Survey Design to Assess Indian Secondary Science Teachers' Inquiry-Based Pedagogical Confidence and Assessment Practices

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Context: Why This Study Now?

- ✓NCF 2023 calls for competency-based, inquiry-driven science education
- ✓Shift from rote learning → scientific thinking, reasoning, experimentation
- ✓Assessment reframed as learning and for learning
- ✓Teachers' pedagogical and assessment confidence becomes central

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Theoretical Underpinnings: Inquiry-Based Science Education?

Inquiry as process and outcome

Emphasis on:

- ✓ Questioning
- ✓ Hypothesis formation
- ✓ Experimental design
- ✓ Data interpretation
- ✓ Evidence-based reasoning

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Theoretical Underpinnings: Teacher Self-Efficacy

- Based on Bandura's social cognitive theory
- Self-efficacy as the belief in one's capability to perform a task
- High self-efficacy → persistence, resilience, willingness to adopt new pedagogies
- Critical for inquiry teaching due to its complexity and unpredictability

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Why Self-Efficacy Matters in Inquiry Teaching

Inquiry requires:

- Managing open-ended investigations
- Facilitating student autonomy
- Assessing complex skills

Research shows teachers often feel underprepared (Zhu et al., 2025; Aydeniz et al., 2021).
Self-efficacy influences whether inquiry is implemented authentically or superficially.

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Gap in Existing Instruments

STEBI: measures general science teaching efficacy → not inquiry-specific
Teaching Science as Inquiry Scale: procedural focus → limited assessment dimension
IBSTES: strong but primary-level and Turkish context
None integrate assessment literacy for inquiry skills
→ Need for a contextualised, assessment-focused instrument for India

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Purpose of the Instrument

Diagnose teachers' perceived competence in:

Teaching inquiry skills
Assessing inquiry skills
Designing practical work
Providing feedback

Support design of training and an assessment framework aligned with NCF 2023

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Instrument Sample Items

“I am confident teaching students how to formulate scientific questions.”

“I can design practical activities to assess students’ interpretation skills.”

“I can provide constructive feedback on inquiry competencies during practical work.”

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Participants

- 1,418 CBSE secondary science teachers
- 70% aged 25–4445% with 6–15 years experience
- 94% from private CBSE schools
- Strong representation of experienced female teachers

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Analytical Approach

- PCA used to identify underlying components
- Rationale: instrument combines adapted + newly developed items
- Cronbach's α used to assess internal consistency
- Missing data imputed using median values

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PCA Findings

Five components identified:

1. Assessment competence (dominant; 56.11% variance)
2. Teaching observation & measurement skills
3. Practical work design & independence
4. Lab safety & problem identification
5. Hypothesis formulation & variable identification

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Reliability

Overall scale α = 0.962

Component α values = 0.841–0.903

Indicates excellent internal consistency

Instrument is multidimensional, but with one dominant assessment component

Reflects intentional design focus on assessment for inquiry

Other components support a holistic understanding of inquiry pedagogy

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Concluding Remarks

Provides a diagnostic tool for professional development

Supports creation of an assessment framework for inquiry skills

Helps identify gaps in:
Pedagogical knowledge
Assessment literacy
Confidence in facilitating inquiry

Contributes to NCF 2023 implementation efforts

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Thanks for Listening

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