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# From Curriculum Reform to Classroom Practice: Pilot Implementation of Primary Education Science Curriculum

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**Abstract** **Original Research Article**

This study explores stakeholder experiences of a newly developed, competency-oriented primary education science curriculum and accompanying student handbook and workbook in Mongolia. The 17-week pilot during the 2024–2025 academic year involved 548 students in Grades 1–5 and 15 teachers across three schools representing urban, provincial-center, and rural settings. Qualitative evidence came from initial and endline interviews with students (73 and 67 participants), teachers (14 and 15), and parents (63 and 52). Interview records were categorized through qualitative content analysis and summarized as proportions of records mentioning each theme; these proportions are not estimates of participant prevalence or measured learning gains. At endline, interest in lessons and tasks was mentioned in 95.5% of student interview records, difficulty in 68.2%, and both themes together in 65.9%. Teachers reported opportunities for experimentation, observation, and collaboration alongside concerns about complex content, equipment shortages, time, and text suitability. Parents described children's curiosity and home-based activity while also identifying support needs. The findings highlight a central implementation tension: inquiry activities can engage children while imposing substantial literacy, explanation, and resource demands. The study contributes context-sensitive evidence for revising science learning materials and supporting teachers, without claiming causal effects on achievement.

**Keywords**: primary science education; curriculum enactment; inquiry-based learning; qualitative content analysis; curriculum piloting; Mongolia.

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## Introduction

Curriculum reform is not completed when a new syllabus or textbook is approved: its educational meaning emerges through teachers' instructional decisions and students' engagement with actual tasks. This distinction is especially consequential in primary education science, where observation, experimentation, discussion, and evidence-based explanation must be made accessible to primary school students with developing reading and writing skills. Inquiry-oriented science education places value on learners' questions and the use of evidence, but requires carefully sequenced activities, explicit support, and feasible classroom resources (National Research Council, 2000). In Mongolia, the primary curricula for "Humans and the Environment" and

"Humans and Nature" were introduced in 2014 and revised in 2019. A national implementation report described weak performance on application-oriented tasks and limited use of practical investigations and equipment (Ministry of Education, Culture, Science and Sports & Institute of Education, 2019). These findings motivate close examination of how revised curriculum intentions operate in classrooms, rather than assuming that curriculum documents alone produce new instructional practices.

Mongolia's 2024 curriculum conceptual framework (2024–2036) articulates a competency-oriented direction for preschool and general education (Government of Mongolia, 2024). During the 2024–2025 academic year, a draft primary science curriculum was piloted with a student handbook and workbook in selected schools. The present analysis examines how stakeholders experienced these materials and the conditions of implementation. Its contribution is not an estimate of achievement effects: the study did not administer standardized outcome measures or include a comparison group. Instead, it identifies the affordances and tensions that arise when inquiry-oriented curriculum expectations meet children's literacy development, teachers' pedagogical knowledge, and material constraints. A related Mongolian study using the Concerns-Based Adoption Model has examined teachers' challenges during curriculum piloting (Densmaa et al., 2025), but the present manuscript adds the voices of students and parents to the implementation discussion.

The purpose of this study is to examine perceived opportunities, implementation constraints, and revision priorities for the draft primary science curriculum and its associated learning materials. The analysis addresses three questions: (1) How do teachers, students, and parents describe the learning opportunities and difficulties associated with the pilot curriculum and materials? (2) What pedagogical, textual, material, and contextual conditions shape their reported implementation experiences? (3) What revisions and forms of support are indicated by the stakeholder evidence?

Literature Review and Conceptual Orientation

Inquiry-based primary education science and the demands of explanation. Inquiry-oriented science learning involves more than performing attractive practical activities: learners must connect questions, observations, evidence, and explanations. The National Research Council (2000) emphasizes the instructional supports needed to engage learners in scientific inquiry. In primary school classrooms, reading task instructions and recording observations can become barriers even when children are motivated by experimentation. This study therefore distinguishes interest, task accessibility, participation, and the ability to explain findings rather than treating them as interchangeable indicators of learning.

Curriculum enactment and implementation conditions. The analytical orientation of this paper treats curriculum implementation as the interaction of intended learning outcomes, learning materials, instructional mediation, and school/home resources. A draft curriculum may specify inquiry and competencies, while the opportunities actually available to children depend on teachers' interpretation, the clarity and sequencing of tasks, lesson time, and equipment. This is an interpretive organizing lens, not a formally tested causal model. It directs attention to both reported opportunities and reported barriers across stakeholder groups.

Stakeholder perspectives and qualitative evidence. Teachers can describe lesson preparation and instructional constraints; students can describe what they found interesting, difficult, or incomplete; and parents can describe activities and assistance at home. These accounts provide complementary perspectives, but cannot automatically corroborate the same event when respondents are not individually matched. Qualitative content analysis supports the systematic identification of recurring meanings in interview material (Hsieh & Shannon, 2005). Accordingly, the present analysis uses theme frequencies descriptively while preserving differences in the questions and units of analysis.

## Methodology

### Study setting and scope

The pilot involved 548 students in 15 classes across Grades 1–5 and 15 teachers from three schools: School No. 48 in Bayanzürkh District, Ulaanbaatar; Delgermörön School in the center of Khövsgöl Province; and Ikh-Uul Soum School. A qualitative study was conducted using initial and endline interviews. Although the sample included urban, provincial-center, and soum contexts, only one school was included from each setting, so the sample cannot be considered nationally representative. Because no control group or equivalent standardized skills test was used, the findings are interpreted as an analysis of implementation experiences rather than an estimate of causal effects.

The pilot was planned and implemented over a total of 17 weeks during the first and second semesters of the 2024–2025 academic year. First-semester topics piloted with the student handbook and workbook included the following. Grade 1: living and nonliving things; making leaves; are all leaves the same?; plant parts; our bodies; our senses; sour or sweet? Grade 2: identifying animal diversity; getting to know domestic animals; exploring plant diversity; getting to know indoor plants; do plants need water and light? Grade 3: properties and uses of materials; choosing suitable materials; solids, liquids, and gases; differences between states of matter; changes of state; separating mixtures; and magnetic separation. Grade 4: why do objects fall?; Earth's gravity; investigating gravity; observing pendulum motion; measuring time when changing pendulum mass; and measuring time when changing pendulum length. Grade 5: latitude and longitude; causes of day, night, and seasonal changes; oceans and land; rivers and lakes; and weather.

Second-semester topics piloted with the student handbook and workbook included the following. Grade 1: materials around us; material properties; pushing and pulling; floating or sinking?; playing with magnets; where does sound come from?; which sounds are loud or soft?; and why do sounds seem loud or soft? Grade 2: permeable and impermeable materials; transparent and opaque materials; playing with modeling clay; how many days are in a month?; the four seasons and months; and rocks and the environment. Grade 3: characteristics of living organisms; insects and arachnids; how sound is produced; why sounds differ; the role of wind and rubber; floating and sinking; finding magnetic objects; do all parts of a magnet attract?; and bringing magnets together. Grade 4: investigating the human body and movement; comparing animal and human bones and muscles; particle models of solids, liquids, and gases; representing changes of state with particle models; maps, symbols, and scale; Earth's internal structure; and planets of the Solar System. Grade 5: how plants obtain food; functions of leaves, roots, and stems; the butterfly life cycle; freezing and melting water; melting point; boiling and condensation; and using a ball rolling down an inclined plane to move a load. Initial data were collected during the first week of November 2024, and endline data during the final week of March 2025. Because the first topics had already been taught at the time of initial data collection, the initial interviews do not represent a true pre-instruction baseline. Teachers from all 15 classes participated, and five students were sampled from each class, together with their parents, for the initial and endline studies.

### Participants and units of analysis

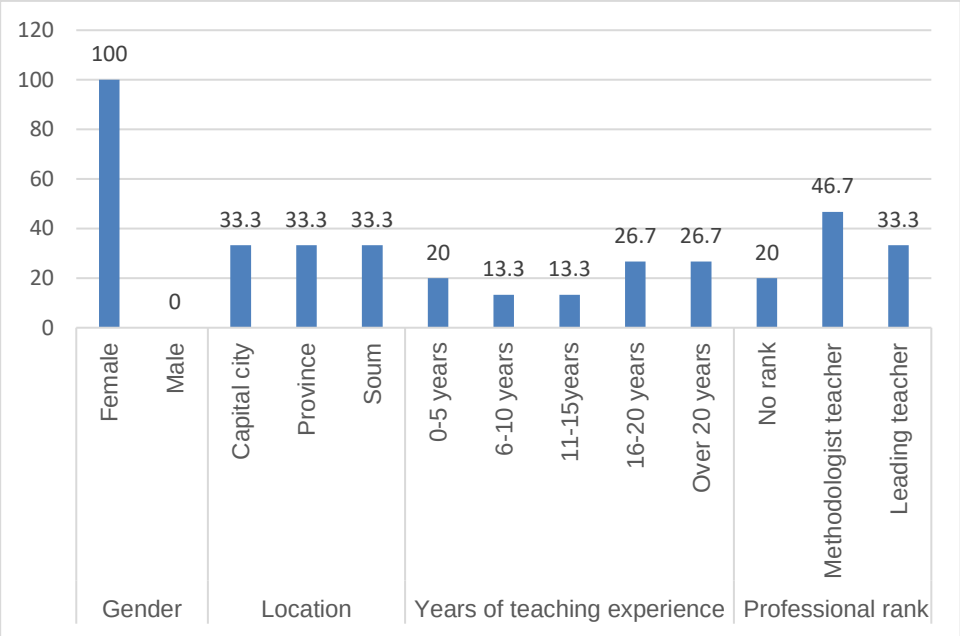
At baseline, individual interviews were organized for Grades 1–2 students and group interviews for Grades 3–5. The initial student interviews involved 73 students documented in 37 interview records, while the endline interviews involved 67 students documented in 44 records. Teachers from the 15 classes at the three pilot schools participated in group interviews organized by Grades 1–2 and Grades 3–5. Parent representatives were also interviewed in groups by class.

*Table 1. Participants*

| Group | Initial | Endline |
|---|---|---|
| Students | 73 | 67 |
| Teachers | 14 | 15 |
| Parents | 63 | 52 |

The participating teachers' characteristics, including gender, location, years of teaching experience, and professional qualification, are presented in Figure 1.

*Figure 1 Characteristics of Participating Teachers*




**Interview questions and data analysis**

Interview recording sheets and the student handbooks and workbooks used during the pilot served as the primary research instruments. The initial student interview included eight questions across three thematic domains; the endline interview included nine questions covering the same domains. Students were asked to show completed work and explain what they had done and why particular activities were interesting or difficult. The initial teacher interview included 18 questions and the endline interview 16 questions across three domains. Teachers were asked about students' necessary and observed skills, teaching methods, planning, resources, time, professional support, costs, and implementation challenges. Parents responded to five initial and seven endline questions concerning children's communication, interests, support received, and learning materials. Interview responses were organized into three domains: (a) skills and communication; (b) use of the student handbook and workbook; and (c) challenges and recommendations for improvement.

Interview records were categorized by central meaning in three domains: (a) skills and communication; (b) use of the student handbook and workbook; and (c) challenges and recommendations. The available analysis

summarizes whether each interview record mentioned a theme, drawing on qualitative content-analysis principles (Hsieh & Shannon, 2005). Across initial and endline interviews, 81 student records, 17 teacher records, and 40 parent records were analyzed. The denominator for each reported percentage is the number of relevant interview records for that phase and question domain, not the total number of individual interviewees. One group-interview record was counted once, regardless of the number of participants. The source materials do not document the number of coders, whether a formal codebook was developed, or any inter-coder comparison; these procedures therefore cannot be claimed. Before submission, the authors should describe the actual coding workflow and clarify the provenance of each denominator, using the original interview records where available.

Percentages were calculated by dividing the number of records mentioning a given theme by the total number of records for that phase and question domain and multiplying by 100. Because a single record could contain multiple themes, percentages do not necessarily sum to 100. Responses mentioning a theme could include both favorable assessments and difficulties. Since the initial and endline interview questions and recording formats differed, differences in percentages were not interpreted as changes in individual students' skills.

Responses from teachers, students, and parents were compared within shared thematic domains to synthesize convergent and divergent perspectives. Percentages for each group were examined separately rather than combined into an overall indicator. Because individual students' responses were not matched with those of their own teachers and parents, similar themes across groups were not treated as triangulated evidence of the same event. Reporting considered the Standards for Reporting Qualitative Research (SRQR) recommendations (O'Brien et al., 2014).

## Research Ethics and Researcher Positioning

The study included children in Grades 1–5. The authors must report the actual institutional ethics review or exemption, school permissions, parental consent and child assent arrangements, confidentiality safeguards, and procedures for storing interview records. These details were not provided in the source manuscript and must be completed from project documentation before submission. The curriculum development team assisted with data collection; the authors should also explain their own roles in curriculum design, piloting, and analysis, and how these roles may have influenced participants' responses and interpretation.

## Results

Teacher interview findings

Table 2. Summary of teachers' responses concerning students' skills and communication

| Theme | Baseline, % | Endline, % |
|---|---|---|
| Comparing and drawing conclusions | 28.6% | 70.0% |
| Conducting experiments | 0.0% | 70.0% |
| Observation skills | 28.6% | 60.0% |
| Concentration, attention, and ability to remain seated | 57.1% | 10.0% |
| Independent learning | 42.9% | 10.0% |
| Asking questions and curiosity | 28.6% | 10.0% |
| Teamwork and collaboration | 0.0% | 80.0% |

| | | |
|---|---|---|
| Home environment and support | 85.7% | 0.0% |
| Communication and expressing ideas | 71.4% | 40.0% |
| Mobile phone and screen use | 14.3% | 0.0% |
| Listening and respecting others | 0.0% | 10.0% |

Note. Percentages represent the proportion of interview records in which a theme was mentioned.

At baseline, teachers identified concentration, learning habits, independent work, comparison and inference, questioning, and problem-solving as particularly important skills. In the endline interviews, performing experiments and comparing and drawing conclusions were each mentioned in 70.0% of teachers' responses, and observation in 60.0%. At baseline, teachers discussed students' communication in relation to everyday conversations, family, friends, learning, and mobile-phone use. At endline, teamwork and cooperation were mentioned in 80.0% of records, expression of ideas in 40.0%, and listening respectfully, assuming responsibilities, and sharing with others in 10.0%.

Table 3. Teachers' instructional approaches and challenges in implementing the curriculum

| Theme | Baseline, % | Endline, % |
|---|---|---|
| Lesson planning | 57.1% | 80.0% |
| Changes in teaching methods | 28.6% | 70.0% |
| Teacher manuals and guidance | 42.9% | 0.0% |
| Training and theoretical support | 28.6% | 0.0% |
| Assessment criteria | 28.6% | 30.0% |
| Difficulty of topics and content | 14.3% | 100.0% |
| Availability of equipment and physical materials | 28.6% | 70.0% |
| Suitability of exercises and tasks | 0.0% | 70.0% |
| Suitability of language and text | 0.0% | 60.0% |
| Time constraints and workload | 0.0% | 50.0% |
| Digital resources and QR codes | 0.0% | 20.0% |

Note. Percentages indicate the proportion of interview records mentioning each theme.

At baseline, teachers emphasized the need to change instructional approaches, obtain theoretical guidance and teacher manuals, and secure practical equipment and materials. At endline, lesson planning was mentioned in 80.0% of records and changes in teaching approaches in 70.0%, including the use of guiding questions and inquiry-based steps. Reported implementation challenges included the difficulty of content, shortages of equipment and materials and the suitability of exercises (70.0% each for the latter two), the

appropriateness of written text (60.0%), and insufficient time (50.0%). Teachers specifically mentioned pendulum motion, changes of state, melting points, and thermometer use as topics requiring advanced physics or chemistry knowledge and specialized materials. Practical lessons sometimes exceeded the available time and required additional preparation. Assessing time allocations therefore requires consideration of topic complexity, material preparation, and students' working pace together.

Figure 2. Selected themes in teachers' reports on instructional approaches and implementation

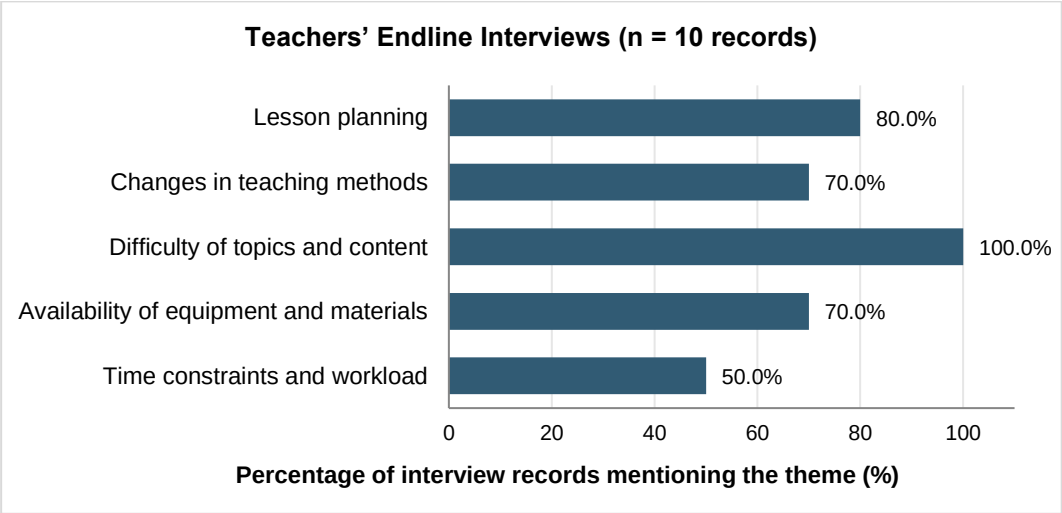



Table 4. Use of the student handbook and workbook and recommendations for improvement

| Question domain | Theme | Baseline, % | Endline, % |
|---|---|---|---|
| Use | Suitability of exercises and tasks | 100.0% | 40.0% |
| Use | Workbook | 71.4% | 40.0% |
| Use | Student handbook | 57.1% | 10.0% |
| Use | Quality and visibility of illustrations | 28.6% | 0.0% |
| Revision | Workbook | 28.6% | 60.0% |
| Revision | Suitability of exercises and tasks | 28.6% | 40.0% |
| Revision | Specific suggestions for improvement | 14.3% | 40.0% |
| Revision | Student handbook | 14.3% | 30.0% |
| Revision | Teacher manuals and guidance | 0.0% | 30.0% |

| | | | |
|---|---|---|---|
| Revision | Assessment criteria | 0.0% | 30.0% |
| Revision | Content alignment and sequencing | 14.3% | 20.0% |
| Content suggestions | Specific suggestions for improvement | — | 40.0% |
| Content suggestions | Suitability of language and text | — | 30.0% |
| Content suggestions | Quality and visibility of illustrations | — | 10.0% |
| Implementation | Professional collaboration | — | 10.0% |
| Implementation | Training and theoretical support | — | 10.0% |
| Implementation | Recommendations for national implementation | — | 10.0% |

Note. Thematic categories such as "suitability," "workbook," and "handbook" may include both favorable comments and difficulties. A dash indicates that there was no equivalent baseline question.

In the baseline questions about use, suitability of exercises and tasks was mentioned in 100.0% of records, the workbook in 71.4%, and the student handbook in 57.1%. This indicates that materials were discussed extensively, not that every teacher considered them appropriate. Compared with previous textbooks, teachers highlighted opportunities for students to work directly in their workbooks and the clearer identification of topic-related activities. At endline, suggestions for revising the workbook appeared in 60.0% of records; exercise suitability and specific revision proposals in 40.0% each; and teacher manuals, guidance, and assessment criteria in 30.0% each.

Guidance and assistance were mentioned in 40.0% of endline records concerning teacher support. Teachers also discussed younger students' reading ability, task difficulty, illustrations, and the suitability of writing and drawing activities. Although theoretical training, teacher manuals, and professional collaboration were mentioned at baseline, the available synthesis did not contain sufficient evidence to code a separate endline subquestion on professional support. Consequently, the absence of these codes should not be interpreted as the disappearance of support needs. Exchanges of theoretical and methodological experience and selected suggestions for nationwide implementation were each recorded in 10.0% of endline records.

**Student interview findings**

In baseline interviews, students commonly described general school activities such as reading, writing, drawing, and arithmetic. Endline interviews yielded more specific examples of experiments, making products, and explaining completed work to others. The following tables summarize the main themes identified in the two rounds of interviews.

Table 5. Students' skills and communication

| Main theme | Baseline, % | Endline, % |
|---|---|---|
| Improved communication and cooperation | 0.0 | 27.3 |
| No change in communication | 0.0 | 11.4 |
| Did not converse; others ignored them | 2.7 | 6.8 |
| Some group members did not participate or listen | 0.0 | 4.5 |
| Reported ability to experiment, create, and predict | 0.0 | 27.3 |
| Read and understood text well or learned to understand it | 0.0 | 13.6 |
| Reported improvement in drawing and coloring | 0.0 | 11.4 |
| Difficulty expressing ideas and explaining completed work | 2.7 | 6.8 |
| Asked friends for help | 37.8 | 31.8 |
| Received help from family or older students in dormitories | 59.5 | 70.5 |
| Asked teachers for help | 64.9 | 43.2 |

Note. Percentages refer to interview forms mentioning each theme. Baseline questions explored needed skills, whereas endline questions also asked about perceived changes.

Improved communication and collaboration were mentioned in 27.3% of endline records; 11.4% reported no change, and 4.5% described uneven participation in groups. A Grade 1 student at Delgermurun reported, "We learned how to talk in pairs." In contrast, a Grade 5 record from the same school stated that "some people do not participate during group work," indicating unequal opportunities to contribute. A Grade 4 student at Ikh-Uul said, "After doing the experiment, I cannot write an explanation," pointing to the need for support in moving from experimentation to written explanation.

Table 6. Students' responses concerning classroom activities and use of the handbook and workbook

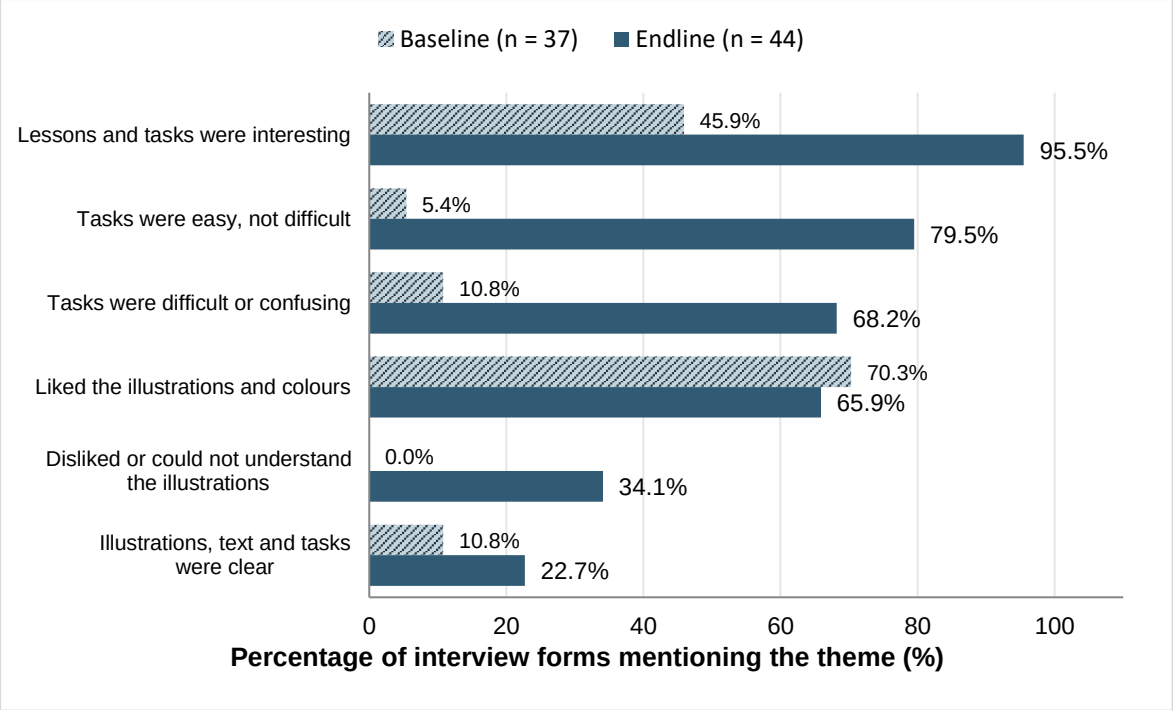
| Main theme | Baseline, % | Endline, % |
|---|---|---|
| Observing, distinguishing, comparing, experimenting, measuring | 67.6 | 63.6 |
| Drawing, coloring, gluing, making products | 24.3 | 34.1 |
| Writing, filling gaps and tables, marking answers | 27.0 | 36.4 |
| Completed independently without help | 10.8 | 22.7 |
| Explained and presented learning to others | 2.7 | 36.4 |
| Did not present work to others | 13.5 | 13.6 |
| Could not learn to present or explain work | 0.0 | 9.1 |
| Lessons, topics, and tasks were interesting | 45.9 | 95.5 |
| Tasks were easy or not difficult | 5.4 | 79.5 |

| | | |
|---|---|---|
| Tasks or topics were difficult, uncertain, or incomplete | 10.8 | 68.2 |
| Illustrations, text, and tasks were understandable | 10.8 | 22.7 |
| Liked illustrations and colors | 70.3 | 65.9 |
| Disliked illustrations; too small or unclear | 0.0 | 34.1 |
| Completed self-assessment section | 5.4 | 2.3 |

Note. A single record may contain multiple themes. “Interesting,” “easy,” and “understandable” were counted separately because they express different meanings.

Observing, distinguishing, comparing, experimenting, and measuring were mentioned in 67.6% of baseline and 63.6% of endline records. Students reporting that they completed work independently without assistance accounted for 10.8% and 22.7%, respectively, while presenting completed work to others was mentioned in 2.7% and 36.4%. These are proportions of interview records, not direct measures of skills. Because interview prompts and recording practices differed between rounds, differences in percentages cannot be interpreted directly as improvement or deterioration in students’ abilities. A Grade 3 student at Delgermurun stated, “We did not need help with the workbook. We did it ourselves; it was interesting and easy,” illustrating independent work.

Figure 3. Selected student evaluations of the handbook and workbook




Note. Percentages are based on baseline (n = 37) and endline (n = 44) forms. Themes overlap; differences in percentages are not measures of skill development.

Table 7. Co-occurrence of interest and difficulty within the same interview form

| Round | Both, % | Interest only, % | Difficulty only, % | Neither mentioned, % | Total, % |
|---|---|---|---|---|---|
| Baseline | 8.1 | 37.8 | 2.7 | 51.4 | 100.0 |
| Endline | 65.9 | 29.5 | 2.3 | 2.3 | 100.0 |

Note. Baseline n = 37; endline n = 44. The four categories are mutually exclusive; totals may differ slightly due to rounding. Failure to mention a theme does not establish the absence of that experience.

Interest was mentioned in 95.5% of endline forms and difficulty in 68.2%; both appeared together in 65.9%. Thus, liking the materials did not necessarily mean finding them easy or understandable. One Grade 2 record from School No. 48 noted that a student liked the book but could not explain the meaning of a passage when asked. Among individual endline interviews with Grades 1–2 students, criticisms of illustrations were recorded in 7 of 9 forms at Delgermurun (77.8%), 2 of 10 at School No. 48 (20.0%), and 2 of 8 at Ikh-Uul (25.0%). These findings justify reviewing the identified illustrations, but do not demonstrate differences in student ability among urban, provincial, and soum settings.

Table 8. Students' task completion, comprehension, and needs for improvement

| Main theme | Baseline, % | Endline, % |
|---|---|---|
| Had tasks they could not finish or complete | 54.3 | 52.3 |
| Completed all tasks | 5.7 | 25.0 |
| Lesson time ended | 0.0 | 6.8 |
| Illness, absence, forgot book or task | 0.0 | 6.8 |
| Section not yet covered; left for later | 25.7 | 6.8 |
| Could not complete or omitted due to lack of understanding | 0.0 | 11.4 |
| Could not understand or read words, sentences, or questions | 34.3 | 15.9 |
| Difficulty understanding or completing tasks, tables, or experiments | 11.4 | 25.0 |
| Specific tasks were uninteresting or tedious | 0.0 | 18.2 |
| Reported that everything was understandable | 8.6 | 52.3 |
| Did not use or understand keywords and objectives | 28.6 | 0.0 |
| Did not complete or read self-assessment | 37.1 | 0.0 |

Note. Reasons for incomplete work may overlap; some responses did not specify a reason.

In the third endline question domain, incomplete tasks were mentioned in 52.3% of records, while 25.0% reported completing all tasks. Reading, vocabulary, and instruction difficulties appeared in 15.9%, and difficulty with specific tasks or tables in 25.0%. A Grade 1 student at School No.

48 commented, “If there are too many words, I cannot read it,” highlighting the need to match text length to students’ reading ability. At the same time, 52.3% reported that materials were clear or contained nothing difficult to understand, suggesting that difficulties varied across children and tasks. At baseline, 37.1% of records mentioned not completing the self-assessment section, and 28.6% mentioned not using or understanding the keywords and objectives. The absence of these themes at endline should not be taken as evidence that their use had become routine: only 2.3% of endline records in the second domain explicitly mentioned completing self-assessment. A Grade 4 student at Ikh-Uul described reading and studying the handbook before completing workbook exercises, illustrating coordinated use of the two materials. Conversely, a Grade 5 baseline record at Delgermurun noted that a handbook question was absent from the workbook. These are examples of alignment and misalignment, not a comprehensive document analysis of every page.

### Parent interview findings

Baseline interviews with parents focused on the home environment, conversations about lessons, screen use, and children’s need for independence. Endline interviews included observations of children’s interest in lessons, questioning, experimentation, and independent work. Parents’ accounts describe learning behaviors observed at home rather than direct assessments of classroom skills.

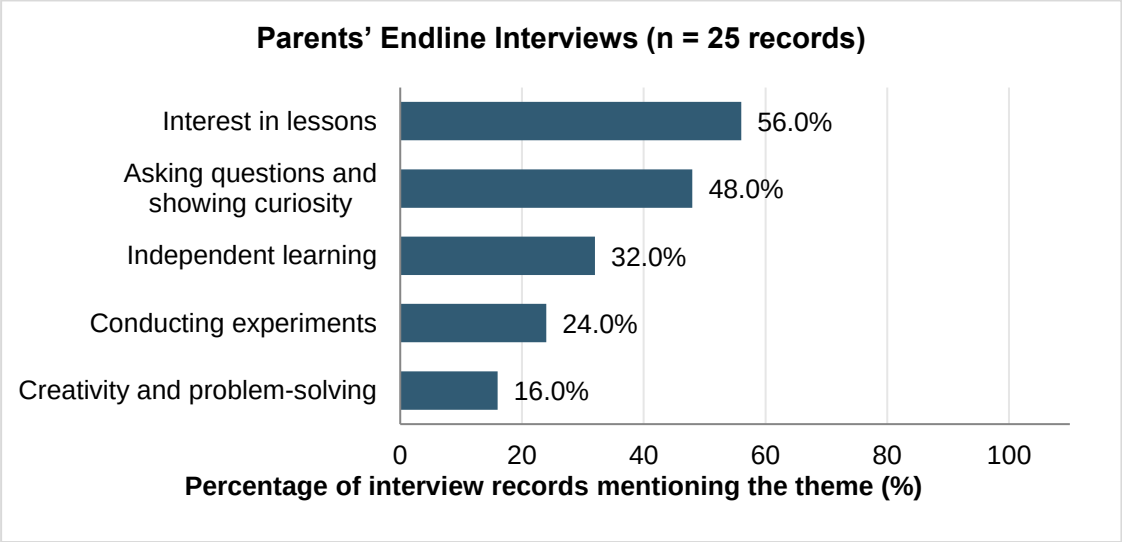
Table 9. Communication, skills, and interests reported by parents

| Question domain | Theme | Baseline, % | Endline, % |
|---|---|---|---|
| Communication | Communication and expressing ideas | 26.7% | 36.0% |
| Communication | Home environment and support | 60.0% | 0.0% |
| Communication | Interest in lessons | 53.3% | 0.0% |
| Communication | Asking questions and curiosity | 46.7% | 0.0% |
| Communication | Mobile phone and screen use | 33.3% | 0.0% |
| Communication | Teamwork and collaboration | 20.0% | 12.0% |
| Skills | Interest in lessons | 6.7% | 56.0% |
| Skills | Asking questions and curiosity | 6.7% | 48.0% |
| Skills | Independent learning | 33.3% | 32.0% |
| Skills | Communication and expressing ideas | 46.7% | 0.0% |
| Skills | Conducting experiments | 0.0% | 24.0% |
| Skills | Concentration, attention, and ability to remain seated | 33.3% | 8.0% |
| Skills | Creativity and problem-solving | 6.7% | 16.0% |

Note. Percentages refer to coded records rather than individual parents. The same code may have different meanings across question domains.

In endline records addressing skills, interest in lessons was mentioned in 56.0%, asking questions and curiosity in 48.0%, independent learning in 32.0%, conducting experiments in 24.0%, and creativity and problem-solving in 16.0%. In a separate communication question, expressing ideas appeared in 36.0% and cooperation in 12.0%. At baseline, attention and the need for independence were each noted in 33.3% of skill-related records. Because the questions served different purposes, these percentages were not subtracted to estimate improvement.

Figure 4. Selected themes in skills and interests reported by parents




Note. Endline skills question: n = 25 coded records. These are reports of behavior observed at home, not percentages of directly measured skills.

Table 10. Parent support, use of materials, and suggestions

| Question domain | Theme | Baseline, % | Endline, % |
|---|---|---|---|
| Support | Home environment and support | 20.0% | 32.0% |
| Use | Workbook | 26.7% | 68.0% |
| Use | Suitability of exercises and tasks | 80.0% | 44.0% |
| Use | Student handbook | 40.0% | 40.0% |
| Use | Quality and visibility of illustrations | 0.0% | 4.0% |
| Open-ended suggestions | Suitability of exercises and tasks | — | 16.0% |

| | | | |
|---|---|---|---|
| Open-ended suggestions | Specific suggestions for improvement | — | 16.0% |
| Open-ended suggestions | Workbook | — | 12.0% |
| Open-ended suggestions | Student handbook | — | 12.0% |
| Open-ended suggestions | Interest in lessons | — | 12.0% |
| Open-ended suggestions | Suitability of language and text | — | 8.0% |
| Open-ended suggestions | Content alignment and sequencing | — | 4.0% |

Note. Percentages for the handbook, workbook, and suitability categories do not indicate approval rates. A dash indicates that there was no corresponding open-ended baseline question.

Family support was mentioned in 20.0% of baseline and 32.0% of endline records. At baseline, parents described extracurricular activities, homework, cooperative play, and explanations; endline records additionally included examples of making things, completing exercises, and playing together at home. In questions about use, the workbook was mentioned in 26.7% and 68.0% of records, and the handbook in 40.0% at both points. Parents positively described writing directly in the workbook and opportunities for independent work. However, some parents had not seen the materials, so participants' evaluations were not all based on equivalent experience. In open-ended suggestions, exercise suitability and specific improvement proposals were each mentioned in 16.0% of records, written language in 8.0%, and content alignment in 4.0%. Suggestions included matching text containing unfamiliar letters to children's reading abilities; improving the clarity of illustrations and words; providing experimental equipment and laboratory conditions; and clarifying the self-assessment section. Differences from earlier textbooks were discussed in 40.0% of baseline records, but the equivalent endline subquestion was not coded separately. Therefore, a zero in that category does not mean that the differences had disappeared.

**Synthesis of the three participant groups**

Table 11. Common themes in endline interviews with students, teachers, and parents

| Theme | Students | Teachers | Parents | Area for improvement |
|---|---|---|---|---|
| Actions and Interest | Interest 95.5%; examples of experimentation and creation | Experiments 70.0%; observation 60.0% | Interest 56.0%; questioning 48.0% | Provide hands-on opportunities and support explanation |

| | | | | |
|---|---|---|---|---|
| Reading and understanding | Reading and instruction difficulties 15.9% | Text suitability 60.0% | Suggestions to adapt text to reading ability 8.0% | Adapt text, terminology, and instructions to grade and reading level |
| Independence and support | Worked without help 22.7% | Guidance and help 40.0% | Independence 32.0%; home support 32.0% | Combine step-by-step guidance with independent work |
| Implementation condition | Completion and understanding 52.3% | Equipment and materials 70.0%; time 50.0% | Home collaboration and suggestions about materials | Plan materials, time, and household resources together |

Note. Percentages in the columns come from different questions and denominators. This table synthesizes themes rather than numerically ranking groups or their progress.

Across the three groups, respondents emphasized opportunities for students to handle real objects, carry out activities themselves, and explain what they had done. Students' reading difficulties overlapped thematically with teachers' concerns about the suitability of texts and parents' suggestions about unfamiliar letters and unclear wording. However, the same child and task were not cross-checked across all three groups, and question emphases differed; these thematic overlaps should not be interpreted as statistical agreement or independent corroboration. Teachers focused more on resources, time, and theoretical preparation; parents on support at home; and students on their own experiences of doing and understanding tasks.

## Discussion

The study's most consequential finding is not simply that students liked practical science activities, but that interest frequently co-occurred with difficulty. In 65.9% of endline student interview forms, both themes were mentioned. This coexistence cautions against equating enjoyment with accessibility or achievement. The curriculum may offer motivating experiences while leaving some children unable to interpret written instructions, complete tasks, or explain experimental observations. In inquiry-oriented science, practical activity and the articulation of evidence are connected instructional goals (National Research Council, 2000). Revision should therefore preserve hands-on opportunities while adding language supports, clearer diagrams, shorter directions, and structured prompts for recording and explaining observations. These are design implications inferred from participant accounts, not experimentally tested interventions.

A second tension concerns the relationship between intended inquiry pedagogy and the conditions required to enact it. Teachers reported opportunities to use guiding questions and practical activities, but also described shortages of equipment, limited lesson time, and demanding topics such as pendulum motion and changes of state. The implementation problem is thus not reducible to teachers' willingness to adopt a new curriculum. It involves the fit between topic complexity, material provision, preparation time, and pedagogical support. Teacher learning should be organized around specific grade-level lessons, including low-cost materials, safety, questioning, assessment, and ways to support children's explanations. Such support should be piloted and evaluated rather than assumed effective.

The perspectives of students, teachers, and parents reveal different dimensions of implementation. Students described task

enjoyment, reading difficulties, incomplete work, and uneven group participation; teachers emphasized lesson planning, content, time, and resources; parents described curiosity, independence, and assistance at home. Their thematic convergence identifies plausible priorities for curriculum revision, but these are not matched observations of the same children or activities. Family-supported tasks may extend learning, yet reliance on household resources could create uneven opportunities. Schools should ensure that essential experiments remain feasible during class and that optional home activities use accessible materials. The present data cannot quantify inequalities by income, disability, gender, or location.

These findings extend the practical discussion of Mongolia's competency-oriented reform by showing how the same curriculum materials can create opportunities for active inquiry and barriers to participation. Rather than interpreting the interview percentages as measured changes in competence, they should be read as a map of reported implementation concerns. The paper's transferability lies in the described mechanisms—text demands, task alignment, instructional mediation, and resource availability—not in statistical generalization from three schools. Further research should combine classroom observations, systematic materials analysis, and comparable student assessments with interviews to examine whether specific revisions improve learning.

## Equitable participation and family–school support

Examples of unequal participation in group work, young students' inability to read instructions, and dependence on home support highlight the need to accommodate differing learning needs. Assigning group roles, offering oral or pictorial explanations, supporting reading, and providing short instructions may promote participation. However, the study did not measure differences by gender, disability, or household resources, and therefore cannot quantify inequities between groups. Reports of completing exercises and creative tasks with parents show how classroom activities may continue at home. Nevertheless, transferring all responsibility for materials and explanations to families could create unequal burdens. Schools should make experimental equipment available for shared teacher use and plan preparation time and professional exchanges. Home tasks should use materials readily available to households, with instructions understandable to children and parents. These recommendations are derived from interviews with students, teachers, and parents; school administrators were not interviewed separately.

## Study Limitations

The pilot included only one school from each of three settings, limiting transferability. Initial interviews occurred after some instruction had already begun; initial and endline prompts and recording formats differed; and respondents were not necessarily matched across rounds. Interview-record percentages therefore do not measure individual change, and the absence of a code may reflect the interview prompt rather than absence of a phenomenon. Group and individual interviews also have different participation dynamics. No comparison group, standardized achievement test, systematic classroom observation dataset, or full independent content-alignment audit was available for this analysis. The results are based on reported experiences and cannot establish causal curriculum effects. Documentation of coding decisions, researcher positionality, and ethics procedures requires completion from original study records.

## Conclusion

Teachers' interviews suggest that the pilot curriculum, student handbook, and workbook provided opportunities for students to observe, experiment, compare, draw conclusions, and collaborate. Teachers also reported changes in lesson planning, guiding questions, and inquiry-based teaching. However, difficult topics, the suitability of text and tasks, shortages of experimental equipment and materials, and

limited lesson time hindered implementation. Improvements to materials should therefore be accompanied by teacher manuals, examples of experimental lessons, and stronger theoretical and methodological support.

Students reported positive experiences with handling objects, experimenting, creating, drawing, recording work, and presenting results. The handbook and workbook appeared to support interest in lessons and independent activity. At the same time, students who found tasks interesting sometimes struggled with comprehension, lengthy texts, illustrations, and written explanations of experimental results. Uneven group participation, unfinished tasks, and limited use of self-assessment were also reported. Text and instructions should be shorter and clearer, illustrations improved, and examples and scaffolds provided to support explanation and independent work.

Parents reported positive experiences of children showing interest in lessons, asking questions, completing tasks independently, and discussing experiments and creative work at home. They valued opportunities for children to write and draw directly in workbooks and to complete activities with family members. They also identified the need to match text to children's knowledge of letters and reading ability, clarify vocabulary and instructions, and improve access to experimental materials. Home activities should therefore be understandable and feasible with available resources, and expectations for parental support should be clearly specified.

Across all three groups, the main strengths of the pilot primary science curriculum, handbook, and workbook were their support for student interest, practical learning, and opportunities for independent and collaborative work. To ensure that all children can benefit, improvements are needed in the suitability of text, illustrations, instructions, and tasks; support for writing explanations; and alignment between sections of the handbook and workbook. Revisions should be planned alongside teacher professional support, experimental materials, time allocations, and family participation. These findings reflect participants' reported experiences and do not establish the magnitude of student skill development or whether any development was caused by the materials alone.

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## References

Government of Mongolia. (2024). Conceptual framework for preschool and general education curricula (2024–2036).

PISA International Assessment Report 2022.

[VERIFY OR REMOVE BEFORE SUBMISSION] PISA International Assessment Report 2026 (citation and reported score not verified).

Ministry of Education, Culture, Science and Sports & Institute of Education. (2019). Implementation of the general education curriculum and factors affecting it: Research report (pp. 51–53, 68–71). Ulaanbaatar.

Ministry of Education, Culture, Science and Sports & Institute of Education. (2018). Report on the development, implementation, and evaluation of Mongolia's general education school curricula. Ulaanbaatar.

Lkhagvasuren, O., & Chuluuntsetseg, D. (2023). Research methodology. Ulaanbaatar: Aurug Publishing.

Densmaa, J., Enkhjargal, Kh., & Oyuntsetseg, N. (2025). Findings from a CBAM-model study of challenges faced by teachers during curriculum piloting.Mongolian Journal of Educational Research, 30(2). https://doi.org/10.46328/mjer.v30.2.4

Sanjaabadam, S., Lkhagvasuren, Ts., Bayarmaa, B., Bayasgalan, E., & Enkhbayar, B. (2023). Developmental criteria and indicators for

children aged 3–17. MNIER.

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. Qualitative Health Research, 15(9), 1277–1288. https://doi.org/10.1177/1049732305276687

National Research Council. (2000). Inquiry and the National Science Education Standards: A guide for teaching and learning. National Academies Press. https://doi.org/10.17226/9596

O'Brien, B. C., Harris, I. B., Beckman, T. J., Reed, D. A., & Cook, D. A. (2014). Standards for reporting qualitative research: A synthesis of recommendations. Academic Medicine, 89(9), 1245–1251. https://doi.org/10.1097/ACM.0000000000000388