Science Inquiry Skills Test (SIST)

**Purpose**
- To determine the extent to which science inquiry standards are being met
- To assess Grade 8 students’ science inquiry skills across a range of difficulty

**Coverage**
- simple measurements
- classification tasks
- control of several variables
- interpretation of multivariate data

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**Samples**
- 22 science teachers of Grade 8
- 11 schools
- 2 teachers per school
- 2 sections per teacher

Diverse sample of school settings in terms of
- class size
- access to resources

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**Method**

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**Constraints**
- Minimize science content knowledge, that is, to be as content-free as possible.
  - To assess the science inquiry skills of the students without interference caused by differences in knowledge of science content due to different curricula.
- Minimize the reading load.

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**Development process**

**Definition of science inquiry**
1. (EQ) Learner begins with a question that can be answered in a scientific way.
2. (EV) Learner gathers evidence in attempting to answer the question.
3. (EX) Learner forms an explanation to answer the question based on the evidence collected.
4. (EK) Learner connects explanations to scientific knowledge.
5. (EC) Learner communicates and justifies explanations.

(National Science Education Standards, 1996)
Development Process
Key Stage Standards from the Science Curriculum

<table>
<thead>
<tr>
<th>K-3</th>
<th>4-6</th>
<th>7-10</th>
<th>11-12</th>
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<tbody>
<tr>
<td>At the end of Grade 3, the learners should have developed basic process skills of observing, communicating, reasoning, inferring and interpreting.</td>
<td>At the end of Grade 6, the learners should have developed the essential skills of scientific inquiry: designing simple investigations, using equipment properly, materials and tools to gather evidence, observing patterns, describing relationships, developing conclusions based on evidence, and communicating ideas in varied ways to make meaning of the observations and/or changes that occur in the environment.</td>
<td>At the end of Grade 10, the learners should have developed scientific, technological, and environmental literacy and can make that would lead to rational choices on issues confronting them. They should recognize that the central feature of an investigation is that if one variable is changed while controlling all others, the effect of the change on another variable can be observed.</td>
<td>At the end of Grade 12, the learners should have gained skills in obtaining scientific and technological information from varied sources and can make that would lead to rational choices on issues confronting. They should recognize that the central feature of an investigation is that if one variable is changed while controlling all others, the effect of the change on another variable can be observed.</td>
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Diagram also shows relative difficulty of the tested items.

Analysis of Test Results

- The numbers in the right column refers to the test questions. The item numbers at the top indicates the most difficult questions. Easiest questions are at the bottom.
- Generalized descriptions of increasing competence were developed based on the clustering of test items.
- Levels identify the kinds of skills that students are ready to learn.

Analysis of Test Results

- Variable map was generated based on student test data.
- Map shows a schematic representation of how item difficulty and student ability relate to each other with respect to science inquiry skills.
- Diagram also shows relative difficulty of the tested skills.
- X in the left column represents the students, where most able student is at the top and the least able at the bottom.
Feedback to Teachers

• Results describe the performance of only the two classes handled by a teacher. The data should not be construed as a reflection of general school performance.

• Results are not expressed as numeric scores but in terms of students’ emerging abilities—the levels at which they are ready to learn a particular set of science inquiry skills.

Feedback to teachers

Developmental progression of science inquiry skills

Level | Description
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4 | Ability to experiment with multiple variables
3 | Ability to relate answers to current scientific knowledge
2 | Ability to answer questions using results from scientific inquiries
1 | Ability to measure, observe and classify

Skills in each level build on those in the previous levels. Each level description is an indication of the kinds of ideas those students are ready to engage in.