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A Bilingual Observation Checklist to Support Identification of Preoperational Cognitive Skills in Early Childhood Classrooms

Aruna Maruthi

Department of Psychology, Centre for Distance and Online Education, JAIN (Deemed -to- be University), Bengaluru-78, India
Email: *aruna_maruthi[at]yahoo.co.in*

Abstract: ***Early childhood classrooms rely heavily on informal teacher observations to understand children's development. However, such observations are rarely structured or systematically linked to cognitive development frameworks. The present study proposes the development of a bilingual (Kannada–English) observation checklist to identify preoperational cognitive skills among children aged 2–7 years. Grounded in developmental theory, the tool focuses on observable indicators of symbolic thinking, egocentrism, and conservation. A descriptive research design is adopted, involving classroom-based observation and teacher training in checklist usage. The study aims to enhance teachers' ability to identify developmental cues and align instructional strategies through scaffolded interaction. The findings are expected to support early identification of cognitive lags and promote responsive teaching practices in early childhood settings. The tool is designed for use in routine classroom contexts and teacher training programs.***

Keywords: Preoperational stage, observation checklist, early childhood, cognitive development, bilingual assessment

1. Introduction

Early childhood is a critical period marked by rapid development in cognitive, language, and social domains. During this phase, children typically function within the preoperational stage, characterized by symbolic thinking, imaginative play, and intuitive reasoning. These developmental processes are often expressed through observable classroom behaviors such as storytelling, questioning, and pretend play. (Piaget, 1952; Berk, 2013)

In everyday classroom settings, teachers continuously observe these behaviours. However, such observations are largely informal and seldom documented in a structured manner that can inform instructional planning. Recognizing and systematically recording these developmental cues can significantly enhance teachers' ability to tailor instruction and provide timely support.
"In Indian early childhood classrooms, teachers often rely on experiential and intuitive observation practices. However, the absence of structured tools limits the systematic use of such observations for instructional planning."

This paper proposes a structured bilingual observational framework to enhance classroom-based identification and response to cognitive developmental processes.

Need for the Study
Despite the importance of observation in early childhood education, existing practices lack consistency and structure. Most available developmental tools are designed for clinical assessment or parent reporting, limiting their applicability in everyday classroom environments.

Teachers require practical, easy-to-use tools that allow them to observe and document developmental indicators during routine activities such as play, group interaction, and storytelling. A structured observation checklist can bridge this gap by enabling teachers to systematically identify cognitive cues and translate them into meaningful instructional strategies.

2. Theoretical Framework

This study is grounded in established theories of child development:

Cognitive Development Perspective
Children in the preoperational stage demonstrate symbolic thinking and imagination but also exhibit limitations such as egocentrism and centration. Observable behaviours provide insight into these emerging cognitive processes. (Piaget, 1962)

Sociocultural Perspective
Learning occurs through interaction and guided participation. Behaviours such as imitation, questioning, and collaboration indicate readiness for scaffolding. (Vygotsky, 1978)

Psychosocial Perspective
Children's initiative, curiosity, and engagement reflect their psychosocial development and influence their learning experiences.

Ecological Perspective
Development is shaped by interactions within the child's environment, particularly the classroom context, making teacher observation a crucial tool.

Rationale
Children aged 2–7 years develop foundational cognitive skills that influence later academic and social outcomes. Weaknesses in areas such as symbolic thinking, perspective-taking, and logical reasoning can lead to long-term difficulties.

While play-based and social-emotional learning approaches exist, teachers often lack structured tools to identify such

difficulties early. A bilingual observational checklist can provide a practical solution by enabling systematic observation and documentation within classroom contexts. (Wortham, 2012)

Research Gap

Existing developmental tools primarily focus on clinical assessment or parental reporting. There is limited emphasis on classroom-based observation of cognitive processes, particularly in the Indian context. (NCERT, 2005)

Teachers frequently rely on informal observations that are not organized into frameworks for instructional planning. Additionally, there is a lack of culturally relevant, bilingual tools tailored for early childhood classrooms.

This study addresses this gap by developing a structured, teacher-friendly observational checklist aligned with classroom realities.

Objectives

1) To develop a bilingual (Kannada–English) observation checklist for identifying preoperational skill deficits.
2) To define observable indicators of key cognitive processes such as egocentrism, symbolic thinking, and conservation.
3) To link observed behaviours with appropriate classroom-based intervention strategies.

Problem Statement

Children in the preoperational stage often exhibit:

- Egocentrism affecting social interactions
- Limited symbolic thinking impacting language and representation
- Difficulties in logical reasoning, including conservation

Although these behaviours are visible in classrooms, the absence of structured tools prevents systematic identification and intervention, highlighting the need for a practical observational framework.

3. Literature Review

Research highlights the importance of early identification of cognitive and social-emotional difficulties in young children. Studies indicate that symbolic play supports language development, categorization skills predict later academic success, and conservation understanding is linked to logical reasoning. Additionally, social-emotional challenges influence peer interactions and classroom adjustment. While existing frameworks emphasize the role of observation, they often lack specificity in identifying preoperational cognitive indicators within classroom contexts. There is also limited availability of culturally relevant, bilingual tools designed for everyday use by teachers. Contemporary approaches increasingly advocate process-based observation, focusing on how children think rather than solely on outcomes.

4. Methodology

Research Design

Descriptive research design with tool development and pilot classroom application

Participants

- Early childhood teachers (Preschool- class 2)
- Children aged 2–7 years

Classroom Applicability

The checklist is designed to be integrated into routine classroom activities without disrupting instructional flow. Teachers can use it during play, group interaction, and storytelling sessions.

Tool Description

Conceptual Overview of the Tool (Ages 2–7)

The primary tool is a **Structured Bilingual Observation Checklist**. (see Appendix A) It is designed to track a child's cognitive journey from the early years in the Anganwadi through the formal transition into **Class 1 and Class 2**.

1) Language That Connects (ಸರಳ ಮತ್ತು ಸ್ಪಷ್ಟ ಭಾಷೆ)

We have translated complex Piagetian theory into everyday classroom moments. Instead of "testing" a child, teachers look for these shifts in logic:

- **Imagination:** Does the child use a block as a phone? (Symbolic Thought).
- **Perspectives:** Can they understand that a friend sitting opposite them sees a different side of the picture? (Egocentrism).
- **Changes:** Do they realize that 10 beads in a row are the same as 10 beads in a circle? (Conservation).
- **Groups:** Can they sort objects by color *and* shape as they move into more complex math? (Classification).

2) How Teachers Use It (ಶಿಕ್ಷಕರು ಇದನ್ನು ಬಳಸುವ ವಿಧಾನ)

This is a **"Live" Tool** used during play in Pre-KG and during hands-on activities in Class 1 & 2.

- **Observe:** The teacher watches the child's natural logic during daily lessons and peer interactions.
- **Mark the "Three-Point Scale":**
  - **Not Yet:** The child is still guided by "how things look" (Perception).
  - **Occasional (◌): Emerging Stage of Understanding.** This is the most vital stage. The child is beginning to doubt their eyes and use their brain to solve a problem. It is the perfect time for a teacher to step in.
  - **Consistent:** The child has mastered the logic. They are now ready for the more abstract symbols used in Class 2 math and reading.
- **Dialogue:** Teachers use the **Dialogue Guide** to nudge the child's thinking forward without simply giving them the answer.

3) Why Bilingual Matters (ದ್ವಿಭಾಷೆಯ ಮಹತ್ವ)

As children move into Class 1 and 2, the "language of instruction" often becomes more formal.

- **Brain Power vs. Word Power:** A child may understand a mathematical concept perfectly in **Kannada** but struggle to explain it in **English**. This tool ensures we measure their **actual intelligence**, not just their language fluency.
- **Teacher Confidence:** The **Bilingual Dialogue Guide** gives teachers the exact prompts to use in both languages,

ensuring that the "bridge" to formal English is built on a strong foundation of the mother tongue.
- **Inclusion:** It ensures that the transition to Class 1 is smooth for every child, regardless of the language they speak at home.

4) The Complete Kit
- **The Checklist:** Tracking the four key areas of logic across the preschool and primary years.
- **The Recording Template (Bilingual) :** A space for teachers to capture the "logic" behind a child's answer. (see Appendix B)
- **The Teacher Dialogue Guide:** A bilingual "Structured Dialogue Support" of questions that challenge a child to think twice and move toward logical operations. (see Appendix C)
- **"A detailed bilingual (Kannada–English) training manual with expanded scaffolding prompts was developed but is not included here to maintain brevity."*

Closing Thought for Training:
"By extending this observation up to Class 2, we ensure that the 'logic of play' isn't lost when 'formal schooling' begins. We are helping teachers see that a 7-year-old in Class 2 is still building the same mental bridges as a 4-year-old in the Anganwadi."

Procedure
Teachers were oriented to the use of the checklist and conducted observations during routine classroom activities such as play, group interaction, and storytelling. Observations were recorded and interpreted to identify developmental patterns and guide instructional responses.

Expected Outcomes
- Improved teacher ability to identify cognitive developmental cues
- Increased use of structured observation in classrooms
- Enhanced alignment between observation and teaching strategies
- Early identification of developmental delays

Implications
The study contributes to early childhood education by providing a practical, classroom-based assessment tool. It supports teacher training, inclusive practices, and formative assessment approaches aligned with developmental needs. (NCTE, 2014)

Implications for Teacher Education
"The checklist can be integrated into pre-service and in-service teacher training programs to enhance observational skills and support reflective teaching practices."

5. Conclusion

Structured observation has the potential to transform everyday classroom interactions into meaningful opportunities for understanding and supporting children's cognitive development. The proposed bilingual checklist bridges the gap between theory and practice, enabling teachers to engage more effectively with children's thinking processes. The integration of bilingual tools further ensures inclusivity and accessibility in diverse classroom settings.

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Core Theory
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Appendices
Appendix A: Observation Checklist


Appendix%20A%20-%20observational%2(

Appendix B: Observation Recording Template


Appendix%20B%20Observation%20Record

Appendix C: Teacher Dialogue Guide (Sample)


Appendix%20c%20-%20Teacher%20dialo

Appendix D: Training Evaluation Form

*Detailed training materials are available with the author upon request.
Appendix - A: Observation Checklist
Appendix B: Observation Recording Template (Bilingual)
Appendix – C: Teacher Dialogue Guide (Bilingual: English & Kannada)

Appendix A

Observation Sheet for Conservation Tasks – Occasional

This sheet helps teachers record children's responses when skills are observed occasionally. Use ◯ (occasional) and add notes.

1) Conservation of Number

Scenario: Two equal rows of beads; one row spread out.

- Child's Response: _____
- Teacher Notes: _____

2) Conservation of Mass

Scenario: Two equal clay balls; one flattened.

- Child's Response: _____
- Teacher Notes: _____

3) Conservation of Length

Scenario: Two equal sticks; one moved slightly forward.

- Child's Response: _____
- Teacher Notes: _____

4) Conservation of Area

Scenario: Two equal rectangles; one cut and spread apart.

- Child's Response: _____
- Teacher Notes: _____

5) Conservation of Weight

Scenario: Equal clay balls on balance scale; one reshaped.

- Child's Response: _____
- Teacher Notes: _____

6) Conservation of Volume

Scenario: Equal sand/rice in two containers; one transferred to taller container.

- Child's Response: _____
- Teacher Notes: _____

Recording Key

- ◯ Observed occasionally

Teacher Reflection

- Strategies used: Use of concrete materials and visual aids to demonstrate conservation concepts; encouraging children to verbalize their observations; providing repeated opportunities for hands-on exploration; scaffolding questions to guide thinking; positive reinforcement to build confidence.
- Next steps: Plan targeted activities to reinforce understanding of conservation principles; incorporate group discussions to deepen conceptual grasp; assess individual progress regularly; adapt tasks to challenge children at varying levels; involve parents in supporting learning at home.

Teacher Observations

- Moving from Not Yet to Occasional: The child begins to show emerging awareness of conservation concepts, sometimes responding correctly with prompts or cues. Responses may be inconsistent, requiring additional support and encouragement. The child shows curiosity and attempts to engage with tasks but may need repeated demonstrations.
- Moving from Occasional to Consistent: The child demonstrates increased understanding and can apply conservation concepts more reliably with less prompting. Responses become more accurate and frequent, showing growing confidence. The child actively participates in discussions and can explain observations with guidance.

ಸಂರಕ್ಷಣಾ ಕಾರ್ಯಗಳಿಗಾಗಿ ಅವಲೋಕನ ಪತ್ರಿಕೆ – ಕೆಲವೊಮ್ಮೆ

ಈ ಪತ್ರಿಕೆ ಶಿಕ್ಷಕರು ಮಕ್ಕಳ ಪ್ರತಿಕ್ರಿಯೆಗಳನ್ನು ಕೆಲವೊಮ್ಮೆ ಕೌಶಲ್ಯಗಳನ್ನು ಗಮನಿಸಿದಾಗ ದಾಖಲಿಸಲು ಸಹಾಯ ಮಾಡುತ್ತದೆ. ◯ (ಕೆಲವೊಮ್ಮೆ) ಬಳಸಿ ಟಿಪ್ಪಣಿಗಳನ್ನು ಸೇರಿಸಿ.

1) ಸಂಖ್ಯೆಯ ಸಂರಕ್ಷಣೆ

ದೃಶ್ಯಾವಳಿ: ಎರಡು ಸಮಾನ ಮುತ್ತು ಸಾಲುಗಳು; ಒಂದು ಸಾಲು ವಿಸ್ತಾರಗೊಳ್ಳುತ್ತದೆ.

- ಮಕ್ಕಳ ಪ್ರತಿಕ್ರಿಯೆ: _____
- ಶಿಕ್ಷಕರ ಟಿಪ್ಪಣಿಗಳು: _____

2) ಭಾರದ ಸಂರಕ್ಷಣೆ

ದೃಶ್ಯಾವಳಿ: ಎರಡು ಸಮಾನ ಮಣ್ಣಿನ ಗುಂಡಿಗಳು; ಒಂದು ಒತ್ತಡಗೊಳ್ಳುತ್ತದೆ.

- ಮಕ್ಕಳ ಪ್ರತಿಕ್ರಿಯೆ: _____
- ಶಿಕ್ಷಕರ ಟಿಪ್ಪಣಿಗಳು: _____

3) ಉದ್ದದ ಸಂರಕ್ಷಣೆ

ದೃಶ್ಯಾವಳಿ: ಎರಡು ಸಮಾನ ಕಡ್ಡಿಗಳು; ಒಂದು ಸ್ವಲ್ಪ ಮುಂದೆ ಸರಿಸಲಾಗಿದೆ.

- ಮಕ್ಕಳ ಪ್ರತಿಕ್ರಿಯೆ: _____
- ಶಿಕ್ಷಕರ ಟಿಪ್ಪಣಿಗಳು: _____

4) ಪ್ರದೇಶದ ಸಂರಕ್ಷಣೆ

ದೃಶ್ಯಾವಳಿ: ಎರಡು ಸಮಾನ ಆಯತಾಕಾರಗಳು; ಒಂದು ಕತ್ತರಿಸಿ ವಿಸ್ತಾರಗೊಳ್ಳುತ್ತದೆ.

- ಮಕ್ಕಳ ಪ್ರತಿಕ್ರಿಯೆ: _____
- ಶಿಕ್ಷಕರ ಟಿಪ್ಪಣಿಗಳು: _____

5) ತೂಕದ ಸಂರಕ್ಷಣೆ

ದೃಶ್ಯಾವಳಿ: ಸಮಾನ ಮಣ್ಣಿನ ಗುಂಡಿಗಳು ತೂಕದ ತೂಕದ ಮೇಲೆ; ಒಂದು ಮರುರೂಪಗೊಳ್ಳುತ್ತದೆ.

- ಮಕ್ಕಳ ಪ್ರತಿಕ್ರಿಯೆ: _____
- ಶಿಕ್ಷಕರ ಟಿಪ್ಪಣಿಗಳು: _____

6) ಪ್ರಮಾಣದ ಸಂರಕ್ಷಣೆ

ದೃಶ್ಯಾವಳಿ: ಎರಡು ಪಾತ್ರೆಗಳಲ್ಲಿ ಸಮಾನ ಮರಳು/ಅಕ್ಕಿ; ಒಂದು ಎತ್ತರದ ಪಾತ್ರೆಗೆ ಬದಲಾಯಿಸಲಾಗಿದೆ.

- ಮಕ್ಕಳ ಪ್ರತಿಕ್ರಿಯೆ: _____
- ಶಿಕ್ಷಕರ ಟಿಪ್ಪಣಿಗಳು: _____

ದಾಖಲಾತಿ ಕೀ

- ◯ ಕೆಲವೊಮ್ಮೆ ಗಮನಿಸಲಾಗಿದೆ

ಶಿಕ್ಷಕರ ಪರಾಮರ್ಶೆ

- ಉಪಯೋಗಿಸಿದ ತಂತ್ರಗಳು: ಸಂರಕ್ಷಣಾ ತತ್ವಗಳನ್ನು ತೋರಿಸಲು ಸ್ಪಷ್ಟ ವಸ್ತುಗಳು ಮತ್ತು ದೃಶ್ಯ ಸಹಾಯಗಳನ್ನು ಬಳಸುವುದು; ಮಕ್ಕಳಿಗೆ ತಮ್ಮ

ಗಮನಗಳನ್ನು ಮಾತಿನಲ್ಲಿ ಹೇಳಲು ಪ್ರೋತ್ಸಾಹಿಸುವುದು; ಕೈಯಿಂದ ಅನ್ವೇಷಣೆಗೆ ಪುನರಾವೃತ್ತಿ ಅವಕಾಶಗಳನ್ನು ನೀಡುವುದು; ಚಿಂತನೆಗೆ ಮಾರ್ಗದರ್ಶನ ನೀಡಲು ಪ್ರಶ್ನೆಗಳನ್ನು ಹಂತ ಹಂತವಾಗಿ ಕೇಳುವುದು; ಆತ್ಮವಿಶ್ವಾಸವನ್ನು ನಿರ್ಮಿಸಲು ಧನಾತ್ಮಕ ಪ್ರೋತ್ಸಾಹ.

- ಮುಂದಿನ ಹಂತಗಳು: ಸಂರಕ್ಷಣಾ ತತ್ವಗಳ ಅರ್ಥವನ್ನು ಬಲಪಡಿಸಲು ಗುರಿತಗೊಂಡ ಚಟುವಟಿಕೆಗಳನ್ನು ಯೋಜಿಸುವುದು; ಗುಂಪು ಚರ್ಚೆಗಳನ್ನು ಸೇರಿಸಿ ತತ್ವಗಳ ಆಳವಾದ ಗ್ರಹಿಕೆಯನ್ನು ಹೆಚ್ಚಿಸುವುದು; ವೈಯಕ್ತಿಕ ಪ್ರಗತಿಯನ್ನು ನಿಯಮಿತವಾಗಿ ಅಳೆಯುವುದು; ಮಕ್ಕಳ ವಿಭಿನ್ನ ಮಟ್ಟಗಳಿಗೆ ಸವಾಲು ನೀಡುವಂತೆ ಕಾರ್ಯಗಳನ್ನು ಹೊಂದಿಸುವುದು; ಮನೆಯಲ್ಲಿಯೂ ಪೋಷಕರನ್ನು ಸಹಭಾಗಿಯಾಗಿಸುವುದು.

ಶಿಕ್ಷಕರ ಗಮನಿಕೆಗಳು

- "ಇನ್ನೂ ಇಲ್ಲ" ರಿಂದ "ಕೆಲವೊಮ್ಮೆ" ಗೆ: ಮಕ್ಕಳು ಸಂರಕ್ಷಣಾ ತತ್ವಗಳ ಪ್ರಾರಂಭಿಕ ಅರಿವನ್ನು ತೋರಿಸುತ್ತಾರೆ, ಕೆಲವೊಮ್ಮೆ ಸೂಚನೆಗಳೊಂದಿಗೆ ಸರಿಯಾಗಿ ಪ್ರತಿಕ್ರಿಯಿಸುತ್ತಾರೆ. ಪ್ರತಿಕ್ರಿಯೆಗಳು ಅಸಮರ್ಪಕವಾಗಿರಬಹುದು, ಹೆಚ್ಚುವರಿ ಬೆಂಬಲ ಮತ್ತು ಪ್ರೋತ್ಸಾಹ ಅಗತ್ಯವಿರುತ್ತದೆ. ಮಕ್ಕಳು ಕುತೂಹಲ ತೋರಿಸುತ್ತಾರೆ ಮತ್ತು ಕಾರ್ಯಗಳಲ್ಲಿ ತೊಡಗಿಕೊಳ್ಳಲು ಪ್ರಯತ್ನಿಸುತ್ತಾರೆ ಆದರೆ ಪುನರಾವೃತ್ತಿ ಪ್ರದರ್ಶನಗಳು ಬೇಕಾಗಬಹುದು.
- "ಕೆಲವೊಮ್ಮೆ" ರಿಂದ "ಸ್ಥಿರ" ಗೆ: ಮಕ್ಕಳು ಹೆಚ್ಚಿದ ಅರ್ಥವನ್ನು ತೋರಿಸುತ್ತಾರೆ ಮತ್ತು ಕಡಿಮೆ ಸೂಚನೆಗಳೊಂದಿಗೆ ಸಂರಕ್ಷಣಾ ತತ್ವಗಳನ್ನು ಹೆಚ್ಚು ನಂಬಿಕೆಯಿಂದ ಅನ್ವಯಿಸುತ್ತಾರೆ. ಪ್ರತಿಕ್ರಿಯೆಗಳು ಹೆಚ್ಚು ಸರಿಯಾಗುತ್ತವೆ ಮತ್ತು ಹೆಚ್ಚಾಗುತ್ತವೆ, ಆತ್ಮವಿಶ್ವಾಸ ಹೆಚ್ಚುತ್ತದೆ. ಮಕ್ಕಳು ಚರ್ಚೆಗಳಲ್ಲಿ ಸಕ್ರಿಯವಾಗಿ ಭಾಗವಹಿಸುತ್ತಾರೆ ಮತ್ತು ಮಾರ್ಗದರ್ಶನದೊಂದಿಗೆ ಗಮನಗಳನ್ನು ವಿವರಿಸಬಹುದು.

Appendix B

Observational Template (The "Shift" Tracker)
This template is designed for quick, day-to-day use in the classroom to track the transition from **Preoperational** to **Concrete Operational** thinking.

Child's Name: _____ **Date:** _____

Conservation Task	Scenario / Activity	Status (◯ = Occasional)	Evidence of "Moving" (Teacher Notes)
Number	Two rows of beads; one row is spread out.	◯	Example: Counted both rows to check.
Mass	Two clay balls; one is flattened into a pancake.	◯	
Length	Two equal sticks; one is moved forward.	◯	
Area	Two rectangles; one is cut into pieces.	◯	
Weight	Equal clay balls on a scale; one is reshaped.	◯	
Volume	Rice/Sand moved to a taller, thinner jar.	◯	

Progress Indicators:

- **Moving toward Occasional:** Uses prompts/cues; shows curiosity but is inconsistent.
- **Moving toward Consistent:** Explains reasoning; requires little to no prompting.

ಅವಲೋಕನ ಮಾದರಿ ("ಬದಲಾವಣೆ" ಟ್ರ್ಯಾಕರ್)
Observational Template (The "Shift" Tracker)
ಈ ತಪಾಸಣಾ ಪಟ್ಟಿಯನ್ನು ಮಕ್ಕಳ ಆಲೋಚನಾ ಕ್ರಮದಲ್ಲಿನ ಬದಲಾವಣೆಗಳನ್ನು (Preoperational ಇಂದ Concrete Operational ಹಂತಕ್ಕೆ) ಪ್ರತಿದಿನ ಸುಲಭವಾಗಿ ಗುರುತಿಸಲು ವಿನ್ಯಾಸಗೊಳಿಸಲಾಗಿದೆ.

ಮಗುವಿನ ಹೆಸರು (Child's Name): _____ **ದಿನಾಂಕ (Date):** _____

ಸಂರಕ್ಷಣಾ ಕಾರ್ಯ (Conservation Task)	ಸನ್ನಿವೇಶ / ಚಟುವಟಿಕೆ (Scenario / Activity)	ಸ್ಥಿತಿ (◯ = ಕೆಲವೊಮ್ಮೆ) Status	"ಬದಲಾವಣೆ"ಯ ಪುರಾವೆ (ಶಿಕ್ಷಕರ ಟಿಪ್ಪಣಿ) Evidence of "Moving"
ಸಂಖ್ಯೆ (Number)	ಎರಡು ಸಾಲುಗಳಲ್ಲಿ ಮಣಿಗಳನ್ನು ಜೋಡಿಸುವುದು; ಒಂದು ಸಾಲನ್ನು ಹರಡುವುದು.	◯	ಉದಾಹರಣೆ: ಎರಡೂ ಸಾಲುಗಳನ್ನು ಎಣಿಸಿ ಪರೀಕ್ಷಿಸಿದನು/ಳು.
ದ್ರವ್ಯರಾಶಿ (Mass)	ಎರಡು ಜೇಡಿಮಣ್ಣಿನ ಉಂಡೆಗಳು; ಒಂದನ್ನು ಚಪ್ಪಟೆ ಮಾಡುವುದು.	◯	
ಉದ್ದ (Length)	ಎರಡು ಸಮಾನ ಉದ್ದದ ಕಡ್ಡಿಗಳು; ಒಂದನ್ನು ಮುಂದಕ್ಕೆ ಸರಿಸುವುದು.	◯	

ವಿಸ್ತೀರ್ಣ (Area)	ಎರಡು ಸಮಾನ ಆಯತಾಕಾರದ ಕಾಗದಗಳು; ಒಂದನ್ನು ತುಂಡುಗಳಾಗಿ ಕತ್ತರಿಸುವುದು.	◯	
ತೂಕ (Weight)	ತಕ್ಕಡಿಯಲ್ಲಿ ಸಮಾನ ತೂಕದ ಮಣ್ಣಿನ ಉಂಡೆಗಳು; ಒಂದರ ಆಕಾರ ಬದಲಿಸುವುದು.	◯	
ಗಾತ್ರ (Volume)	ಅಕ್ಕಿ ಅಥವಾ ಮರಳನ್ನು ಅಗಲವಾದ ಪಾತ್ರೆಯಿಂದ ಎತ್ತರವಾದ ಸಣ್ಣ ಜಾರ್‌ಗೆ ಸುರಿಯುವುದು.	◯	

ಪ್ರಗತಿ ಸೂಚಕಗಳು (Progress Indicators):

- **'ಕೆಲವೊಮ್ಮೆ' (Occasional) ಹಂತದ ಕಡೆಗೆ:** ಮಗು ಶಿಕ್ಷಕರ ಸುಳಿವು ಅಥವಾ ಪ್ರಶ್ನೆಗಳನ್ನು ಬಳಸುತ್ತದೆ; ಕುತೂಹಲ ತೋರುತ್ತದೆ ಆದರೆ ಉತ್ತರಗಳಲ್ಲಿ ಸ್ಥಿರತೆ ಇರುವುದಿಲ್ಲ.
- **'ಸ್ಥಿರ' (Consistent) ಹಂತದ ಕಡೆಗೆ:** ಮಗು ತನ್ನ ಉತ್ತರಕ್ಕೆ ಕಾರಣವನ್ನು ವಿವರಿಸುತ್ತದೆ (Reasoning); ಶಿಕ್ಷಕರ ಯಾವುದೇ ಸುಳಿವು ಇಲ್ಲದೆಯೇ ಸರಿಯಾದ ತರ್ಕವನ್ನು ಬಳಸುತ್ತದೆ.

Teacher's Tip (ಶಿಕ್ಷಕರಿಗೆ ಸಲಹೆ):

When the teacher marks ◯ **(ಕೆಲವೊಮ್ಮೆ)**, it means the child's brain is "wrestling" with the logic. Encourage the teacher to write down the exact words the child used in the "Evidence" column, as this is the most valuable data for your 6-week study.

Appendix – C: Teacher Dialogue Guide (Bilingual: English & Kannada)

The "Research Gap" is often that teachers don't know *what to say* to trigger a child's thinking. Use these "Scaffolding Questions" to guide the child's cognitive development.

Phase A: Establishing Equality (ಸಮಾನತೆಯನ್ನು ಸ್ಥಾಪಿಸುವುದು)

- **English:** "Do both rows have the same number of beads, or does one have more?"
- **Kannada:** "ಎರಡೂ ಸಾಲುಗಳಲ್ಲಿ ಸಮನಾದ ಮುತ್ತುಗಳಿವೆಯೇ ಅಥವಾ ಒಂದರಲ್ಲಿ ಹೆಚ್ಚಿದೆಯೇ?"

Phase B: The Transformation (ಬದಲಾವಣೆ)

- **English:** "Watch what I do... Now, does this row have more, or are they still the same?"
- **Kannada:** "ನಾನು ಮಾಡುವುದನ್ನು ನೋಡಿ... ಈಗ, ಈ ಸಾಲಿನಲ್ಲಿ ಹೆಚ್ಚು ಇವೆಯೇ ಅಥವಾ ಎರಡೂ ಇನ್ನೂ ಸಮನಾಗಿವೆಯೇ?"

Phase C: Challenging the "Appearance" (ನೋಟಕ್ಕೆ ಸವಾಲು ಹಾಕುವುದು)

- **English:** "Why do you think this one has more? Is it because it looks longer?"
- **Kannada:** "ಇದರಲ್ಲಿ ಹೆಚ್ಚು ಇದೆ ಎಂದು ನಿನಗೆ ಏಕೆ ಅನ್ನಿಸುತ್ತದೆ? ಇದು ಉದ್ದವಾಗಿ ಕಾಣುವುದಕ್ಕಾಗಿಯೇ?"