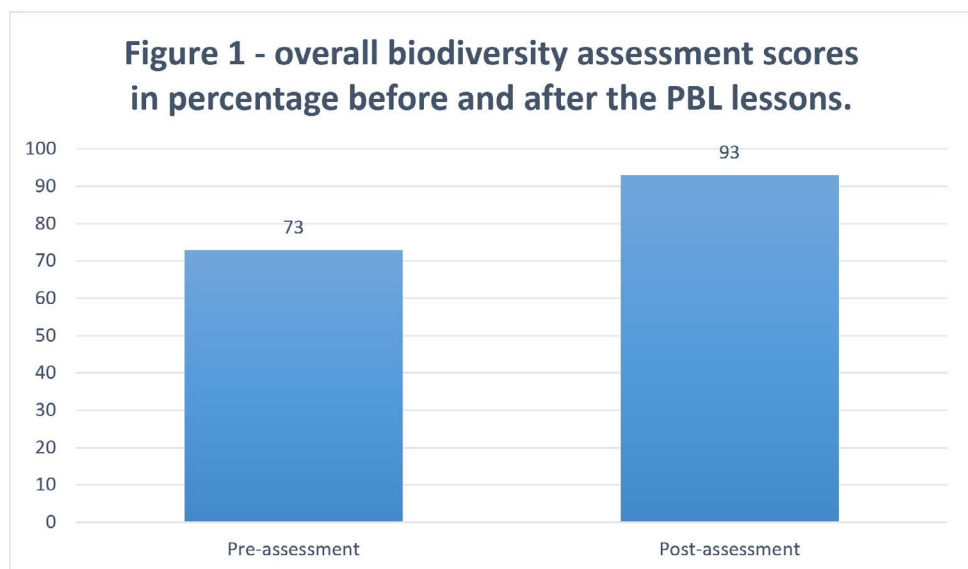
The interview questions were derived from the theoretical framework to ensure that they addressed the research question. The pre- and post-assessments drew items directly from Edexcel examination papers, aligning the test content with the assessed curriculum and supporting content validity. Assessment scores were triangulated with qualitative data from the reflective discussions, interview, and student work, thereby strengthening the credibility of the conclusions (Kakar et al., 2023b).

Because the study involved a single participant, reliability was addressed through consistency in measurement and analysis. Both assessments were scored using a common marking scheme, and a second high school biology teacher independently marked the tests to reduce the influence of researcher bias. A second reviewer also checked the coding of the qualitative data.

FINDINGS

Quantitative data

The student's overall score improved from 73% in the pre-assessment to 93% in the post-assessment, a gain of 20 percentage points (Figure 1). Because the study involved a single participant, these results are reported descriptively and are not subjected to inferential statistical analysis. Therefore, no claims of statistical significance are made.



An item-level comparison shows where improvement occurred. In both assessments, the student scored well on lower-level items testing factual knowledge of biodiversity, such as species concept, adaptation and endemism. On higher-level items requiring the connection of multiple biodiversity concepts, the student scored 2/6 in the pre-assessment but 5/6 in the post-assessment, an improvement of 50%. The largest gains were on items addressing speciation, which improved from 30% to 80%. These descriptive patterns suggest that the student was better able to link different biodiversity concepts after PBL lessons, consistent with the qualitative findings below.

Qualitative data

The qualitative data came from the student's presentations, written work, reflections, and interview. Following the systematic coding process described in the data analysis section, the interview transcript, reflective discussion records, and student work were read repeatedly, initial codes were generated, and related codes were grouped into candidate themes. Four themes were identified and reviewed against the data to confirm that they were supported by the evidence: understanding of the topic, metacognitive abilities, development of transferable skills, and attitude.

During coding, the initial codes clustered into four recurring groups. Codes such as "links concept to context," "gives relevant examples," and "makes inferences" formed the theme of understanding the topic; codes such as "identifies own misconceptions" and "relates learning to local context" formed metacognitive abilities; codes such as "learns new software features," "phrases searches," and "cites sources" formed the development of transferable skills; and codes such as "shows interest" and "prefers this way of learning" formed attitude. Each theme is described below with supporting evidence and the student's own words.

Understanding the topic

This theme captures the student's grasp of biodiversity concepts and her ability to connect and apply them. In the pre-assessment, she struggled to connect concepts and relate content to contextual questions, which cost her marks. In the post-assessment, she integrated multiple concepts and related them to context, and her score rose from 73% to 93%. Her presentations showed the same pattern: she produced information-rich work, explained most research questions clearly, and linked relevant examples to the content taught in class. From this understanding, she made inferences, judgments, and suggestions on biodiversity issues.

"Finding information on my own to do this task was very helpful. I was able to read a lot of information, unlike the notes given by Miss. Also, when you give notes, students won't bother reading more about it."

Learning biodiversity through real-world scenarios made the topic more meaningful to her and encouraged her to take responsibility for her own learning, which may explain why she read beyond what was assigned. This is consistent with research showing that PBL encourages a deep rather than surface approach to learning by requiring students to engage with information at multiple levels and in greater depth than traditional teaching (Fox, 2010). Because exam questions are often set in unfamiliar contexts, PBL can broaden students' knowledge so they can answer questions based on contexts they have not seen before.

Metacognitive abilities

This theme captures the student's awareness of her own learning and thinking. Metacognition refers to thinking about thinking, becoming aware of one's own learning and growth (Flavell, 1979). The student related what she learned to biodiversity in the Maldives, identifying similar environmental conditions in the Maldives and Australia, and reasoned about why animals in the Maldives show particular adaptations. She recognized the importance of conserving Maldivian biodiversity and proposed solutions to its decline, showing comprehension that supported critical thinking and problem solving.

“While researching the peppered moth and the Industrial Revolution, I realized I had a few misconceptions about mutation and natural selection.”

Her ability to identify her own misconceptions through research is direct evidence of metacognitive growth. This finding aligns with research showing that PBL improves students' metacognitive abilities alongside their understanding of a topic (Jannah et al., 2025).

Development of transferable skills

This theme captures the new skills the student acquired during the PBL lessons. Transferable skills are defined by the Organisation for Economic Co-operation and Development (OECD) as “the bundle of knowledge, attributes and capacities that can be learned and that enable individuals to successfully and consistently perform an activity or task and can be built upon and extended through learning” (Pearson Education Limited, 2020). The student learned to search for relevant information, phrase searches to obtain the results she needed, cite sources, separate syllabus content from extra information, and align it with learning outcomes.

“I didn't know how to use some features of PowerPoint before, like how to send back pictures. To do this presentation, I googled and learnt it.”

She also learned to use features of Microsoft applications by searching the web. The PBL tasks required her to move beyond her existing skills and develop research, digital-literacy, critical-thinking, and problem-solving practices that may be useful in future study

and work. This finding is consistent with research showing that PBL can motivate learning about sustainability and support transferable-skill development (Overton & Randles, 2015). In the present case, these skills also helped the student organize information and construct contextually relevant answers in biology.

Attitude

This theme captures the student's engagement and disposition toward learning biology. Although the student was in high school, she appeared uninterested and unmotivated in face-to-face classes, sometimes sleeping during explanations, and this pattern was confirmed in the interview. Despite being conducted online and with a single participant, the PBL lessons motivated her to learn the biodiversity topic because she was interested in the tasks. Her curiosity led her to learn more than expected, helped her retain information, and led her to express a clear preference for learning biology through this method.

"I think learning like this will help me to remember the information for a longer period of time. Also, in exams, we get questions relating to species we know nothing about. So this method will help me to attend these questions too."

This shift in attitude is consistent with research showing that PBL significantly improves student attitudes toward science, problem-solving skills, and views of the learning environment (Ferreira & Trudel, 2012). PBL can therefore help teachers engage students in learning complex topics such as biodiversity.

DISCUSSION

The current action research study examined changes in a Grade 12 student's understanding of biodiversity following participation in PBL. The findings also documented related changes in her performance on higher-order assessment items, metacognitive awareness, transferable skills, and attitude toward learning biology. The discussion considers how features of PBL may have contributed to these observed changes.

The central mechanism is that PBL replaced passive reception of content with active, self-directed construction of knowledge, which is central to inquiry-based learning. Recent evidence shows that PBL and deep-learning approaches significantly improve students' active and independent learning, both directly and through self-regulated learning (Tamami et al., 2025). The open-ended, real-world tasks required the student to locate, evaluate, and integrate information from multiple sources, which forced deeper processing than teacher-delivered notes and explains the depth of understanding she demonstrated (Funa & Prudente, 2021). Because the problems were contextual rather than abstract, the student had to connect biodiversity concepts to real situations, precisely the kind of integration that higher-order questions demand and that her post-assessment performance reflected.

A second mechanism is autonomy and ownership, which are central to inquiry-based learning. Being responsible for her own research shifted the student from a passive recipient to an active agent in her learning. A meta-analysis of PBL across disciplines found a significant effect on self-directed learning compared with lecture-based instruction, with personal autonomy showing the strongest effect (Leary, 2021). This likely explains her motivation and the fact that she read beyond what was assigned. Therefore, when learners direct their own inquiry, they may invest more in both the process and the outcome.

Her metacognitive growth, evidenced by identifying her own misconceptions about mutation and natural selection, follows from the same inquiry process. When learners generate and evaluate their own knowledge, they become aware of gaps in it. This is consistent with quasi-experimental evidence that PBL significantly improves high school students' metacognitive skills alongside their biology concept achievement (Jannah et al., 2025b).

The development of transferable skills (research, digital literacy, and critical thinking) and the positive shift in attitude are also consistent with the inquiry-based learning literature. PBL has been shown to significantly improve student attitudes toward science, problem-solving skills, and positive views of the learning environment (Funa & Prudente, 2021).

LIMITATIONS

The study was conducted with a single student, so the findings are case-specific and cannot be generalized to all students or used to determine how PBL would function with a whole class. Because the study did not include a comparison condition, the observed changes cannot be attributed solely to PBL; they may also reflect repeated assessment, teacher support, or the participant's individual characteristics. The teacher-researcher's dual role and reliance on one participant's self-reported reflections may also have influenced the qualitative findings, despite the use of triangulation, second marking, and second reviewer. In addition, the lessons were delivered online via Google Meet rather than in a physical classroom, and the untimed tasks were completed at the student's convenience. It therefore remains uncertain whether similar activities and outcomes could be achieved with approximately 30 students during a standard 45-minute school period. These constraints mean that the findings should be interpreted as promising, context-specific evidence from one case rather than proof of effectiveness.

ACTION PLAN

- Increase the sample size. Future studies should include a full class (25 to 30 students) rather than one participant, and ideally multiple classes, so findings can be compared across groups and generalization claims become defensible.

- Use multi-site implementation. Conducting the same PBL design across several schools (two or three secondary schools) would show whether the effects hold in different settings and student populations, strengthening the external validity of results.
- Use group tasks. Assigning collaborative group tasks distributes the workload and mirrors real classroom conditions, testing how PBL functions with interdependent learners.
- Provide clear task instructions. Each task should come with detailed instructions and explicit teacher expectations, so students are not confused about the quality of work required.
- Teach information-search skills in advance. Before beginning the tasks, students should learn how to formulate searches, evaluate relevance, and identify sources aligned with the learning outcomes.
- Include recommended sources. Attaching suggested sources to each task guides students toward content aligned with the learning outcomes.
- Time the lessons. Future implementation should follow a fixed schedule to test whether tasks can be completed within the standard lesson period.

IMPLICATIONS

Although the findings cannot be generalized to a mixed-ability class of approximately 30 students, they identify practices worth evaluating in broader classroom settings. Meaningful PBL tasks may support attentiveness and, when combined with collaboration, may contribute to a constructivist learning environment and more positive attitudes toward biology. Similar designs may also be explored in other science subjects, business, and the arts, where authentic problems can help connect disciplinary content to practical contexts. These possibilities require further classroom-based evaluation before claims about effectiveness or transfer across subjects can be made.

CONCLUSION

The study provides an affirmative answer to its research question for the participant: following the PBL intervention, she demonstrated stronger conceptual understanding of biodiversity, improved performance on higher-order assessment items, and a more positive attitude toward biology. These outcomes are consistent with PBL's emphasis on active, self-directed, and context-rich inquiry, which may support conceptual understanding, metacognitive and transferable skills, and motivation. Given the constraints of a single-participant online intervention, the findings support further classroom-based implementation and evaluation of PBL using differentiated and collaborative tasks, larger and more varied samples, and standard lesson timings.

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Assessing School Readiness in Sri Lanka: A Baseline Study for a Play-Based Child-to- Child Transition Programme

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ABSTRACT

The transition from preschool to primary education is a critical stage in children's educational development, yet context-specific baseline evidence on school readiness remains limited in Sri Lanka. This study assessed preschool children's readiness before the implementation of a play-based Child-to-Child (C2C) transition programme and examined how baseline evidence can inform context-responsive transition support. A mixed-methods baseline assessment was conducted with 149 children aged 4-6 years from 10 preschools in the Western Province of Sri Lanka selected through convenience sampling. Structured assessment instruments measured literacy, numeracy, and socio-emotional skills, while preschool teachers provided qualitative observations. Quantitative data were analysed using frequencies and percentages, and teacher observations were analysed thematically. Overall readiness was high: 94.6% of children were classified as Fully Ready in numeracy, 90.6% in literacy, and 85.9% in socio-emotional skills. Gender differences were generally small, although boys showed lower socio-emotional readiness than girls. Children in the semi-urban preschools included in the study showed comparatively lower literacy and socio-emotional readiness than those in the urban and rural settings. Teacher observations highlighted needs in self-management, turn-taking, conflict resolution, and responsible decision-making. The findings provide a baseline for tailoring the C2C intervention and for subsequent evaluation. More broadly, the study demonstrates the value of context-specific readiness assessment for designing play-based, peer-supported transition programmes in settings where locally grounded evidence is limited.

Keywords: school readiness; Child-to-Child (C2C) approach; play-based learning; socio-emotional skills; baseline assessment

INTRODUCTION

The transition from preschool to primary school is a critical stage in a child's educational development and is associated with later academic achievement, social adjustment, and school engagement. A successful transition can support children's learning and well-being, whereas difficulties during this period may affect their long-term educational experiences. As a result, increasing attention has been given to approaches that support school readiness and facilitate positive transitions to formal schooling.

Play-based learning is widely recognized as an effective approach for promoting children's cognitive, social, emotional, and language development during the early years. Similarly, peer-supported learning approaches have been found to enhance children's participation, communication, and collaborative learning experiences. The Child-to-Child (C2C) approach combines these principles by encouraging children to learn through interaction, cooperation, and peer support. This approach has been increasingly applied in educational settings to promote engagement and facilitate learning among young children.

Despite growing interest in school readiness and transition programmes, evidence on preschool children's readiness in Sri Lanka before the introduction of transition interventions remains limited. This creates a practical problem for programme design: without a clear baseline, it is difficult to determine which competencies are already well established, which require targeted support, and whether later changes can reasonably be assessed against pre-intervention conditions. Baseline evidence is particularly important for a Child-to-Child approach because peer-supported and play-based activities need to respond to children's existing literacy, numeracy, and socio-emotional capacities rather than assume a uniform level of readiness.

This study therefore presents a baseline assessment conducted as part of the Scaling Impact of a Play-Based Child-to-Child Approach to Make Preschool to Primary School Transition Fun and Inclusive initiative in the Western Province of Sri Lanka. The assessment examined readiness across literacy, numeracy, and socio-emotional skills among 149 children attending 10 preschools. In addition to informing the Sri Lankan intervention, the study contributes to the wider discussion on school transition by illustrating how context-specific readiness evidence can guide the design and later evaluation of play-based, peer-supported programmes in education systems where locally grounded baseline data are limited.

The study aimed to assess the school readiness of preschool children prior to implementation of the Child-to-Child transition programme. Specifically, it sought to examine baseline levels of literacy, numeracy, and socio-emotional skills among participating children; explore variations in readiness across gender and geographical location; identify strengths and areas requiring support to inform programme content,

pedagogical approaches, and support mechanisms; provide evidence to guide the design of play-based transition activities; and establish benchmark data for evaluating change during subsequent assessments.

LITERATURE REVIEW

2.1 School Readiness and Transition to Primary Education

The transition from preschool to primary school is widely recognized as a critical period in children's educational development. This transition involves not only entering a new learning environment but also adapting to different expectations, routines, social relationships, and learning experiences. Research has consistently demonstrated that children's readiness for school is associated with later academic achievement, social adjustment, and overall educational success (Pianta & Cox, 2002). Consequently, school readiness has become an important focus within early childhood education and educational policy across many countries.

School readiness is generally viewed as a multidimensional construct encompassing children's literacy, numeracy, physical, cognitive, social, and emotional competencies. Contemporary perspectives emphasize that readiness should not be limited to academic preparedness alone. Rather, children should possess a range of skills that enable them to participate meaningfully in classroom activities, interact positively with peers and teachers, regulate their behaviour, and adapt to new learning environments. Children who enter school with stronger readiness skills are more likely to experience positive educational outcomes, whereas those with limited readiness may encounter difficulties in learning, participation, and adjustment.

Among the various dimensions of school readiness, literacy, numeracy, and socio-emotional skills are considered particularly important during the transition to formal schooling. Early literacy skills provide the foundation for communication, language development, and later academic learning. Similarly, numeracy skills contribute to children's understanding of mathematical concepts and problem-solving abilities. Socio-emotional competencies such as self-awareness, self-regulation, cooperation, empathy, and responsible decision-making support children's ability to function effectively within classroom environments and establish positive relationships with others. Research indicates that these domains are interrelated and collectively influence children's readiness to engage successfully in primary education.

2.2 Play-Based Learning and School Readiness

Play-based learning has long been recognized as a developmentally appropriate approach to early childhood education. Through play, children actively construct knowledge, explore their environment, solve problems, and develop social relationships. Unlike highly

structured instructional approaches, play-based learning provides opportunities for children to learn through meaningful experiences that are relevant to their developmental needs and interests.

Studies have shown that play contributes significantly to children's language development, creativity, critical thinking, social competence, and emotional regulation. Through collaborative play activities, children learn to communicate, negotiate, share, take turns, and resolve conflicts. These experiences contribute directly to the development of skills required for successful school participation. Consequently, play-based approaches are increasingly promoted as effective strategies for supporting school readiness and facilitating children's transition to formal education.

Furthermore, play-based learning may be particularly valuable during periods of educational transition. Entering primary school can be associated with anxiety, uncertainty, and adjustment challenges for young children. Play-based activities provide opportunities for children to become familiar with new routines, develop confidence, and establish positive peer relationships in supportive learning environments. As a result, many contemporary transition programmes incorporate play-based pedagogies as a means of promoting both academic and socio-emotional readiness.

2.3 Child-to-Child Learning Approach

The Child-to-Child (C2C) approach is a participatory learning model that encourages children to learn from and support one another through collaborative activities and peer interaction. Originating as a child-centred educational strategy, the approach is based on the principle that children are active contributors to learning rather than passive recipients of knowledge. Through peer teaching, shared problem-solving, and collaborative participation, children are encouraged to take responsibility for their own learning while supporting the learning of others.

The theoretical foundations of the Child-to-Child approach can be linked to both Social Learning Theory and Sociocultural Theory. Bandura (1977) emphasized the importance of observation, modelling, and social interaction in learning, while Vygotsky (1978) highlighted the role of social engagement and peer support in children's cognitive development. From these perspectives, interaction with more knowledgeable peers can facilitate learning and promote the development of new skills.

Research examining Child-to-Child approaches has reported positive outcomes in a variety of educational contexts. Studies have found that peer-supported learning can enhance communication skills, self-confidence, participation, leadership, problem-solving abilities, and social responsibility (Farrokhmanesh et al., 2018; Hamdon & Evans, 2022). Child-to-Child approaches have also been used successfully in health education, life-skills development, and community-based learning programmes. Importantly, the collaborative

and participatory nature of the approach aligns closely with the developmental needs of young children and the principles of play-based learning.

Within transition programmes, the Child-to-Child approach has the potential to support children's adjustment to school by creating opportunities for peer interaction, social support, and shared learning experiences. Through engagement with peers, children may develop both academic competencies and socio-emotional skills that contribute to successful participation in formal education.

2.4 Theoretical Perspective and Research Gap

The present study is informed by Bronfenbrenner's Ecological Systems Theory and Vygotsky's Sociocultural Theory. Bronfenbrenner (1979) emphasized that children's development is influenced by interactions within multiple environmental systems, including families, schools, communities, and broader social contexts. School readiness and transition experiences are therefore shaped not only by individual characteristics but also by the quality of support available within these interconnected systems. Vygotsky's theory further highlights the importance of social interaction and collaborative learning in children's development, providing a strong theoretical basis for peer-supported approaches such as Child-to-Child learning.

Although international research has highlighted the importance of school readiness and demonstrated the potential benefits of play-based and Child-to-Child approaches, empirical evidence within the Sri Lankan context remains limited. In particular, little is known about the readiness levels of preschool children prior to the implementation of transition interventions. Furthermore, baseline evidence is needed to identify children's strengths and areas requiring support, inform programme design, and provide benchmarks for evaluating programme effectiveness. This study addresses this gap by assessing literacy, numeracy, and socio-emotional readiness among preschool children before the implementation of a play-based Child-to-Child transition programme in the Western Province of Sri Lanka.

3. METHODOLOGY

3.1 Research Design, Setting and Participants

This study employed a mixed-methods baseline assessment design to examine children's school readiness prior to implementation of the project, Scaling Impact of a Play-Based Child-to-Child (C2C) Approach to Make the Transition from Preschool to Primary School Fun and Inclusive. The study combined quantitative assessments of literacy, numeracy, and socio-emotional skills with qualitative teacher observations to obtain a comprehensive understanding of children's readiness for the transition to primary education. The baseline findings were intended to inform programme planning, identify areas requiring support, and establish benchmark data for evaluating programme outcomes.

The study was conducted in ten preschools located in the Western Province of Sri Lanka. A total of 149 children aged between 4 and 6 years participated in the assessment. All eligible children enrolled in the selected preschools were included in the study. The participants represented urban, semi-urban, and rural settings, allowing for comparisons across different geographical contexts.

In addition to the child assessments, qualitative information was gathered through teacher observations to provide contextual insights into children's developmental strengths and challenges, particularly in relation to socio-emotional competencies.

A convenience sampling strategy was employed to select preschools participating in the project. The selected preschools represented diverse educational and geographical contexts within the Western Province and were considered suitable for implementing the Child-to-Child intervention. All children within the target age range who were enrolled in the selected preschools were assessed, resulting in a total sample of 149 children.

3.2 Assessment Instruments and Procedures

The baseline assessment utilized a set of school readiness instruments developed and adapted specifically for the objectives of the Child-to-Child transition programme. The instruments were designed to assess three core domains of school readiness: literacy, numeracy, and socio-emotional skills.

The instrument development process involved two stages: a Tool Adaptation Workshop and a Tool Validation Workshop. These workshops brought together preschool teachers, early childhood education specialists, university academics, project staff, and other relevant stakeholders. The purpose of the workshops was to review the content, developmental appropriateness, cultural relevance, inclusiveness, and clarity of the assessment tools.

Particular attention was given to ensuring that the instruments reflected the Sri Lankan context and were suitable for children from diverse linguistic, social, and educational backgrounds, including children from vulnerable groups. Feedback obtained during the workshops was used to revise and refine the instruments. The final versions were translated into Sinhala and Tamil to facilitate implementation across different language groups.

The instruments were validated through expert review and stakeholder consultation during the adaptation and validation workshops. No statistical measures of reliability or validity were calculated as part of the baseline assessment process.

- School readiness was assessed across three domains: literacy, numeracy, and socio-emotional skills.
- The literacy assessment evaluated six dimensions: Speaking and Listening, Reading and Viewing, Writing and Representing, Language Structures and Features, Skills and Strategies, and Communicative Purpose.

- The numeracy assessment examined four dimensions: Number Concepts, Length, Mass and Capacity, Positions and Directions, and Mathematical Process Skills.
- The socio-emotional skills assessment evaluated five dimensions: Self-Awareness, Self-Management, Social Awareness, Relationship Skills, and Responsible Decision-Making.

Together, these domains provided a comprehensive assessment of children's readiness for participation in formal schooling.

Data collection was conducted over a period of three weeks by trained enumerators. Prior to field implementation, enumerators participated in a training programme that familiarized them with the assessment tools, administration procedures, data recording protocols, and approaches to capturing Gender Equality and Inclusion (GEI) indicators. The training also emphasized the importance of collecting data consistently across different social and demographic groups.

Each child was individually assessed using a combination of structured tasks, observations, and age-appropriate activities. The assessment process was designed to capture children's competencies across literacy, numeracy, and socio-emotional domains in a child-friendly manner.

In addition to the quantitative assessments, teachers provided qualitative observations regarding children's behaviours, interactions, strengths, and developmental challenges. These observations offered valuable contextual information that complemented the quantitative findings.

Each assessment dimension was scored using a three-point readiness scale:

- **3 = Fully Ready (FR):** Demonstrates consistent mastery of age-appropriate skills and concepts within the dimension.
- **2 = Developing (D):** Demonstrates emerging understanding and inconsistent application of skills and requires some support to achieve full readiness.
- **1 = Needs Support (NS):** Requires significant guidance and intervention to develop foundational skills within the dimension.

Scores were aggregated across dimensions to determine readiness levels within each domain and to generate overall school readiness profiles for the participating children.

3.3 Data Analysis

Quantitative data were analysed using descriptive statistical techniques. Frequencies and percentages were calculated for each readiness category (Fully Ready, Developing, and Needs Support) across the literacy, numeracy, and socio-emotional skill domains. Comparisons were conducted by gender and geographical location (urban, semi-urban, and rural) to identify patterns and disparities in school readiness.

Qualitative data from teacher observations were analysed thematically. Observations recorded in Sinhala and English were reviewed and organized according to the five socio-emotional skill dimensions: Self-Awareness, Self-Management, Social Awareness, Relationship Skills, and Responsible Decision-Making. Recurring patterns, behaviours, and developmental concerns were identified and grouped into themes. These qualitative findings provided contextual explanation and enriched the interpretation of the quantitative results.

3.4 Ethical Considerations

Approval to conduct the study was obtained from the Western Provincial Department of Education prior to data collection. Permission was also obtained from the participating preschool authorities. Informed consent was obtained from parents or guardians before children participated in the assessment. Participation was voluntary, and all information collected was treated confidentially. No identifying information was included in the analysis or reporting of findings. Data were used solely for research and programme development purposes related to the Child-to-Child transition initiative.

4. RESULTS

4.1 Quantitative Findings

Figure 1: Overall Readiness Levels Across Domains

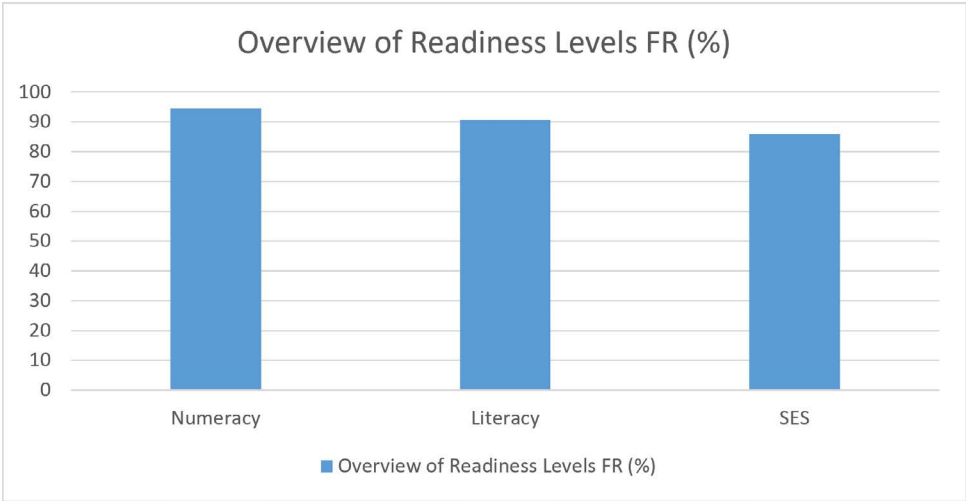


Figure 1 presents overall school readiness across the three assessed domains. Numeracy demonstrated the highest level of readiness, with 94.6% of children classified as Fully Ready, followed by literacy (90.6%) and socio-emotional skills (85.9%). The proportion classified as Developing ranged from 5.4% in numeracy to 10.7% in socio-emotional skills, while 3.4% were classified as Needs Support in socio-emotional skills. This pattern indicates that the intervention can build on relatively strong foundational academic readiness while giving particular attention to socio-emotional competencies.

4.1.1 Overall School Readiness

Table 1: Overall School Readiness Across Domains

Skill Domain	FR (%)	D (%)	NS (%)
Numeracy	94.6	5.4	0
Literacy	90.6	9.4	0
SES	85.9	10.7	3.4

4.1.2 School Readiness by Gender

Figure 2: School Readiness by Gender

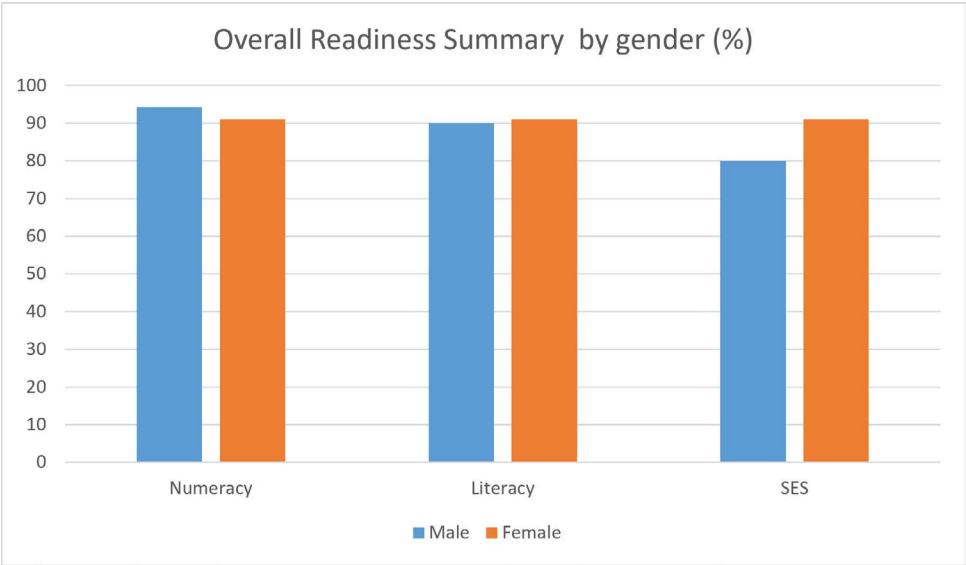


Table 2: School Readiness by Gender

Gender	Numeracy FR	Literacy FR	SES FR
Male	94.3%	90.0%	80.0%
Female	91.1%	91.1%	91.1%

Table 2 presents school readiness levels by gender. Both male and female children demonstrated high readiness across literacy and numeracy. Male children recorded Fully Ready levels of 94.3% in numeracy, 90.0% in literacy, and 80.0% in socio-emotional skills. Female children recorded 91.1% Fully Ready in numeracy, literacy, and socio-emotional skills. The largest observed gender difference was therefore in socio-emotional readiness. As the analysis is descriptive, these percentages indicate a pattern within the study sample rather than a statistically established gender effect.

4.1.3 School Readiness by Location

Table 3: School Readiness by Location

Location	Numeracy FR	Literacy FR	SES FR
Urban (48)	95.8%	93.8%	87.5%
Semi-urban (38)	97.4%	78.9%	71.1%
Rural (63)	92.1%	95.2%	93.7%

Table 3 presents school readiness levels by geographical location. Numeracy readiness was high across the three locations, ranging from 92.1% to 97.4%. Literacy readiness was highest among children in rural preschools (95.2%) and lowest among children in semi-urban preschools (78.9%). Socio-emotional readiness followed a similar pattern, with 93.7% Fully Ready in rural settings and 71.1% in semi-urban settings. These descriptive differences identify the semi-urban sites in this sample as settings where literacy and socio-emotional support may warrant particular attention; the baseline design does not establish why these differences occurred.

Figure 3: School Readiness by Location

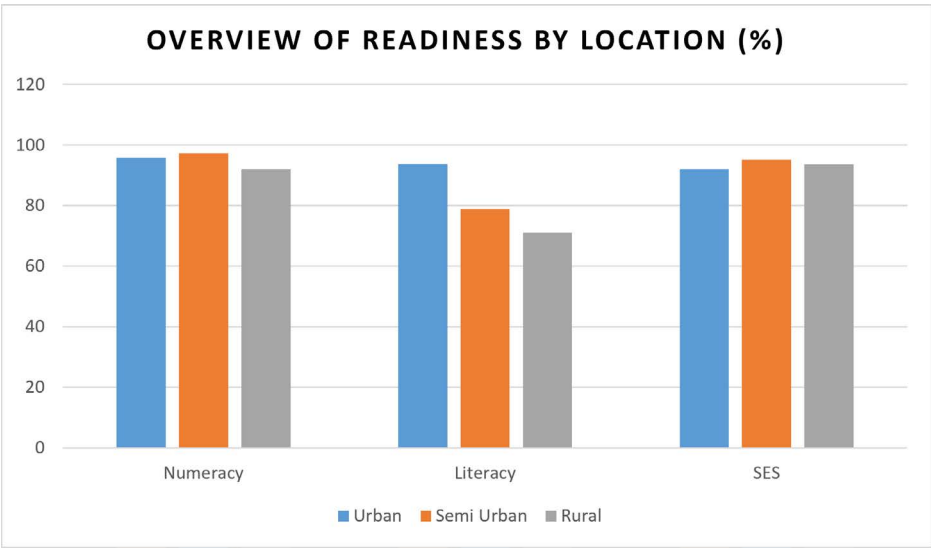


Table 4: Numeracy Readiness by Dimension

Dimension	Fully Ready (FR)	%	Developing (D)	%	Needs Support (NS)	%
1. Number Concept	138	92.6	11	7.4	0	0.0
2. Length, Mass and Capacity	139	93.3	10	6.7	0	0.0
3. Positions and Directions	138	92.6	11	7.4	0	0.0
4. Mathematical process skillsMathematical process skills	139	93.3	10	6.7	0	0.0

4.1.4 Numeracy Readiness

Table 4 presents children's readiness across the four numeracy dimensions. The highest level of readiness was observed in Length, Mass and Capacity and Mathematical Process Skills, with 93.3% of children classified as Fully Ready in each dimension. Number Concept and Positions and Directions both recorded 92.6% of children as Fully Ready. The proportion of children classified as Developing ranged from 6.7% to 7.4%, while no children were classified as Needs Support in any of the numeracy dimensions. The consistently high scores across the four dimensions suggest that numeracy was a relative strength at baseline and may require consolidation rather than broad remedial emphasis in the transition programme.

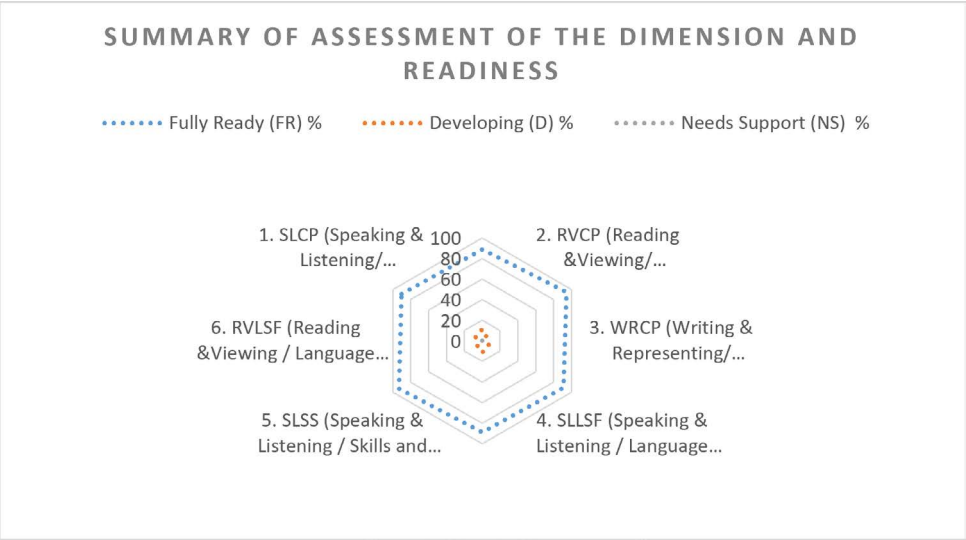
Table 5: Literacy Readiness by Dimension

Dimension	Fully Ready (FR)	%	Developing (D)	%	Needs Support (NS)	%
1. SLCP (Speaking & Listening/ Communicative Purpose)	132	88.6	17	11.4	0	0.0
2. RVCP (Reading & Viewing/ Communicative Purpose)	140	94.6	8	5.4	1	0.7
3. WRCP (Writing & Representing/ Communicative Purpose)	134	89.9	13	8.7	2	1.3
4. SLLSF (Speaking & Listening / Language Structures and Features).	132	88.6	17	11.4	0	0.0
5. SLSS (Speaking & Listening / Skills and Strategies)	138	92.6	11	7.4	0	0.0
6. RVLSF (Reading & Viewing / Language Structures and Features)	133	88.6	13	8.7	3	2.0

4.1.5 Literacy Readiness

Table 5 presents children's readiness across the six literacy dimensions. The highest level of readiness was observed in Reading and Viewing/Communicative Purpose (94.6%), followed by Speaking and Listening/Skills and Strategies (92.6%). Writing and Representing/Communicative Purpose recorded 89.9% Fully Ready, while Speaking and Listening/Communicative Purpose, Speaking and Listening/Language Structures and Features, and Reading and Viewing/Language Structures and Features each recorded 88.6%. Developing classifications ranged from 5.4% to 11.4%. Needs Support was recorded for Reading and Viewing/Communicative Purpose (0.7%), Writing and Representing/Communicative Purpose (1.3%), and Reading and Viewing/Language Structures and Features (2.0%). The variation across dimensions suggests that transition activities should retain broad literacy support while placing additional emphasis on language structures, communicative use, and emergent writing.

Figure 5: Literacy Readiness Across Assessed Dimensions



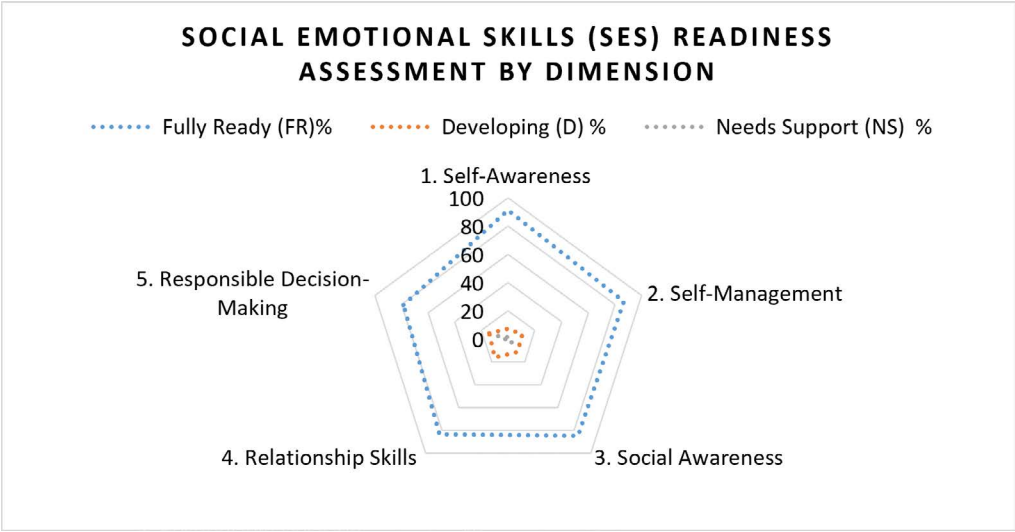
4.1.6 Socio-Emotional Skills (SES) Readiness

Table 6: Socio-Emotional Skills Readiness by Dimension

Dimension	Fully Ready (FR)	%	Developing (D)	%	Needs Support (NS)	%
1. Self-Awareness	136	91.3	11	7.4	2	1.3
2. Self-Management	129	86.6	16	10.7	4	2.7
3. Social Awareness	126	84.6	17	11.4	6	4.0
4. Relationship Skills	124	83.2	24	16.1	1	0.7

Table 6 presents children's readiness across the five socio-emotional skill dimensions. Self-Awareness recorded the highest level of readiness, with 91.3% of children classified as Fully Ready, followed by Self-Management (86.6%) and Social Awareness (84.6%). Relationship Skills recorded 83.2% of children as Fully Ready, while Responsible Decision-Making showed the lowest readiness level at 77.2%. The proportion of children classified as Developing ranged from 7.4% to 16.1% across the dimensions. The highest percentage of children classified as Needs Support was observed in Responsible Decision-Making (7.4%), followed by Social Awareness (4.0%) and Self-Management (2.7%). The comparatively lower readiness in Responsible Decision-Making and Relationship Skills identifies these competencies as priority areas for play-based and peer-supported transition activities.

Figure 6: Socio-Emotional Skills Readiness by Dimension



In addition to the quantitative findings, qualitative observations were collected from preschool teachers to provide contextual insights into children's readiness for school transition.

4.2 Qualitative Findings from Teacher Observations

Teacher observations provided additional insights into children's readiness for school transition. Teachers generally reported that children demonstrated confidence in participating in classroom activities and interacting with peers. Most children were able to follow classroom routines and engage in collaborative learning activities with minimal support.

However, teachers also identified areas requiring further development, particularly in relation to self-management, turn-taking, conflict resolution, and responsible decision-making. Some children experienced difficulties maintaining attention during activities, regulating emotions, and considering the consequences of their actions. Teachers further noted that while most children interacted positively with peers, a small number required additional support to develop cooperation and problem-solving skills during group activities.

Overall, the qualitative findings supported quantitative results, particularly the comparatively lower readiness levels observed in the socio-emotional domain. These findings suggest the importance of incorporating activities that strengthen self-regulation, social interaction, and decision-making within school transition programmes.

DISCUSSION AND IMPLICATIONS

The present study examined baseline school readiness before implementation of a play-based Child-to-Child (C2C) transition programme in the Western Province of Sri Lanka. Participating children showed high overall readiness in numeracy and literacy, while socio-emotional readiness was comparatively lower. These findings extend the Sri Lankan evidence base by identifying both competencies on which the intervention can build and areas requiring targeted support. They also reinforce the multidimensional view of school readiness described in the literature: readiness for primary education involves not only academic foundations but also the social and emotional capacities needed to participate, cooperate, regulate behaviour, and adapt to new classroom expectations (Pianta & Cox, 2002).

Numeracy emerged as the strongest domain, with 94.6% of children classified as Fully Ready overall and more than 92% Fully Ready in each assessed numeracy dimension. This provides a strong baseline foundation for transition activities involving counting, measurement, spatial concepts, and mathematical processes. The result is consistent with the broader literature emphasizing the importance of early academic competencies for later school participation and achievement (Pianta & Cox, 2002). However, because this study used descriptive baseline data, the findings should be interpreted as a profile of readiness in the participating sample rather than evidence about the causes of children's numeracy performance.

Literacy readiness was also high overall (90.6%), but the dimension-level results reveal meaningful variation. Reading and Viewing/Communicative Purpose and Speaking and Listening/Skills and Strategies were relative strengths, whereas several language-structure and communicative dimensions were lower. This pattern supports retaining language-rich, interactive activities within the transition programme rather than treating high overall literacy readiness as evidence that all literacy needs have been met. Serpell (2020) similarly emphasizes that literacy development is embedded in children's communicative and sociocultural experiences. For programme design, play, storytelling, dialogue, emergent writing, and peer interaction can therefore be used to consolidate literacy while responding to the weaker dimensions identified at baseline.

Among the three domains, socio-emotional skills showed the lowest overall readiness (85.9%), with Responsible Decision-Making (77.2%) and Relationship Skills (83.2%) emerging as the dimensions with the greatest need for support. Teacher observations converged with this quantitative pattern by identifying challenges in self-management, turn-taking, conflict resolution, attention, emotional regulation, and consideration of consequences. These findings are important because the transition to primary school requires children to manage routines and relationships as well as academic tasks (Pianta

& Cox, 2002). They also provide a clear rationale for C2C activities that create structured opportunities for cooperation, shared problem-solving, communication, and peer interaction, consistent with the social and collaborative learning principles associated with Vygotsky (1978) and Bandura (1977).

The findings also revealed descriptive differences across geographical locations. Children attending the semi-urban preschools in this sample showed lower literacy and socio-emotional readiness than those in the urban and rural preschools. The study was not designed to identify the determinants of these differences, and no causal explanation can therefore be established from the available data. Rather than attributing the pattern to particular resources or learning opportunities, the finding indicates the importance of context-responsive implementation and of examining, in future research, the individual, family, preschool, and community factors that may be associated with geographical variation.

Gender differences were generally small in literacy and numeracy, while boys showed lower socio-emotional readiness than girls within this sample. Because the analysis was descriptive and did not test statistical significance, this pattern should not be interpreted as evidence of a general gender difference. For programme implementation, it nevertheless supports providing all children with inclusive opportunities to practise self-regulation, cooperation, communication, and relationship skills and monitoring whether participation and progress differ by gender over time.

The findings have direct implications for the C2C transition programme. High baseline numeracy and literacy readiness suggests that activities can focus on consolidation and application, while comparatively lower socio-emotional readiness indicates a need for deliberate emphasis on responsible decision-making, relationship skills, self-management, and social awareness. The peer-supported character of C2C is relevant to these priorities because it organizes learning through interaction, modelling, collaboration, and support from other children, mechanisms consistent with Social Learning Theory and Sociocultural Theory (Bandura, 1977; Vygotsky, 1978). At the same time, the baseline cannot demonstrate that C2C will improve these outcomes; that question requires comparison with subsequent assessments.

For practice, the baseline supports a differentiated approach to programme design: maintain opportunities to consolidate strong numeracy foundations; strengthen language-rich literacy experiences; give explicit attention to socio-emotional competencies; provide additional support where lower readiness is observed; prepare teachers and facilitators to use play-based and C2C strategies responsively; and engage families in reinforcing learning. For educators beyond Sri Lanka, the broader contribution lies not in assuming that the same readiness profile will apply elsewhere, but in demonstrating how a multidimensional

baseline can be used to tailor peer-supported transition programmes to local patterns of strength and need.

5.1 Programme Design Implications

Based on the baseline findings, programme implementation should prioritize six evidence-informed actions:

1. **Strengthen literacy development:** Incorporate play-based activities that promote language development, emergent writing, communication, and literacy skills, particularly in the areas of Writing and Representing and Language Structures and Features.
2. **Enhance socio-emotional learning:** Develop activities that support self-regulation, responsible decision-making, relationship-building, cooperation, turn-taking, and conflict resolution, as these areas demonstrated comparatively lower readiness levels.
3. **Provide differentiated support:** Offer additional learning opportunities and targeted assistance for children who require greater support, particularly in preschools and contexts where lower readiness levels were observed.
4. **Strengthen facilitator and teacher capacity:** Provide training for teachers and programme facilitators on play-based learning, Child-to-Child methodologies, differentiated instruction, and strategies for supporting diverse learners.
5. **Promote family engagement:** Encourage parents and caregivers to participate in children's learning through home-based activities and guidance that reinforce literacy, numeracy, and socio-emotional development.
6. **Establish ongoing monitoring and evaluation:** Use the baseline findings as a benchmark for monitoring children's progress throughout programme implementation and for evaluating the effectiveness of the Child-to-Child intervention through subsequent assessments.

CONCLUSION, LIMITATIONS AND FUTURE DIRECTIONS

Several limitations should be considered. First, the study used convenience sampling in 10 preschools in one province; the findings therefore describe the participating children and should not be generalized to all preschool children in Sri Lanka. Second, the analysis was descriptive and did not test the statistical significance or causes of observed gender or location differences. Third, classroom space, available resources, and the time available for assessment varied across settings and may have influenced data collection. Fourth, limited parental input restricted examination of home learning contexts. Finally, instrument validation relied on expert review and stakeholder consultation, and no statistical reliability or validity estimates were calculated. These limitations should guide interpretation of the baseline and the design of subsequent evaluation phases.

In conclusion, this baseline assessment found high overall readiness in numeracy and literacy among participating preschool children, alongside comparatively lower readiness in socio-emotional skills, particularly Responsible Decision-Making and Relationship Skills. The results provide a clear evidence base for tailoring the Sri Lankan C2C transition programme to consolidate academic foundations while strengthening the interpersonal and self-regulatory competencies required for successful school transition. The baseline also establishes a benchmark against which subsequent assessments can examine change over time.

Future phases should use the same core readiness domains, where methodologically appropriate, to assess change after programme implementation and should strengthen the evidence base through broader sampling and appropriate inferential or longitudinal analyses. Future research should also examine the contextual factors associated with the location patterns observed at baseline. Such evidence will be necessary before drawing conclusions about programme effectiveness or the determinants of readiness differences.

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Child-to-Child Pedagogy in Practice: A Qualitative Study of Grade 5 Facilitators in Maldivian Preschools

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ABSTRACT

The Child-to-Child (CtC) approach is well documented, yet research often emphasises outcomes for younger learners while overlooking the development of young facilitators. Using a qualitative narrative case study design, this study explores the lived experiences of four Grade 5 students serving as young facilitators (YFs) in a CtC framework implemented in Maldivian preschools. The study was guided by the research question: How do Grade 5 YFs experience and make sense of their facilitator role within a CtC approach in Maldivian preschool classrooms? The wider SIPCA project also aimed to understand whether the facilitator role could help students with low self-esteem or limited leadership confidence gain confidence, agency, communication skills, and social responsibility. YFs were initially identified through screening and teacher consultation, with attention to students showing low self-esteem or leadership hesitancy at baseline. From this wider cohort, four participants were purposively selected because their interviews, reflective conversations, and journals provided rich, sustained accounts of development across the 25-week intervention. Data were analysed thematically and presented as narrative vignettes. Findings suggest that, from the YFs' perspectives, CtC supported relational interactions marked by emotional bonds, trust, and reduced power differentials. The YFs described using play-based and narrative activities to encourage preschool children's participation, while also reporting gains in self-efficacy, leadership, patience, and moral responsibility. Because preschool children's learning, anxiety, engagement, and emotional safety were not directly measured, claims about these areas are treated as facilitator perceptions and interpretive observations rather than measured outcomes. The study suggests that structured cross-age peer facilitation may support young facilitators' holistic development while offering possibilities for relational classroom practice.

Keywords: Child-to-Child (CtC) pedagogy, Narrative Vignettes, Maldives, Student Agency, Qualitative Research, Young Facilitators

INTRODUCTION

Early childhood education establishes foundations for lifelong wellbeing through the quality of relationships, participation, and meaningful engagement. Moving away from passive learning, the Child-to-Child (CtC) approach emphasises peer interaction and relational learning. Originating in 1970s health initiatives, CtC evolved into a rights-based participatory framework outlining children's agency to influence communities (Pridmore & Stephens, 2000). Rooted in sociocultural theories, CtC views knowledge as socially constructed and mediated through interaction, positioning older children simultaneously as experts, learners, and capable facilitators (Vygotsky, 1978; Wood et al., 1976). These ideas highlight the importance of interaction and relationship when implementing CtC in learning contexts.

By treating learning as social negotiation rather than a consequence of socialisation, CtC challenges adult-directed teaching models (Vygotsky, 1978). Preschools are inherently relational spaces where cognitive development intertwines with play, emotion, and communication. This environment is continuously co-constructed through participants' actions (Vuorisalo et al., 2015) and mediated by a "relational pedagogy" in which emotional wellbeing, communication, and peer play are fundamentally interdependent (Papatheodorou & Moyles, 2008). Communication and play serve as psychological tools that transform external social interactions into internal cognitive development.

While historical CtC literature focuses on primary school health metrics, emerging research highlights its dual capacity to boost younger children's learning and older children's leadership. However, existing studies largely prioritise programme evaluations and younger child outcomes, leaving a critical gap regarding the actual lived experiences of young facilitators within preschool contexts. This gap is highly relevant to the Maldives, a nation characterised by geographically dispersed island communities, strong social interconnectedness, and close relationships between schools and families. Despite these enabling conditions, empirical research on peer-mediated and CtC approaches in Maldivian early childhood settings remains limited. Globally, qualitative evidence is lacking regarding how older children experience facilitation roles, interpret their interactions, and develop identity, confidence, and responsibility.

Drawing on a qualitative narrative case study design, this study explores the lived experiences of Grade 5 students serving as young facilitators (YFs) within a CtC framework in Maldivian preschools. The wider project also examined what students who initially showed low self-esteem, limited confidence, or hesitancy in leadership might gain from occupying a meaningful facilitator role with younger children. Guided by research questions focused on YFs' lived experiences, confidence development, agency, and relational pedagogy, the study moves beyond outcome-focused evaluations to illuminate

the relational, pedagogical, and developmental processes of everyday classroom practice. Ultimately, this paper contributes contextually grounded insight into how CtC functions as a relational pedagogy, advances broader debates on child participation, and offers practical and policy-relevant insights for community-oriented and island contexts.

The article is organised as follows. The literature review first situates Child-to-Child pedagogy within sociocultural, relational, play-based, and rights-based learning. The methodology section then explains the SIPCA project, participant selection, data sources, analysis, trustworthiness, and ethical procedures. The findings are presented through four narrative vignettes, followed by a discussion of how the young facilitator role shaped confidence, agency, relational awareness, and responsibility in Maldivian preschool contexts.

LITERATURE REVIEW

This literature review situates the study within scholarship on Child-to-Child (CtC) pedagogy, sociocultural learning, relational pedagogy, play-based and narrative learning, youth facilitation, and rights-based participation. It first reviews the conceptual foundations of CtC and related peer-mediated approaches, then considers how relational and play-based pedagogies inform early childhood practice. It also examines literature on youth agency, leadership, inclusion, and moral responsibility. The review concludes by identifying a specific research gap: while CtC has been discussed internationally, limited qualitative evidence foregrounds the lived experiences of older child facilitators in preschool settings, and there is particularly little context-specific evidence from Maldivian island schools.

1. Conceptual Foundation of CtC approach

The Child-to-Child (CtC) approach is grounded in the principle that children are not passive recipients of knowledge but active social agents capable of contributing meaningfully to the learning and wellbeing of others (Johnsunderraj et al., 2023; van Rensburg & van Rensburg, 2020). Central to CtC is the idea that learning occurs most effectively when children learn with and from one another in socially meaningful and relational contexts. Rather than replacing adult guidance, CtC complements teacher-led instruction by creating structured opportunities for children to assume supportive, cross-age facilitator roles, thereby strengthening ownership, motivation, and the mutual co-construction of classroom knowledge. International organisations such as UNICEF have historically and continually highlighted CtC as an authentic, rights-based approach aligned with children's participation, agency, and voice (Jansen van Rensburg, 2024; UNICEF, 2001), particularly in contexts where relational and community-based learning is culturally valued.

Within early childhood education, the Child-to-Child (CtC) approach offers a compelling alternative to purely adult-directed teaching models. It directly embraces Vygotsky's (1978) premise that learning develops through social interaction with others and the surrounding environment rather than through isolated individual activity. Consequently, preschool classrooms can be understood as inherently relational spaces where cognitive development is deeply intertwined with play, emotion, and communication. As Vuorisalo et al. (2015) demonstrate, this learning environment is continuously co-constructed and negotiated through participants' verbal and non-verbal actions. Within these shared spaces, cognitive development is mediated by a "relational pedagogy" in which children's emotional wellbeing, communicative capacities, and peer play are fundamentally interdependent elements of the educational process (Papatheodorou & Moyles, 2008). Communication and play therefore serve as psychological tools through which children transform external social interactions into internal emotional and cognitive development.

Peer learning is well established in early childhood education as an important mechanism through which children participate in shared activity, observe others, negotiate meanings, and practise social communication. Drawing on sociocultural theories of learning, peer interaction is often understood as a space where children co-construct knowledge through dialogue, modelling, and guided participation (Vygotsky, 1978; Rogoff, 2003). However, studies of peer learning in early childhood have more commonly focused on benefits for younger learners or on teacher-organised peer interaction, with less attention to the older children who take on facilitative responsibilities in cross-age arrangements.

Cross-age tutoring and peer mentoring studies suggest that older children may develop communication, responsibility, confidence, and a sense of competence when they support younger peers (Topping, 2005). Nevertheless, much of this literature examines structured tutoring, academic support, or mentoring in primary and secondary school contexts. Fewer studies examine cross-age facilitation in preschool classrooms, where facilitation occurs through play, storytelling, movement, care, and informal guidance, and where the facilitator's own identity development is central to understanding the process.

3. Relational Pedagogy and Emotional Safety in Preschool Classrooms

Relational pedagogy emphasises the quality of relationships as foundational to learning, particularly in early childhood settings. Research consistently demonstrates that children learn best in environments characterised by trust, warmth, and emotional security (Bronfenbrenner & Morris, 2006; Hamre & Pianta, 2001; OECD, 2021; Pianta et al., 2008). In such environments, children are more likely to participate actively, take risks in learning, and engage meaningfully with peers.

The CtC approach naturally aligns with relational pedagogy by foregrounding care, empathy, and mutual respect. When children take on supportive roles, such as young

facilitators, they often form strong emotional bonds with younger peers, creating a sense of belonging and continuity that extends beyond formal classroom interactions. These relational dimensions are particularly significant in preschool contexts, where emotional regulation, social learning, and attachment are closely intertwined with cognitive development.

4. Play-Based and Narrative Pedagogy in Child-to-Child Learning

Play-based learning is widely recognised as the cornerstone of effective early childhood education. Through play, children explore concepts, negotiate meanings, and develop social and motor skills in ways that are intrinsically motivating (Bodrova & Leong, 2007; Fleeer, 2018; Hirsh-Pasek et al., 2009). Within CtC contexts, play-based activities, such as movement games, role play, and collaborative tasks—serve as accessible entry points for peer-led engagement.

Narrative and storytelling further extend the pedagogical reach of CtC in preschool classrooms. Storytelling supports language development, imagination, moral reasoning, and sustained attention, particularly when delivered in interactive and informal settings (Nicolopoulou, 2010). When older children tell stories to younger peers, the activity becomes both instructional and relational, reinforcing listening skills, shared meaning-making, and emotional connection. Research suggests that narrative-based peer learning can enhance children's engagement and comprehension, especially when learning occurs outside rigid classroom structures.

5. Youth Facilitation, Leadership, and Identity Development

Participation as a young facilitator within CtC programmes can be understood through positive youth development and child participation literature. These perspectives suggest that meaningful roles may allow children and adolescents to experiment with identity, responsibility, agency, and belonging in supported environments (Checkoway & Gutierrez, 2006; Hart, 1997; Shier, 2001). This is particularly relevant during middle childhood and early adolescence, when self-concept and social identity are still developing. However, the literature has not sufficiently examined how young facilitators themselves narrate these changes when they are positioned as pedagogical actors in preschool classrooms.

Youth leadership studies also caution that participation must be meaningful rather than symbolic. Opportunities for planning, preparation, collaboration with adults, and reflection may help young people develop a sense of ownership and competence (Larson, 2000; Geldhof et al., 2013; Rhodes, 2005). For CtC research, this means that the facilitator role should be examined not only as a delivery mechanism for younger children's activities, but also as a developmental experience for older children. This study responds to that need by focusing on how YFs describe confidence, responsibility, relational awareness, and emerging leadership through their own narratives.

6. Inclusion, Moral Responsibility, and Rights-Based Learning

A growing body of literature emphasises the role of peer-based approaches in fostering inclusion, empathy, and moral development. When children engage in helping roles, they develop greater awareness of individual differences, patience, and responsibility toward others (Killen & Smetana, 2015; Wentzel, 2015). CtC approaches are particularly well positioned to support inclusive practices by normalising peer support and shared responsibility for learning and wellbeing (Florian & Black-Hawkins, 2011).

Additionally, CtC aligns with rights-based education by recognising children as contributors to their own and others' learning. Learning about children's rights, participation, and protection within CtC frameworks supports early civic awareness and ethical understanding. This is especially relevant in contexts where community cohesion, mutual care, and collective responsibility are culturally significant.

7. Research Gaps and the Need for Contextualised Evidence

Despite this theoretical foundation, several gaps remain. First, historical CtC literature has been shaped strongly by health, sanitation, nutrition, and community-development interventions, often in primary school contexts. Second, education-focused CtC studies frequently emphasise programme outcomes or younger children's participation, while the perspectives of older child facilitators remain less visible. Third, research on peer learning and youth leadership rarely examines how young facilitators make sense of relational, pedagogical, and identity-related changes over an extended intervention in preschool classrooms. These gaps are important because they limit understanding of CtC as a developmental experience for the facilitators themselves.

The Maldivian context adds a further gap and contribution. The Maldives is characterised by dispersed island communities, close school-family relationships, strong communal ties, and culturally familiar forms of play, storytelling, care, and intergenerational support. These conditions make the CtC approach contextually meaningful, yet there is limited published qualitative research examining how CtC is enacted in Maldivian preschool classrooms. A Maldivian study can therefore contribute to international CtC scholarship by showing how peer-mediated pedagogy operates in a small-island education system where relational proximity, community belonging, and local cultural practices shape classroom interaction.

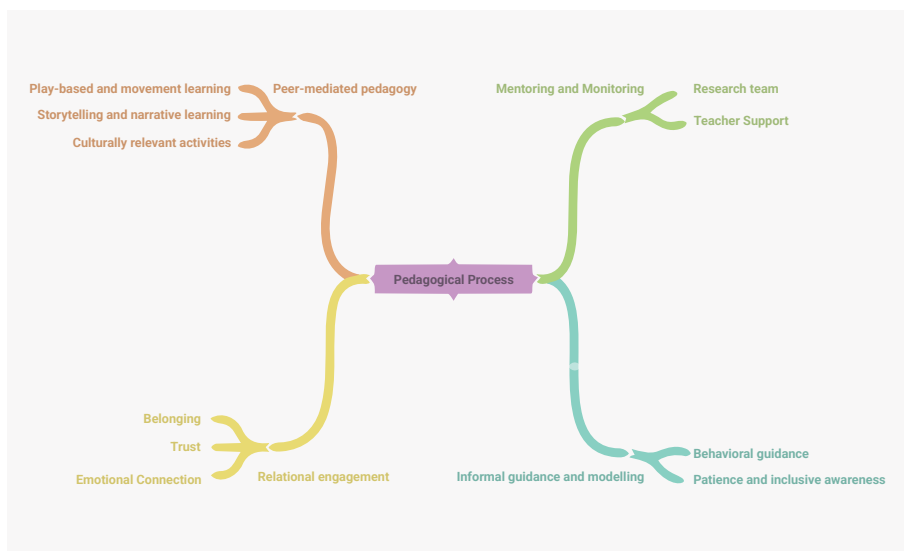
The present study addresses these gaps by foregrounding the voices of four Grade 5 young facilitators selected from the wider SIPCA cohort because their reflective journals, interviews, and conversations offered especially detailed accounts of development over time. Rather than treating CtC only as an intervention for preschool children, the study examines how the facilitator role was experienced by older children themselves. In doing so, it contributes context-sensitive evidence on young facilitators' agency, confidence, responsibility, relational awareness, and pedagogical meaning-making in Maldivian preschools.

In summary, the literature positions CtC as a participatory and relational approach that aligns with sociocultural learning, play-based pedagogy, youth agency, inclusion, and rights-based education. However, it also shows that greater qualitative attention is needed to the lived experiences of young facilitators, especially in preschool and culturally specific contexts. By locating CtC within Maldivian island schools, this study extends the literature beyond general programme evaluation and contributes a locally grounded account of how children’s facilitative roles are narrated, supported, and understood within everyday early childhood practice.

CONCEPTUAL FRAMEWORK

The conceptual framework for this study was developed as a sensitising and interpretive framework rather than as a model to be tested or validated by the four cases. Figure 1 positions the CtC approach as a relational, peer-mediated pedagogical system operating within preschool classrooms, supported by older children and guided by adult mentors. The framework draws on sociocultural learning theory, ecological models of development, and relational pedagogy to identify key processes that may shape CtC practice: peer-mediated pedagogy, relational engagement, informal guidance and modelling, and mentoring and monitoring. At the centre of the framework is the Pedagogical Process, understood not as a linear sequence of instruction, but as a dynamic interactional system shaped by peer relationships, children’s meaning-making, adult scaffolding, and local school culture. In this study, the framework guided attention to relevant dimensions of practice while allowing themes to emerge inductively from young facilitators’ accounts. Therefore, the findings are used to illustrate, refine, and discuss the relevance of the framework in this context, rather than to claim that the framework has been empirically validated.

Figure 1. Conceptual Framework



Peer-mediated pedagogy: This dimension refers to the ways older children support younger children through play-based activities, storytelling, movement, and culturally familiar learning experiences. It is informed by sociocultural learning theory, which emphasises that learning is mediated through interaction with others and through shared cultural tools (Vygotsky, 1978; Daniels, 2016). In the CtC approach, young facilitators may act as accessible peer supporters who help organise participation and make activities approachable for preschool children. In this paper, this dimension is used to interpret how YFs described planning and leading activities, rather than to make direct claims about measured preschool learning outcomes.

Relational engagement: This dimension refers to the emotional and social qualities that YFs perceived in their interactions with preschool children, including recognition, approachability, trust, and belonging. It draws on relational pedagogy and ecological perspectives that view development as shaped by sustained and meaningful interactions (Bronfenbrenner & Morris, 2006; Pianta et al., 2008). In this study, relational engagement is treated as an interpretive category for analysing YFs' accounts of interaction, not as independently measured evidence of preschool children's emotional safety, anxiety reduction, or learning outcomes.

Informal guidance and modelling: This dimension captures the ways YFs described modelling behaviour, encouraging participation, showing patience, and responding to children's different needs during CtC activities. It is informed by social learning and moral development literature, which suggests that children can learn social norms and prosocial behaviours through observation, interaction, and guided practice (Bandura, 1986; Killen & Smetana, 2015). Within this study, the dimension helps interpret the YFs' emerging awareness of responsibility, inclusion, and care.

Mentoring and monitoring: This dimension situates CtC within a guided participation model in which adult teachers and researchers provide orientation, coordination, supervision, and feedback. Participation literature emphasises that meaningful child participation requires adult scaffolding rather than adult withdrawal (Hart, 1997; Shier, 2001). In the present study, this dimension helps explain how YFs' opportunities for agency were structured and supported through weekly coordination meetings, teacher mentoring, guidebooks, and classroom supervision.

Collectively, the framework offers a way to organise and interpret the relational, pedagogical, and developmental processes associated with CtC practice. It does not assume that all four dimensions operate in the same way across all contexts, nor does it claim causal relationships between the framework and outcomes for children or facilitators. Instead, it provides a conceptual lens for examining how peer-mediated activity, relational interaction,

informal modelling, and adult mentoring were described by the young facilitators in this particular Maldivian preschool context.

RESEARCH METHODOLOGY

Research design and research questions: This study adopted a qualitative narrative case study design within an interpretivist paradigm. The design was appropriate because the study sought to understand how young facilitators interpreted, narrated, and made meaning of their CtC experiences rather than to measure predetermined outcomes. The narrative case study approach enabled the researchers to foreground participants' voices through vignette-based accounts while also examining cross-case themes related to relational pedagogy, agency, confidence, and leadership development.

1. How do Grade 5 young facilitators experience and make sense of their facilitator role within a Child-to-Child approach in Maldivian preschool classrooms?
2. How does participation as a young facilitator shape students' confidence, self-efficacy, agency, communication, and sense of responsibility?
3. How do young facilitators describe the relational and pedagogical processes that support preschool children's engagement in CtC activities?

The project: This paper draws on qualitative findings generated from a multi-site research project titled Scaling Impact of a Play-Based Child-to-Child Approach (SIPCA). The SIPCA project was implemented across 10 schools located in four regions of the Maldives, with schools purposively selected to reflect geographic and contextual diversity. Within each school, approximately six young facilitators (YFs) were engaged, with variation based on classroom size and schools. In several schools, preschool classrooms were organised into multiple small groups, resulting in more than five YFs working concurrently, each supporting a small group of four to five preschool children. Within the SIPCA project, YFs were selected from Grade 5 cohorts, with participants typically approximately 12 years of age. These older children were purposively selected in collaboration with school leadership and teachers. The selection of Grade 5 students was intentional, as this age group represents a developmental stage where children are sufficiently mature to model behaviour, communicate ideas clearly, and assume guided responsibility, while still remaining close enough in age to preschool children for peer relationships to feel accessible and non-hierarchical.

The selection of participants: Out of approximately 88 YFs who participated in the SIPCA project, this paper focuses on four YFs whose narratives were selected through purposive, information-rich case sampling. The broader pool of YFs was initially identified in collaboration with school leadership and teachers, using screening information and teacher observations that highlighted students who displayed low self-esteem, limited leadership

confidence, or hesitancy in taking public responsibility at the beginning of the project. This was intentional because one aim of the wider project was to understand how assuming the young facilitator role might support such students to develop confidence, voice, communication, responsibility, and a more positive sense of self through guided interaction with younger children. The decision to focus on four participants was made after reviewing the available qualitative materials from the wider group. These four YFs had the most complete reflective journals, participated in especially rich reflective conversations, and provided detailed interview accounts that traced their development across the intervention. Their shared journeys also resonated most closely with the central argument of this paper: that the CtC approach may support initially hesitant students to become more confident, relationally aware, and responsible young facilitators. Therefore, the four cases were not selected as statistically representative of all 88 YFs, but as the most information-rich cases for illustrating the processes of change, meaning-making, and relational pedagogy explored in this study. Their rich experiences do not contradict the baseline screening criteria; rather, they show how students who initially appeared hesitant or low in confidence were able to articulate meaningful relational, pedagogical, and personal development after sustained participation in the CtC process. The participants' original names are replaced with pseudonyms in the findings.

The CtC pedagogical process: Grade 5 students were formally positioned as YFs and attached to preschool classrooms for the duration of the intervention. At the beginning of the programme, YFs received orientation on how to interact with young children in ways that supported children's safety and wellbeing. Each week, they participated in coordination meetings with teachers and contributed to the design of learning activities for preschool children. During implementation, each YF worked with a small group of four to five preschool children alongside a trained preschool teacher who guided and supervised the classroom process. This cross-age arrangement operationalised the CtC approach by enabling older children to support learning through play, storytelling, and informal guidance while remaining under continuous adult supervision. The age proximity between facilitators and preschool children was a key design feature of the programme, supporting relational trust, approachability, and authentic peer-mediated learning.

At the outset of the project, all YFs participated in structured training and comprehensive orientation on the principles and practices of the CtC approach. They also received a guidebook to support lesson preparation, record keeping, and implementation. This initial preparation was followed by weekly coordination and preparation meetings, where YFs worked closely with preschool teachers to plan activities, reflect on classroom experiences, and prepare materials. Over a period of 25 weeks, corresponding to the 2025 school academic year, each YF was consistently attached to a specific preschool classroom.

Within these classrooms, YFs typically supported small groups of four to five preschool children, working alongside the classroom teacher to ensure continuity of relationships and pedagogical practice.

Preschool teachers were trained to mentor YFs, facilitate weekly coordination meetings, and provide ongoing classroom guidance. In addition, monitoring and structured classroom observations were conducted by a research team comprising four researchers, who closely supported implementation throughout the 25-week period. To promote consistency across sites, a student–teacher guidebook and a Young Facilitator guidebook were developed and used to operationalise the CtC approach, clarifying roles, pedagogical principles, and activity structures.

Data sources and data collection: Data were generated from three complementary qualitative sources: two rounds of semi-structured interviews, reflective conversations, and young facilitators’ reflective journals. The first round of semi-structured interviews was conducted during the early phase of the intervention to explore participants’ initial expectations, confidence, understanding of the facilitator role, and early experiences of working with preschool children. The second round was conducted toward the later phase of the 25-week intervention to capture changes in participants’ self-perception, confidence, leadership, communication, relationships with preschool children, and reflections on what they had gained through the CtC experience. The two interview rounds enabled the research team to examine development over time rather than relying on a single retrospective account.

Reflective conversations were conducted informally during weekly coordination meetings, classroom visits, and monitoring interactions with teachers and researchers. These conversations allowed YFs to discuss recent activities, challenges, children’s responses, moments of success, and areas where they needed guidance. Unlike the formal interviews, the reflective conversations were ongoing and situated close to the actual implementation process, providing insight into how YFs made sense of their role while the programme was unfolding. They also helped clarify meanings emerging from interview responses and supported a more nuanced understanding of the relational and pedagogical processes within the CtC approach.

Reflective journals formed the third data source. Each YF used the Young Facilitator guidebook to record reflections on weekly lesson preparation, activities implemented, preschool children’s engagement, personal feelings, difficulties encountered, and lessons learned. These journals provided written accounts of participants’ evolving experiences across the intervention and helped document development in confidence, responsibility, patience, and pedagogical awareness. Together, the interview data, reflective conversations,

and journal entries were used to construct narrative vignettes and to identify cross-case themes through thematic analysis. The use of multiple data sources strengthened the credibility of the findings by allowing participants' spoken reflections, ongoing conversations, and written records to be considered together.

Interview language, transcription, and translation: The interviews and reflective conversations were conducted primarily in Dhivehi, the participants' first language, to allow the young facilitators to express their experiences comfortably and in age-appropriate ways. Field notes and journal materials were also reviewed in the language in which they were produced. Audio-recorded interview data were transcribed verbatim in Dhivehi, including pauses, repeated phrases, and child-like expressions where these were relevant to meaning. For the purposes of analysis and presentation in this English-language paper, selected extracts were translated into English by the research team. Translation was treated as an interpretive process rather than a purely technical task; therefore, translated extracts were checked against the original Dhivehi transcripts to preserve participants' intended meanings, tone, and culturally situated expressions as closely as possible. Where direct translation risked losing meaning, the research team prioritised semantic accuracy and clarity while retaining the participants' voice. The final English quotations used in the findings are therefore translated verbatim as closely as possible, with minor grammatical adjustments only where needed for readability.

Data analysis: Thematic analysis was conducted using a primarily inductive approach, as the main research focus was to understand how young facilitators made sense of their experiences rather than to test predetermined theoretical categories. Although the conceptual framework sensitised the researchers to broad areas such as relational pedagogy, peer facilitation, agency, and adult mentoring, the initial codes and themes were generated from the participants' interview transcripts, reflective conversations, and journal entries. This inductive orientation was appropriate because the study sought to preserve the meanings, priorities, and developmental journeys expressed by the YFs themselves.

The analysis followed several stages. First, the research team read and re-read all qualitative materials to become familiar with each participant's account. Second, meaningful segments of data were coded manually, with attention to repeated ideas, emotionally significant moments, role-related reflections, and descriptions of interaction with preschool children and teachers. Third, similar codes were grouped into provisional themes within each participant's narrative. Fourth, these provisional themes were compared across the four cases to identify shared patterns and points of difference. This cross-case comparison informed the construction of the narrative vignettes and the synthesis of themes related to confidence, responsibility, relational connection, play-based facilitation, and adult guidance.

Use of Gemini AI in analytic refinement: Gemini AI was used only as a supplementary analytic support tool after the researchers had completed initial familiarisation, manual coding, and provisional theme development. The version used was the publicly available Gemini model accessible to the research team at the time of analysis; because model interfaces and version names change over time, the exact access date and model label should be recorded in the project audit trail. Gemini was not used to generate original codes independently, determine final themes, interpret participant meanings on behalf of the researchers, or make methodological decisions. Its role was limited to supporting analytic refinement, such as checking whether provisional theme labels were coherent, identifying possible overlap between themes, suggesting clearer wording for theme names, and helping the researchers examine whether selected extracts were appropriately aligned with the emerging thematic structure.

To protect participant privacy, identifiable information was removed before any text was entered into Gemini. Participants' real names, school names, island names, teacher names, and other contextual details that could identify individuals or sites were replaced with pseudonyms or broad descriptors. Only short, de-identified excerpts and researcher-generated summaries of codes or provisional themes were used; full transcripts, complete journals, audio recordings, consent forms, and raw identifiable datasets were not uploaded. Prompts were designed to ask Gemini to comment on analytic clarity rather than to produce findings. Examples of prompt purposes included: "Check whether these provisional themes overlap conceptually," "Suggest clearer wording for these theme labels without changing their meaning," and "Identify whether this de-identified extract appears to fit the stated theme."

All AI-supported outputs were treated as prompts for researcher reflection rather than as evidence. The research team reviewed every Gemini suggestion against the original Dhivehi transcripts, translated extracts, reflective conversations, and journal entries. Suggestions that were not supported by the data were rejected, and wording changes were accepted only when they improved clarity without altering participant meaning. Final decisions about coding, theme development, vignette construction, interpretation, and reporting remained fully researcher led. The use of Gemini was therefore positioned within a reflexive qualitative workflow: it supported consistency checking and clarity, but the credibility of the analysis depended on human interpretation, repeated comparison with the source data, and transparent documentation of how AI assistance was used.

Construction of narrative vignettes: The narrative vignettes were created after the inductive thematic analysis as a way of presenting each participant's experience in a coherent, case-based form. For each YF, the researchers brought together data from the two interview rounds, reflective conversations, and reflective journal entries. These

materials were reviewed chronologically and thematically to identify key moments in each participant's journey, including initial expectations, experiences of working with preschool children, challenges, reflections on confidence and responsibility, and perceived changes over time. The vignettes were therefore not written as fictionalised accounts; rather, they were constructed from participants' own data to preserve the sequence, meaning, and texture of their experiences while making the findings readable and analytically coherent.

Verbatim quotations were selected when they directly illustrated a theme or captured a participant's own wording about an important experience. These quotations are presented in quotation marks and formatted as separate indented extracts in the findings section. Researcher interpretation appears outside the quotation marks and is used only to introduce, connect, or interpret the participant's words in relation to the research questions and emerging themes. This distinction was maintained throughout the findings so that readers can identify which statements come directly from participants and which statements represent researcher-led analytic interpretation. Where brief connective text was added to improve narrative flow, it was based on the surrounding interview, conversation, or journal data and was reviewed against the original source material to avoid adding meanings not supported by the data.

Qualitative trustworthiness: Trustworthiness was strengthened through attention to credibility, dependability, confirmability, and transferability. Credibility was supported through multiple qualitative data sources, repeated engagement with the data, cross-case comparison, and verbatim quotations. Dependability was addressed through a clear analytic process comprising familiarisation, manual coding, provisional theme development, cross-case comparison, vignette construction, and documented AI-assisted refinement. This analytic sequence created a transparent decision trail that could be reviewed in relation to the original data. Confirmability was supported by checking interpretations against the original Dhivehi transcripts, translated extracts, reflective conversations, and journals, and by treating Gemini outputs only as prompts for researcher reflection rather than as evidence. Transferability was supported through contextual detail about the Maldivian island school setting, the SIPCA project, the CtC pedagogical process, participant selection, and vignette construction. Together, these procedures strengthened methodological transparency while recognising that the findings offer depth and contextual insight rather than statistical generalisation.

Ethical considerations: Ethical considerations were closely maintained in accordance with the requirements of the relevant ethical bodies, including approval from the Ministry of Education, Maldives, and the Islamic University of Maldives. Parental consent and student assent were obtained before participation, and participants were informed that their involvement was voluntary. Pseudonyms were used in the findings, and identifying details

such as school names, island names, teacher names, and other contextual markers were removed or generalised to protect participants and sites.

FINDINGS

The findings for this paper are presented as vignettes representing narrative accounts of four young facilitators (YFs), two males and two females, who were closely involved in the CtC approach implemented in preschool classrooms in the Maldives. These four cases were selected from the wider SIPCA cohort because they generated the most complete reflective journals, engaged in particularly rich reflective conversations, and offered detailed interview accounts of their development over time. Their shared journeys closely aligned with the paper's central focus on how initially hesitant or less confident students can gain agency, relational awareness, and leadership through the young facilitator role. Each vignette was constructed by combining evidence from interviews, reflective conversations, and journal entries, then organising it around the main themes emerging from that participant's account. Verbatim participant quotations are shown in quotation marks and set apart from the surrounding text, while the sentences before and after each quotation represent researcher interpretation used to explain the relevance of the extract to the study's themes. The vignettes are written to preserve each participant's voice while situating their experiences within a coherent analytical narrative.

Vignette 1: YF Raahim (Male)

Raahim's experience illustrates how CtC is grounded in relationships that extend beyond formal classroom boundaries. His account reflects a strong sense of emotional connection and recognition among the young children he taught in the preschool classrooms, suggesting that trust and familiarity were established early in his engagement. He said:

"Whenever the children see me, even outside the school environment, they get excited and call out my name, 'Rai Sir.' That reaction makes me feel that they are genuinely happy to see me and comfortable around me. It shows that they recognise me not just as someone who comes to teach, but as someone they trust and enjoy being with."

Within classroom interactions, Raahim demonstrates emerging pedagogical awareness by interpreting children's behaviours as indicators of learning and engagement.

"I can tell that the children are really listening during the activities because they follow the instructions carefully. After the lesson, they also ask questions about what we did, which shows that they were thinking about the activity and trying to understand it, not just copying others."

His role was embedded within a collaborative structure supported by teachers, where shared planning and decision-making enabled youth agency.

“During the coordination meetings, I found it easy to understand what the teachers expected from me. For one activity in particular, we discussed different ideas together and decided as a group—teachers, students, and myself—what activity to do, how to do it, and how to organise everything for the day.”

Raahim recounts a memorable play-based numeracy activity that exemplifies experiential learning in the CtC approach.

“One activity I remember clearly was an addition lesson. The teachers gave us markers, and we wrote numbers. We used a spinning wheel, and whenever it stopped on a number, the children had to jump onto the matching number on the floor tiles. The children were very excited and enjoyed learning through movement.”

Leading learning activities independently contributed to his sense of confidence and self-efficacy.

“When I was leading the session on my own, I felt a strong sense of self-accomplishment. I realised that I was not just helping the children but also developing myself. Through this experience, I gained confidence and learned important life skills and soft skills that I did not have before.”

His narrative also reflects an internalised sense of responsibility for children’s wellbeing, extending beyond instructional roles.

“If I saw the children being bullied, I would immediately step in to stop it. I would ask what happened and try to solve the problem between them. I feel responsible for their safety and wellbeing, even outside the classroom.”

Raahim identifies patience and inclusivity as critical competencies developed through working with diverse learners.

“Patience is very important because sometimes children do not listen the first time. There are also children with special needs who need more time and individual attention. Without patience, it would be difficult to help every child properly.”

Behind classroom interactions, Raahim describes the importance of preparation and accountability.

“Being hardworking is important because after the coordination meetings, we still have a lot to do. We often need to prepare materials at home and make sure everything is ready for the next lesson. This taught me to be responsible and committed to what I agreed to do.”

His continued engagement is driven by enjoyment, belonging, and supportive relationships.

“I want to continue next year because the programme is enjoyable. I like spending time with the children and working together with my friends. The coordinators and teachers are also very kind and supportive, which makes me want to stay involved.”

Vignette 2: YF Maahil (Male)

Maahil's account emphasises attentiveness, behavioural guidance, and culturally grounded engagement within CtC practice. He characterises children's listening and behaviour as central indicators of effective interaction.

"The children really listen to what I say... they are very well-behaved and well-mannered children."

Learning was not confined to formal classroom settings but extended into culturally familiar forms of play.

"We went outside and played 'Dak-Dak Go'."

Maahil also positions himself as a guide for children's behaviour through everyday interaction.

"Yes," (in response to whether he tells children how to behave properly).

"Many times, I remember correcting their behaviour in class. I tell them not to do that and to keep focusing on learning or on the task. They always listen to me."

Affective closeness and children's presence were central to his motivation.

"It's because those children are very loving. They are always around me whenever I go to the class, and they are very attached to me. Even when their teachers are around, they talk to me more."

Programme closure and recognition provided symbolic affirmation of his role and contribution.

"I took photos with the children. I felt very proud too. Yes, I received the completion certificate."

"I had fun at the closing event. I want to have this next year too."

His willingness to continue reflects positive engagement and intrinsic motivation.

"Yes, I want to."

Vignette 3: YF Insha (Female)

Insha's narrative highlights confidence development, emotional fulfilment, and storytelling as a key pedagogical practice within CtC.

"It was very good actually. I gained more confidence."

She identifies storytelling as a meaningful way of engaging preschool children.

"I really like... telling stories to them... The Bee story."

Her relationship with children continued beyond structured sessions, marked by joy and play.

"I feel so happy to see them again and again. Their parents also know me, and whenever the children see me, they call me and come to me."

"Yeah, they always play with me. We had a good time over the last couple of weeks."

Insha also acknowledges her role in guiding children's behaviour and learning.

"Yes, I always tell them to listen carefully and handle the pencil properly, and they actually listen to me. I like it very much."

She expresses a clear intention to continue participating in the programme.

"Yes," (in response to continuing next year).

Vignette 4: YF Ain (Female)

Ain's vignette provides insight into student-level impact of the CtC approach, highlighting emotional validation, learning transfer, and emerging leadership identity. She describes her participation as a unique and affirming opportunity.

"I felt very special... like I was given a unique opportunity that no one else had."

"I feel grateful and happy—very happy."

Her strongest source of joy came from children's emotional responses.

"What makes me happiest is whenever I go to the class and see the smiles on those little children's faces as I arrive."

A storytelling session outside the classroom remains a vivid memory, illustrating context-sensitive engagement.

"That was the day we read our first story... We were out of the classroom, and I read the story to them."

"They were incredibly well-behaved and listened very carefully."

"Usually, when we teach in the classroom, they don't pay as much attention... but they really enjoyed hearing stories outside the class."

Ain also reports learning related to rights awareness and interpersonal understanding.

"I learned that children have many rights."

"I learned how to interact and play with children, and how to understand them."

Through participation, she began to imagine herself in a teaching role.

"I got a sense of what it feels like to be a teacher."

"I would love to be a teacher."

She further describes transfer of confidence and leadership into her own classroom context.

"I participate more in class now. It's also easier to take on leadership roles."

"They ask me for help... Yes, I help them."

Looking ahead, Ain expresses strong motivation and advocacy for continued participation.

"I want to continue... keep going and never stop, because it is a truly great opportunity."

Across the vignettes, several dominant and interrelated themes illustrate how the YFs experienced the CtC approach in preschool classrooms in the Maldives. Most prominent is the strength of emotional connection and relational trust as described by the young facilitators, evidenced in their accounts of children recognising them, approaching them, and responding positively during activities. These accounts suggest that relational closeness was an important part of the facilitation process. However, preschool children's emotional safety, anxiety, engagement, and learning were not independently measured in this study.

A second dominant theme is the YFs' use of developmentally appropriate pedagogical practices, particularly play-based learning, storytelling, movement, and culturally familiar games. Participants interpreted preschool children's listening, questioning, excitement, and willingness to join activities as signs of participation and interest. These observations are reported as YF perceptions rather than direct evidence of measured learning gains or engagement outcomes. The CtC approach also fostered youth leadership, confidence, and self-efficacy, as young facilitators experienced a strong sense of accomplishment, responsibility, and emerging teacher identity.

Importantly, CtC cultivated prosocial values among the YFs, including patience, inclusivity, moral guidance, and child protection awareness, demonstrating its relevance to young facilitators' holistic development rather than academic outcomes alone. The findings further highlight shared responsibility and collaboration with teachers, showing that CtC was experienced by YFs as most meaningful when youth participation was guided, supported, and structurally integrated. Finally, strong motivation to continue and a sense of belonging across participants indicate sustainability potential from the facilitators' perspectives. Collectively, these themes suggest that the Child-to-Child approach is well suited to further exploration in Maldivian preschool contexts, particularly as a model for developing young facilitators' agency, confidence, responsibility, and relational awareness.

DISCUSSION AND CONCLUSION

The findings of this study provide a nuanced understanding of how young facilitators experienced the CtC approach as a relational and developmental pedagogy. By centring the voices of young facilitators like Raahim and Maahil, the research moves beyond traditional

outcome-based metrics to examine the social, emotional, and pedagogical meanings that YFs attached to peer-mediated facilitation in the Maldives. The discussion therefore focuses primarily on YF development and perceptions, rather than making direct claims about preschool children's measured learning or emotional outcomes.

1. Relational Pedagogy and the Lowered Power Differential

A primary theme across the facilitators' narratives was the depth of emotional connection and trust they perceived within the CtC framework. As seen in Raahim's experience of being greeted as "Rai Sir" outside formal school boundaries, the CtC approach appeared, from his perspective, to extend beyond rigid instructional structures. This interpretation aligns with relational pedagogy, which emphasises that the quality of interpersonal relationships is foundational to early childhood learning (Pianta et al., 2008). In this study, however, children's emotional safety, anxiety, and learning outcomes were not directly assessed. Therefore, references to trust, comfort, or participation are treated as young facilitators' interpretations of their interactions with preschool children, supported by illustrative accounts from the vignettes.

The age proximity between the child-facilitator and the preschool child may have contributed to a lower perceived power differential in classroom interactions. The YFs interpreted children's willingness to approach them, listen to them, and participate in activities as signs of relational accessibility. Rather than claiming that the programme directly reduced anxiety or created emotionally safe learning environments, this study presents such observations as facilitator-reported perceptions that require further investigation through direct data from preschool children, teachers, or independent classroom measures.

2. Pedagogical Agency through Play, Interactive and the Culturally Sustained ZPD

The empirical findings are consistent with Vygotsky's sociocultural learning theory, particularly the idea of the Zone of Proximal Development (ZPD). Within this framework, the Young Facilitators (YFs) can be understood as accessible "More Knowledgeable Others". However, unlike traditional adult educators, their instructional methods were largely play-based and narrative-driven. Literature widely recognises play as central to early childhood education, noting that it allows children to explore concepts, negotiate meanings, and develop social and motor skills in intrinsically motivating ways (Bodrova & Leong, 2007). In this study, the YFs used movement-based activities and traditional games as accessible entry points for peer-led participation.

This localisation of learning is vividly demonstrated in Maahil's deployment of the traditional game "Dak-Dak" and Raahim's movement-based numeracy activities. By embedding abstract curriculum goals, such as basic literacy and addition, into culturally familiar, play-based structures, the facilitators rendered complex concepts tangible and digestible for the preschoolers. Because peer facilitators inhabit the exact same social world,

neighbourhood dynamics, and play-language as their younger peers, they are uniquely positioned to enact culturally sustaining pedagogy (Paris & Alim, 2017). Furthermore, the facilitators leveraged narrative and storytelling to extend the pedagogical reach of the CtC approach. As highlighted by Nicolopoulou (2010), interactive and informal storytelling supports rapid language development, imagination, and sustained attention in early childhood. When older children share narratives or contextualise games for younger peers, the act becomes simultaneously instructional and deeply relational.

This dual dynamic may have supported listening, shared meaning-making, and relational connection, as interpreted by the YFs in their accounts. However, because the study did not directly measure preschool children's cognitive engagement, comprehension, or learning gains, these claims are framed cautiously as perceived classroom processes rather than demonstrated preschool outcomes. Future research could extend this study by collecting direct observational data, teacher assessments, or preschool children's perspectives.

3. Identity Transformation and Leadership Development

One important finding of this study concerns the way the facilitators described changes in their own self-concepts. This is particularly relevant because the project was not only designed to benefit preschool children, but also to explore whether students who initially appeared less confident or low in self-esteem could develop a stronger sense of competence through the young facilitator role. The transition from "student" to "facilitator" was described by participants as a meaningful shift in self-perception, suggesting that participation in CtC programmes may contribute to positive youth development. This experiential learning is relevant during middle childhood and early adolescence, a developmental window where self-concept and social identity are actively forming (Checkoway & Gutierrez, 2006). Rather than engaging in symbolic or nominal involvement, the YFs assumed meaningful responsibility. As Larson (2000) suggests, developmental growth, competence, and ownership are more likely when youth are trusted with authentic roles. The "self-accomplishment" reported by the YFs indicates that meaningful responsibility, scaffolded by structured adult guidance, may support self-efficacy. This dynamic is broadly consistent with Mitra's (2018) work on youth-adult partnerships. Mitra's framework supports the interpretation that the adult teacher's role may shift from a top-down "director" to a supportive "mentor" while retaining necessary structural oversight.

Furthermore, this identity shift was associated with an emerging sense of moral responsibility and civic awareness. The YFs did not merely see themselves as operational "teachers"; rather, they began to describe themselves as protectors against bullying and advocates for inclusive practice. This finding is consistent with literature suggesting that peer-based approaches can support inclusion, empathy, and moral development (Killen & Smetana, 2015). For instance, Raahim's reflection on the need for "patience" when

supporting children with special needs illustrates how placing youth in helping roles may deepen their awareness of individual differences and encourage an ethics of care.

By recognising children as active contributors to their own and others' learning, the CtC approach reflects elements of a rights-based education framework, including civic awareness and peer support in contexts where community cohesion is culturally important. The findings also highlight that while the CtC approach is child-centred, it is not a "hands-off" or unsupervised model. The identity shifts and agency described by the YFs appeared to be supported by structured adult guidance, including regular coordination meetings and student-teacher guidebooks. This collaborative planning suggests a pedagogical shift in which the adult teacher's role moves from a top-down "director" toward a supportive "mentor." This relationship between adult scaffolding and youth agency may help keep activities within preschoolers' developmental boundaries while giving YFs opportunities to practise leadership.

Link with the conceptual framework and empirical findings

The empirical findings can be read in relation to the four areas of the Pedagogical Process conceptual framework (Figure 1), but they should not be understood as validating the framework. Rather, the four narrative cases illustrate how selected dimensions of the framework were visible in the YFs' accounts. Peer-mediated pedagogy is reflected in the facilitators' descriptions of play-based and narrative activities, including culturally familiar games such as "Dak-Dak". Relational engagement is suggested in their accounts of recognition, approachability, emotional connection, and belonging, although these remain facilitator perceptions rather than direct measures of preschool children's experiences. Informal guidance and modelling are evident in the YFs' reflections on patience, behavioural guidance, and inclusive awareness. Mentoring and monitoring are visible in the role of teachers, coordination meetings, guidebooks, and adult supervision. Taken together, the findings help refine the framework by showing how its dimensions may interact in practice within this specific Maldivian context, while also indicating areas that require further investigation through broader samples and direct data from preschool children and teachers.

Implications for the broader school environment

Traditionally, school leadership roles (like prefects) are often administrative or disciplinary. The paper suggests a shift toward pedagogical leadership.

- Students in mid-to-upper primary (Grade 5 and above) can move beyond being passive learners to becoming "knowledge co-creators."

When students are trusted with the learning of others, they may develop a stronger sense of school belonging and self-efficacy, with possible benefits for behaviour and peer relationships.

The paper highlights how relationships formed in the CtC programme extend beyond the classroom (e.g., the "Rai Sir" example).

- Implementing CtC school-wide breaks down the "silo" effect where different age groups never interact. This creates a safer, more familial school environment.

As noted in the vignettes, young facilitators may develop a protective instinct toward younger students. This natural mentorship could complement adult-led safeguarding and contribute to a more caring school environment.

The facilitators' reflections on patience and inclusive awareness suggest that CtC is a practical tool for moral education.

- Instead of learning about empathy in a textbook, students practice it by adapting their communication to peers with different needs.

A whole-school CtC approach normalises the idea that everyone learns differently, fostering a culture where helping and being helped become standard social norms rather than exceptions.

A school-wide adoption requires teachers to shift their professional identity.

- Teachers must learn to scaffold student agency rather than controlling every interaction. This creates a "ladder of participation" where teachers mentor older students, who then support younger ones.
- The weekly coordination meetings mentioned in the paper imply a need for schools to bake "collaboration time" into the master schedule, allowing for student-teacher planning.

LIMITATIONS OF THE STUDY

This study has several limitations that should be considered when interpreting the findings. First, the paper draws on four purposively selected narrative cases from a wider group of approximately 88 young facilitators. These four participants were selected because they provided the most complete reflective journals, rich reflective conversations, and detailed interview accounts; therefore, the findings are intended to offer depth and insight rather than statistical generalisation. Second, the study relies primarily on young facilitators' self-reported experiences, supported by journals and reflective conversations. Although these sources provide valuable access to participants' meaning making, they may also reflect selective memory, social desirability, or a tendency to emphasise positive experiences within a programme they valued. Third, the study does not directly measure preschool children's learning, anxiety, engagement, or emotional safety. Any references to preschool children's responses are therefore interpreted as YF perceptions or observational accounts rather than independently verified outcomes. Fourth, because the study is situated in Maldivian island school contexts, the findings may not transfer directly to larger, urban,

or culturally different education systems without adaptation. Fifth, Gemini AI was used only for de-identified analytic refinement after manual coding and provisional theme development; however, AI-supported checking cannot replace researcher judgement and may reflect limitations of the model, prompt wording, or the data excerpts provided. For this reason, all Gemini suggestions were reviewed against the original data and final analytic decisions remained researcher led. Finally, the study did not include long-term follow-up, so it cannot determine whether the reported gains in confidence, leadership, responsibility, and agency were sustained beyond the intervention period. Future research could address these limitations by including a larger and more diverse sample of YFs, collecting direct data from preschool children and teachers, using classroom observations or assessment measures, and following participants over time to examine the durability of developmental gains.

CONCLUSION

The study concludes that the CtC approach is more than a simple classroom exercise. It is a relational pedagogical strategy that connects formal schooling with the communal values of Maldivian society. By positioning Grade 5 students as young facilitators, the programme shifted the focus from adult-led instruction toward guided peer-mediated participation. The evidence in this study most strongly supports claims about the young facilitators' own development: they described growth in confidence, leadership, responsibility, patience, and relational awareness. While the YFs perceived preschool children as responsive and engaged during activities, the study does not make direct claims about preschool children's learning, anxiety, engagement, or emotional safety because these were not directly measured.

The overall implications of this research suggest that student agency should be considered within school-wide policy and practice. For the young facilitators, the role appeared to support identity development, leadership, empathy, and a sense of moral responsibility that traditional curricula may not always foreground. For schools, the model offers a possible approach for strengthening cross-age relationships and guided participation, although its effects on younger children should be examined through direct evidence in future studies. Future educational policy, particularly in community-oriented contexts like the Maldives, could consider integrating cross-age peer facilitation as a formal curriculum component while ensuring appropriate teacher mentoring, safeguarding, and evaluation mechanisms.

Peer-mediated learning, storytelling, play-based activities, and informal guidance are key features of CtC and are well aligned with developmentally appropriate practice in the early years. Importantly, CtC does not remove the role of teachers; rather, it reconfigures it. Adults become facilitators and mentors who scaffold children's participation, ensuring that peer-led learning remains inclusive, ethical, and developmentally appropriate.

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