The Ontario Curriculum - Exemplars
Grades 1 and 2

Science and Technology

Samples of Student Work: A Resource for Teachers
Contents

Introduction ................................................................. 3
Purpose of This Document ................................................. 4
Features of This Document ............................................... 4
The Tasks ................................................................. 5
The Rubrics ............................................................... 5
Development of the Tasks ............................................... 7
Assessment and Selection of the Samples ................................. 8
Use of the Student Samples .............................................. 8
  Teachers and Administrators ........................................... 8
  Parents .................................................................. 10
  Students ................................................................. 10

Grade 1 – Matter and Materials ........................................... 11
  Cleaning Up Spills ........................................................ 12
    The Task ................................................................ 12
    Expectations .......................................................... 12
    Prior Knowledge and Skills ......................................... 13
    Task Rubric ............................................................ 14
    Student Samples ....................................................... 16
    Teacher Package ......................................................... 48

Grade 2 – Structures and Mechanisms .................................... 57
  Making a Toy ............................................................. 58
    The Task ................................................................ 58
    Expectations .......................................................... 58
    Prior Knowledge and Skills ......................................... 59
    Task Rubric ............................................................ 60
    Student Samples ....................................................... 62
    Teacher Package ......................................................... 102

This publication is available on the Ministry of Education’s website at http://www.edu.gov.on.ca.
In 1998, the Ministry of Education and Training published a new science and technology curriculum policy document for Ontario elementary students entitled *The Ontario Curriculum, Grades 1–8: Science and Technology, 1998*. The new curriculum is more specific than previous curricula with respect to both the knowledge and the skills that students are expected to develop and demonstrate in each grade. The document contains the curriculum expectations for each grade and an achievement chart that describes four levels of student achievement to be used in assessing and evaluating student work.

The present document contains samples (“exemplars”) of student work at each level of achievement for Grades 1 and 2. It is part of a set of four documents, each covering two grades (Grades 1 and 2, Grades 3 and 4, Grades 5 and 6, and Grades 7 and 8). These exemplar documents are intended to provide assistance to teachers in their assessment of student achievement of the curriculum expectations. The samples included in the documents represent work produced at the end of the school year in each grade.

Ontario school boards were invited by the Ministry of Education to participate in the development of the exemplars. Teams of teachers and administrators from across the province were involved in developing the assessment materials. They designed the performance tasks and scoring scales (“rubrics”) on the basis of selected Ontario curriculum expectations, field-tested them in classrooms, suggested changes, administered the final tasks, marked the student work, and selected the exemplars used in this document. During each stage of the process, external validation teams and Ministry of Education staff reviewed the tasks and rubrics to ensure that they reflected the expectations in the curriculum policy documents and that they were appropriate for all students. External validation teams and ministry staff also reviewed the samples of student work.

The selection of student samples that appears in this document reflects the professional judgement of teachers who participated in the project. No students, teachers, or schools have been identified.

Samples are recorded on video for Grades 1, 2, 5, and 8. These samples were produced in partnership with TVOntario.

The procedures followed during the development and implementation of this project will serve as a model for boards, schools, and teachers in designing assessment tasks within the context of regular classroom work, developing rubrics, assessing the achievement of their own students, and planning for the improvement of students’ learning.
The samples in this document will provide parents\(^1\) with examples of student work to help them monitor their children's progress. They also provide a basis for communication with teachers.

Use of the exemplar materials will be supported initially through provincial in-service training.

**Purpose of This Document**

This document was developed to:

- show the characteristics of student work at each of the four levels of achievement for each grade;
- promote greater consistency in the assessment of student work across the province;
- provide an approach to improving student learning by demonstrating the use of clear criteria applied to student work in response to clearly defined assessment tasks;
- show the connections between what students are expected to learn (the curriculum expectations) and how their work can be assessed using the levels of achievement described in the curriculum policy document for the subject.

Teachers, parents, and students should examine the student samples in this document and consider them along with the information in the Teacher's Notes and Comments/Next Steps sections. They are encouraged to examine the samples in order to develop an understanding of the characteristics of work at each level of achievement and the ways in which the levels of achievement reflect progression in the quality of knowledge and skills demonstrated by the student.

The samples in this document represent examples of student achievement obtained using only one method of assessment, called performance assessment. Teachers will also make use of a variety of other assessment methods and strategies in evaluating student achievement over a school year.

**Features of This Document**

This document contains the following:

- a description of each performance task, as well as the curriculum expectations related to the task
- a task-specific assessment chart (“rubric”) for each grade
- two samples of student work for each of the four levels of achievement
- Teacher's Notes, which provide some details on the level of achievement for each sample
- Comments/Next Steps, which offer suggestions for improving achievement
- the Teacher Package that was used by teachers in administering the task

It should be noted that each sample for a specific level of achievement represents the characteristics of work at that level of achievement.

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1. In this document, parent(s) refers to parent(s) and guardian(s).
The videos for the Grade 1 and 2 science and technology tasks contain the following:

- a brief overview of the exemplar project
- an introduction to the video
- an overview of the performance task and the expectations addressed in the task
- student samples (presentations)
- comments on the rubric, the levels of achievement, and the student samples
- concluding remarks

Students whose performance was scored at level 1 or level 2 appear on the videos, but only in ways that ensure that they are not identifiable.

The Tasks

The performance tasks were based directly on curriculum expectations selected from The Ontario Curriculum, Grades 1–8: Science and Technology, 1998. The tasks encompassed the four categories of knowledge and skills (i.e., understanding of basic concepts; inquiry and design skills; communication of required knowledge; relating of science and technology to each other and to the world outside the school), requiring students to integrate their knowledge and skills in meaningful learning experiences. The tasks gave students an opportunity to demonstrate how well they could use their knowledge and skills in a specific context.

Teachers were required to explain the scoring criteria and descriptions of the levels of achievement (i.e., the information in the task rubric) to the students before they began the assignment.

The Rubrics

In this document, the term rubric refers to a scoring scale that consists of a set of achievement criteria and descriptions of the levels of achievement for a particular task. The scale is used to assess students’ work; this assessment is intended to help students improve their performance level. The rubric identifies key criteria by which students’ work is to be assessed, and it provides descriptions that indicate the degree to which the key criteria have been met. The teacher uses the descriptions of the different levels of achievement given in the rubric to assess student achievement on a particular task.

The rubric for a specific performance task is intended to provide teachers and students with an overview of the expected product with regard to the knowledge and skills being assessed as a whole.

The achievement chart in the curriculum policy document for science and technology provides a standard province-wide tool for teachers to use in assessing and evaluating their students’ achievement over a period of time. While the chart is broad in scope and general in nature, it provides a reference point for all assessment practice and a framework within which to assess and evaluate student achievement. The descriptions
associated with each level of achievement serve as a guide for gathering and tracking assessment information, enabling teachers to make consistent judgements about the quality of student work while providing clear and specific feedback to students and parents.

For the purposes of the exemplar project, a single rubric was developed for each performance task. This task-specific rubric was developed in relation to the achievement chart in the curriculum policy document.

The differences between the achievement chart and the task-specific rubric may be summarized as follows:

• The achievement chart contains broad descriptions of achievement. Teachers use it to assess student achievement over time, making a summative evaluation that is based on the total body of evidence gathered through using a variety of assessment methods and strategies.

• The rubric contains criteria and descriptions of achievement that relate to a specific task. The rubric uses some terms that are similar to those in the achievement chart but focuses on aspects of the specific task. Teachers use the rubric to assess student achievement on a single task.

The rubric contains the following components:

• an identification (by number) of the expectations on which student achievement in the task was assessed

• the four categories of knowledge and skills

• the relevant criteria for evaluating performance of the task

• descriptions of student performance at the four levels of achievement (level 3 on the achievement chart is considered to be the provincial standard)

As stated earlier, the focus of performance assessment using a rubric is to improve students' learning. In order to improve their work, students need to be provided with useful feedback. Students find that feedback on the strengths of their achievement and on areas in need of improvement is more helpful when the specific category of knowledge or skills is identified and specific suggestions are provided than when they receive only an overall mark or general comments. Student achievement should be considered in relation to the criteria for assessment stated in the rubric for each category, and feedback should be provided for each category. Through the use of a rubric, students' strengths and weaknesses are identified and this information can then be used as a basis for planning the next steps for learning. In this document, the Teacher's Notes section indicates the reasons for assessing a student's performance at a specific level of achievement, and the Comments/Next Steps section indicates suggestions for improvement.

In the exemplar project, a single rubric encompassing the four categories of knowledge and skills was used to provide an effective means of assessing the particular level of student performance in the performance task, to allow for consistent scoring of student performance, and to provide information to students on how to improve their work. However, in the classroom, teachers may find it helpful to make use of additional rubrics.
if they need to assess student achievement on a specific task in greater detail for one or more of the four categories. For example, it may be desirable in evaluating an oral report to use one rubric for assessing the content (understanding of basic concepts), one for the research (inquiry and design skills), one for the writing and presentation (communication of required knowledge), and one for the application of knowledge (relating of science and technology to each other and to the world outside the school).

The rubrics for the tasks in the exemplar project are similar to the scales used by the Education Quality and Accountability Office (EQAO) for the Grade 3, Grade 6, and Grade 9 provincial assessments in that both the rubrics and the EQAO scales are based on the Ontario curriculum expectations and the achievement charts. The rubrics differ from the EQAO scales in that they were developed to be used only in the context of classroom instruction to assess achievement in a particular assignment.

Although rubrics were used effectively in this exemplar project to assess responses related to the performance tasks, they are only one way of assessing student achievement. Other means of assessing achievement include observational checklists, tests, marking schemes, or portfolios. Teachers may make use of rubrics to assess students’ achievement on, for example, essays, reports, exhibitions, debates, conferences, interviews, oral presentations, recitals, two- and three-dimensional representations, journals or logs, and research projects.

Development of the Tasks

The performance tasks for the exemplar project were developed by teams of educators in the following way:

- The teams selected a cluster of curriculum expectations that focused on the knowledge and skills that are considered to be of central importance in the subject area. Teams were encouraged to select a manageable number of expectations. The particular selection of expectations ensured that all students would have the opportunity to demonstrate their knowledge and skills in each category of the achievement chart in the curriculum policy document for the subject.

- The teams drafted one task for each grade that would encompass all of the selected expectations and that could be used to assess the work of all students.

- The teams established clear, appropriate, and concrete criteria for assessment, and wrote the descriptions for each level of achievement in the task-specific rubric, using the achievement chart for the subject as a guide.

- The teams prepared detailed instructions for both teachers and students participating in the assessment project.

- The tasks were field-tested in classrooms across the province by teachers who had volunteered to participate in the field test. Student work was scored by teams of educators. In addition, classroom teachers, students, and board contacts provided feedback on the task itself and on the instructions that accompanied the task. Suggestions for improvement were taken into consideration in the revision of the tasks, and the feedback helped to finalize the tasks, which were then administered in the spring of 2001.
In developing the tasks, the teams ensured that the resources needed for completing the tasks— that is, all the worksheets and support materials— were available.

Prior to both the field tests and the final administration of the tasks, a team of validators— including research specialists, gender and equity specialists, and subject experts— reviewed the instructions in the teacher and student packages, making further suggestions for improvement.

Assessment and Selection of the Samples
After the final administration of the tasks, student work was scored at the district school board level by teachers of the subject who had been provided with training in the scoring. These teachers evaluated and discussed the student work until they were able to reach a consensus regarding the level to be assigned for achievement in each category. This evaluation was done to ensure that the student work being selected clearly illustrated that level of performance. All of the student samples were then forwarded to the ministry. A team of teachers from across the province, who had been trained by the ministry to assess achievement on the tasks, rescored the student samples. They chose samples of work that demonstrated the same level of achievement in all four categories and then, through consensus, selected the samples that best represented the characteristics of work at each level of achievement. The rubrics were the primary tools used to evaluate student work at both the school board level and the provincial level.

The following points should be noted:
• Two samples of student work are included for each of the four achievement levels. The use of two samples is intended to show that the characteristics of an achievement level can be exemplified in different ways.
• Although the samples of student work in this document were selected to show a level of achievement that was largely consistent in the four categories (understanding of basic concepts; inquiry and design skills; communication of required knowledge; relating of science and technology to each other and to the world outside the school), teachers using rubrics to assess student work will notice that students’ achievement frequently varies across the categories (e.g., a student may be achieving at level 3 in understanding of basic concepts but at level 4 in communication of required knowledge).
• Although the student samples show responses to most questions, students achieving at level 1 and level 2 will often omit answers or will provide incomplete responses or incomplete demonstrations.
• Students’ effort was not evaluated. Effort is evaluated separately by teachers as part of the “learning skills” component of the Provincial Report Card.
• The document does not provide any student samples that were assessed using the rubrics and judged to be below level 1. Teachers are expected to work with students whose achievement is below level 1, as well as with their parents, to help the students improve their performance.
Use of the Student Samples

Teachers and Administrators

The samples of student work included in this document will help teachers and administrators by:

- providing student samples and criteria for assessment that will enable them to help students improve their achievement;
- providing a basis for conversations among teachers, parents, and students about the criteria used for assessment and evaluation of student achievement;
- facilitating communication with parents regarding the curriculum expectations and levels of achievement for each subject;
- promoting fair and consistent assessment within and across grade levels.

Teachers may choose to:

- use the teaching/learning activities outlined in the performance tasks;
- use the performance tasks and rubrics in the document in designing comparable performance tasks;
- use the samples of student work at each level as reference points when assessing student work;
- use the rubrics to clarify what is expected of the students and to discuss the criteria and standards for high-quality performance;
- review the samples of work with students and discuss how the performances reflect the levels of achievement;
- adapt the language of the rubrics to make it more “student friendly”;
- develop other assessment rubrics with colleagues and students;
- help students describe their own strengths and weaknesses and plan their next steps for learning;
- share student work with colleagues for consensus marking;
- partner with another school to design tasks and rubrics, and to select samples for other performance tasks.

Administrators may choose to:

- encourage and facilitate teacher collaboration regarding standards and assessment;
- provide training to ensure that teachers understand the role of the exemplars in assessment, evaluation, and reporting;
- establish an external reference point for schools in planning student programs and for school improvement;
- facilitate sessions for parents and school councils using this document as a basis for discussion of curriculum expectations, levels of achievement, and standards.
Parents
The performance tasks in this document exemplify a range of meaningful and relevant learning activities related to the curriculum expectations. In addition, this document invites the involvement and support of parents as they work with their children to improve their achievement. Parents may use the samples of student work and the rubrics as:
• resources to help them understand the levels of achievement;
• models to help monitor their children's progress from level to level;
• a basis for communication with teachers about their children's achievement;
• a source of information to help their children monitor achievement and improve their performance;
• models to illustrate the application of the levels of achievement.

Students
Students are asked to participate in performance assessments in all curriculum areas. When students are given clear expectations for learning, clear criteria for assessment, and immediate and helpful feedback, their performance improves. Students' performance improves as they are encouraged to take responsibility for their own achievement and to reflect on their own progress and “next steps”.

It is anticipated that the contents of this document will help students in the following ways:
• Students will be introduced to a model of one type of task that will be used to assess their learning, and will discover how rubrics can be used to improve their product or performance on an assessment task.
• The performance tasks and the exemplars will help clarify the curriculum expectations for learning.
• The rubrics and the information given in the Teacher's Notes section will help clarify the assessment criteria.
• The information given under Comments/Next Steps will support the improvement of achievement by focusing attention on two or three suggestions for improvement.
• With an increased awareness of the performance tasks and rubrics, students will be more likely to communicate effectively about their achievement with their teachers and parents, and to ask relevant questions about their own progress.
• Students can use the criteria and the range of student samples to help them see the differences in the levels of achievement. By analysing and discussing these differences, students will gain an understanding of ways in which they can assess their own responses and performances in related assignments and identify the qualities needed to improve their achievement.
Grade 1

Matter and Materials
The Task

Students were asked to select and test three materials to determine which was the most effective in cleaning up a specific kind of spill. They were then to make recommendations based on their observations and prior experience. Specifically, they were to:

- describe the spill (dry, wet, sticky, etc.);
- choose three different materials to test;
- explain why those materials were chosen;
- test each material;
- show which material best cleaned up the spill;
- explain why they thought that one was best.

For the scenario and task instructions that were presented to students, see page 48.

Students submitted completed worksheets for assessment. Once they had completed their worksheets, they were asked to respond orally to questions posed by the teacher. These interviews were videotaped, and the videos were also used for assessment purposes. (A copy of the videotape is included with this document.)

Expectations

This task gave students the opportunity to demonstrate their achievement of all or part of each of the following selected overall and specific expectations from the strand Matter and Materials: Grade 1 – Characteristics of Objects and Properties of Materials. (The codes that follow the expectations are from the Ministry of Education’s Curriculum Unit Planner.)

Students will:
1. distinguish between objects and materials and identify and describe the properties of some materials (1s24);
2. investigate the properties of materials and make appropriate use of materials when designing and making objects (1s25);
3. describe the function of specific materials in manufactured objects that they and others use in daily life (1s26);
4. ask questions about and identify needs and problems related to objects and materials, and explore possible answers and solutions (1s34);
5. plan investigations to answer some of these questions or solve some of these problems (1s35);
6. use appropriate vocabulary in describing their investigations, explorations, and observations (1s36);
7. record relevant observations, findings, and measurements, using written language, drawings, charts, and concrete materials (1s37);
8. communicate the procedures and results of investigations for specific purposes, using demonstrations, drawings, and oral and written descriptions (1s38).
Prior Knowledge and Skills

To complete this task, students were expected to have some knowledge or skills related to the following:

- identifying properties of materials
- describing materials using their senses
- using a simple inquiry process
- using a simple experimental method and conducting a fair test
- communicating findings orally and recording their findings using pictures and/or words

In the teacher’s notes and comments accompanying the student samples that follow, the examples cited are either from the student worksheets (indicated by a “P”, for “print”) or from the videotape (indicated by a “V”).

For information on the process used to prepare students for the task and on the materials and equipment required, see the Teacher Package, reproduced on pages 48–56 of this document.
Task Rubric – Grade 1: Cleaning Up Spills

<table>
<thead>
<tr>
<th>Expectations*</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Understanding of Basic Concepts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The student:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>– shows limited understanding of the difference between objects and materials</td>
<td>– shows some understanding of the difference between objects and materials</td>
<td>– shows general understanding of the difference between objects and materials</td>
<td>– shows thorough understanding of the difference between objects and materials</td>
</tr>
<tr>
<td></td>
<td>– chooses materials with limited understanding of their properties</td>
<td>– chooses materials with some understanding of their properties</td>
<td>– chooses materials with general understanding of their properties</td>
<td>– chooses materials with an in-depth understanding of their properties</td>
</tr>
<tr>
<td><strong>Inquiry Skills</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The student:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– initiating and planning</td>
<td>– identifies the problem to be solved with limited clarity</td>
<td>– identifies the problem to be solved with some clarity</td>
<td>– clearly identifies the problem to be solved</td>
<td>– clearly and precisely identifies the problem to be solved</td>
</tr>
<tr>
<td>4, 5</td>
<td>– provides limited reasons for the selection of material</td>
<td>– provides somewhat logical reasons for the selection of material</td>
<td>– provides logical reasons for the selection of material</td>
<td>– provides insightful reasons for the selection of material</td>
</tr>
<tr>
<td>– performing and recording</td>
<td>– describes a modelled procedure with limited accuracy</td>
<td>– describes a modelled procedure with some accuracy</td>
<td>– describes a modelled procedure with general accuracy</td>
<td>– describes a modelled procedure with precision</td>
</tr>
<tr>
<td>7</td>
<td>– makes observations with limited accuracy</td>
<td>– makes observations with some accuracy</td>
<td>– makes observations with accuracy</td>
<td>– makes insightful and precise observations</td>
</tr>
<tr>
<td></td>
<td>– reports results using pictures and/or words with limited clarity</td>
<td>– reports results using pictures and/or words with some clarity</td>
<td>– reports results using pictures and/or words with general clarity</td>
<td>– reports results using pictures and/or words with clarity and precision</td>
</tr>
<tr>
<td>– analysing and interpreting</td>
<td>– makes a minimally reasonable recommendation</td>
<td>– makes a somewhat reasonable recommendation</td>
<td>– makes a reasonable recommendation</td>
<td>– makes a thoroughly reasoned recommendation</td>
</tr>
<tr>
<td>4, 7</td>
<td>– explains why one material was more effective, with limited connections to the observations</td>
<td>– explains why one material was more effective, with some connections to the observations</td>
<td>– explains why one material was more effective, with clear connections to the observations</td>
<td>– explains why one material was more effective, with insightful connections to the observations</td>
</tr>
</tbody>
</table>
### Communication of Required Knowledge

The student:

<table>
<thead>
<tr>
<th>Expectations*</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>6, 8</td>
<td>– demonstrates limited ability to communicate observations and results (orally, pictorially, or in written form)</td>
<td>– demonstrates some ability to communicate observations and results (orally, pictorially, or in written form)</td>
<td>– demonstrates considerable ability to communicate observations and results (orally, pictorially, or in written form)</td>
<td>– demonstrates extensive ability to communicate observations and results (orally, pictorially, or in written form)</td>
</tr>
<tr>
<td></td>
<td>– makes limited use of appropriate science and technology vocabulary</td>
<td>– makes some use of appropriate science and technology vocabulary</td>
<td>– makes general use of appropriate science and technology vocabulary</td>
<td>– makes extensive use of appropriate science and technology vocabulary</td>
</tr>
</tbody>
</table>

*The expectations that correspond to the numbers given in this chart are listed on page 12.

**Note:** This rubric does not include criteria for assessing student performance that falls below level 1.

### Relating of Science and Technology to Each Other and to the World Outside the School

The student:

<table>
<thead>
<tr>
<th>Expectations*</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>– provides limited reasons for choosing an everyday material to clean up a spill</td>
<td>– provides somewhat logical reasons for choosing an everyday material to clean up a spill</td>
<td>– provides logical reasons for choosing an everyday material to clean up a spill</td>
<td>– provides insightful reasons for choosing an everyday material to clean up a spill</td>
</tr>
</tbody>
</table>
Cleaning Up Spills  Level 1, Sample 1

A

Identify the Problem
Use pictures and/or words

The problem is: I spilled ketchup

My task is: to clean it up

B

My Choices of Materials

My first choice is sponge because:

it’s the best.

My second choice is cloth because:

it cleans.

My third choice is foil because:

it is good.
My Plan

1) What I Need

sponge cloth foil

2) What I Will Do

clean it up.

What Happened

Use pictures and/or words to show what you saw.

The sponge didn’t work. The foil did work.
What I Learned: Part 1

Which material worked best to clean up the spill?  
foil

Why was it the best?  
the best

What other kinds of spills could it clean up?  
milk

What I Learned: Part 2

If you could use anything else in the world to clean up your spill, what would you use? Tell why.  
newspaper
**Teacher’s Notes**

**Understanding of Basic Concepts**
- The student shows limited understanding of the difference between objects and materials (e.g., [V] is able to identify an object but needs help to articulate the difference between objects and materials: “Stapler.” Teacher: “OK, the stapler’s an object, what about the materials, looking at the stapler?” Student pauses. Teacher: “Why don’t you pick up the stapler and what materials are in the stapler?” Student: “Staples …” Student hesitates, then adds: “Metal”).
- The student chooses materials with limited understanding of their properties (e.g., [P] My Choices of Materials: suggests foil as a possible material to use to clean up ketchup but does not identify any properties of foil that would make it an effective choice).

**Inquiry Skills**
- The student identifies the problem to be solved with limited clarity (e.g., [P] Identify the Problem: focuses on the act of spilling – “I spilled ketchup” – rather than on the purpose of the experiment).
- The student provides limited reasons for the selection of material (e.g., [P] My Choices of Materials: “sponge” because “it’s the best”; identifies no properties of the sponge to explain the choice).
- The student describes a modelled procedure with limited accuracy (e.g., [V] Teacher: “What did you do to solve the problem of the ketchup spills?” Student: “Materials.” Teacher: “You used materials? What did you do with the materials?” Student: “I wiped the ketchup.”).
- The student makes observations with limited accuracy (e.g., [P] What I Learned: Part 1: “the foil wips [wipes] the best.”; does not give details to explain “the best”).
- The student reports results using pictures and/or words with limited clarity (e.g., [P] What Happened: “the sponge didn’t work. The foil did work.”; includes pictures, but they do not clarify or add details to the written responses).
- The student makes a minimally reasonable recommendation (e.g., [V] makes some connection to the observations made during the experiment, but does not provide reasons for recommendations: Teacher: “If you could use anything else in the world to clean up your spill, what would you use?” Student hesitates. Teacher: “Anything at all, what would you have used?” Student: “Foil.” Teacher: “And why would you pick foil?” Student shrugs; [P] What I Learned: Part 2: picks “newspaper” in response to the same question, but does not answer the question “Tell why.”).

**Communication of Required Knowledge**
- The student demonstrates limited ability to communicate observations and results (orally, pictorially, or in written form) (e.g., [V] Teacher: “What would you use to clean up those spills?” Student: “Foil.” Teacher: “What else?” Student: “A cloth.” Teacher: “Why would you pick those?” Student: “Because …” Student shrugs).
- The student makes limited use of appropriate science and technology vocabulary (e.g., [P] uses general phrases such as “wipe up, clean up” but makes no use of science vocabulary such as “absorbs, flexible, fair test” to describe the materials or processes used).

**Relating of Science and Technology to Each Other and to the World Outside the School**
- The student provides limited reasons for choosing an everyday material to clean up a spill (e.g., [P] What I Learned: Part 1: “the foil wips [wipes] the best.”; offers no observation about the properties of the material that produced the stated result).

**Comments/Next Steps**
- The student should continue to explore the environment, to make careful observations, and to report them in more detail, using both words and pictures.
- The student should develop a clearer understanding of the difference between objects and materials.
- The student should discuss the steps in a fair test and then apply them in a variety of new situations.
Cleaning Up Spills Level 1, Sample 2

A

Identify the Problem
Use pictures and/or words

The problem is: Ketchup spilled

My task is: To clean it up

B

My Choices of Materials

My first choice is paper towel because:

It sticks

My second choice is sponge because:

It's wet

My third choice is cloth because:

It picks up
**C**

**My Plan**

1) **What I Need**
   - paper towel
   - sponge cloth

2) **What I Will Do**
   - clean the
   - ketchup
   - paper towel
   - sponge cloth

**D**

**What Happened**

Use pictures and/or words to show what you saw.

The paper towel didn't work. The sponge didn't work. The cloth worked.
What I Learned: Part 1
Which material worked best to clean up the spill?  
the cloth
Why was it the best?  
because  
the cloth cleaned the best
What other kinds of spills could it clean up?  
the cloth can pick up the pop

What I Learned: Part 2
If you could use anything else in the world to clean up your spill, what would you use?  Tell why.
I would use a mop because it would wipe it all up
Teacher's Notes

Understanding of Basic Concepts

– The student shows limited understanding of the difference between objects and materials (e.g., [V] Teacher: “Can you show us an object?” Student picks up a box of crayons from the table. Teacher: “What are those?” Student: “Crayons.” Teacher: “What are the materials? What are the kinds of materials in the crayons?” Student: “Paper and...” Teacher: “Can you tell us something about the paper?” Student shrugs and smiles. Teacher: “Anything at all?” Student: “It has colours on it.”).

– The student chooses materials with limited understanding of their properties (e.g., [P] My Choices of Materials: observes the effects of using materials – “paper towel ... sticks”; “sponge ... it’s wet”; “cloth ... picks up” – but does not identify the properties they illustrate).

Inquiry Skills

– The student identifies the problem to be solved with limited clarity (e.g., [P] Identify the Problem: focuses on the spill rather than on the purpose of the experiment, which is to identify the most effective material for cleaning it up).

– The student provides limited reasons for the selection of material (e.g., [V] Student shrugs in response to question. Teacher: “Why did you pick those instead of the foil or the plastic wrap?” Student: “Cause [because] I thought it was best.”).

– The student describes a modelled procedure with limited accuracy (e.g., [P] My Plan: provides list of materials used – “paper towel sponge cloth” – but no details of steps in process: “Clean the ketchup up ...”).

– The student makes observations with limited accuracy (e.g., [P] What Happened: demonstrates awareness that one of the materials will clean up the spill better than others, but does not demonstrate an understanding that different materials have varying rates of absorption: “The paper towel didn’t work. The sponge didn’t work. The cloth worked.”).

– The student reports results using pictures and/or words with limited clarity (e.g., [P] What Happened: gives no details about why materials did or didn’t work: “The paper towel didn’t work .... The cloth worked.”).

– The student makes a minimally reasonable recommendation (e.g., [P] What I Learned: Part 2: gives no details to explain suggestions: “I well [will] use a mop because it would wipe it all up”).

– The student explains why one material was more effective, with limited connections to the observations (e.g., [P] What I Learned: Part 1: “because it cleaned the best”).

Communication of Required Knowledge

– The student demonstrates limited ability to communicate observations and results (orally, pictorially, or in written form) (e.g., [P] What Happened: states only that some materials “didn’t work” and one material “worked”).

– The student makes limited use of appropriate science and technology vocabulary (e.g., [P] uses only general words: “picks up, sticks”).

Relating of Science and Technology to Each Other and to the World Outside the School

– The student provides limited reasons for choosing an everyday material to clean up a spill (e.g., [V] Student: “A mop.” Teacher: “Why would you choose a mop?” Student: “Cause [because] it will clean up.”).

Comments/Next Steps

– The student should continue to explore the environment, to make careful observations, and to report them in more detail, using both words and pictures.

– The student should also begin to incorporate appropriate scientific terms when sharing his or her learning.

– The student should discuss the steps in a fair test and then apply them in a variety of new situations.

– The student needs to develop a clearer understanding of the differences between objects and materials.
Cleaning Up Spills  Level 2, Sample 1

Identify the Problem
Use pictures and/or words

The problem is: the ketchup has spilled on the floor.

My task is: to clean it up.

My Choices of Materials

My first choice is the cloth because it cleans and soak up best.

My second choice is paper towel because it soak up to.

My third choice is the sponge because it cleans up to.
C

My Plan

1) What I Need
   a cloth, a paper towel, and a sponge.

2) What I Will Do
   I will wipe up the ketchup with the cloth and the paper towel and the sponge.

D

What Happened

Use pictures and/or words to show what you saw.

The paper towel worked best. It soaked up the spill.
What I Learned: Part 1

Which material worked best to clean up the spill? The paper towel.

Why was it the best? Because it picked up a lot.

What other kinds of spills could it clean up? Water and juice and pop.

What I Learned: Part 2

If you could use anything else in the world to clean up your spill, what would you use? Tell why. A mop because it will stick to the mop and it will soak it up.
Teacher’s Notes

Understanding of Basic Concepts
- The student shows some understanding of the difference between objects and materials (e.g., [V] with teacher prompting, is able to identify an object and some properties of materials: “This is the object” [the box of crayons]; “It has paper on it … and it’s made with … umm … wax” [the materials]).
- The student chooses materials with some understanding of their properties (e.g., [P] My Choices of Materials: chooses three appropriate materials, because they can “clean up” and “soke up”, but does not identify specific properties that make them effective).

Inquiry Skills
- The student identifies the problem to be solved with some clarity (e.g., [P] Identify the Problem: notes that there is a spill and that the task is to clean it up, but does not refer to the purpose of the experiment, which is to select the best cleaning material).
- The student provides somewhat logical reasons for the selection of materials (e.g., [P] My Choices of Materials: “the cloth … cleans and soaks up best”; “Paper towel … soaks up to [too]”).
- The student describes a modelled procedure with some accuracy (e.g., [P] My Plan: “I will wipe up the ketchup with the cloth and the paper towel and the sponge.”).
- The student makes observations with some accuracy (e.g., [P] What Happened: identifies the material – “paper towel” – that “wonked [worked] best. It soked up the spill.”).
- The student reports results using pictures and/or words with some clarity (e.g., [P] What I Learned: Part 1: reports that the paper towel “picked up a lot.”).

Communication of Required Knowledge
- The student demonstrates some ability to communicate observations and results (orally, pictorially, or in written form) (e.g., [V] “The paper towel was the best because it cleaned up a lot.”).
- The student makes some use of appropriate science and technology vocabulary (e.g., [P] uses words such as “soke up, pick up, stick to” but does not use science words such as “absorbs, flexible, fair test” to describe the materials or processes used).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student provides somewhat logical reasons for choosing an everyday material to clean up a spill (e.g., [V] “I clean up the ketchup … the sandwich with the mop … cause they’ll clean up a lot.”; [P] What I Learned: Part 2: “a mop because it will stick to the mop and it will soke it up.”).

Comments/Next Steps
- The student needs to continue to explore and consolidate understanding of properties of materials and objects.
- The student should provide more details when reporting observations.
- The student should discuss the steps in a fair test and then apply them in a variety of new situations.
- The student should correct spelling errors by referring to resources such as word lists, wall charts, and a personal dictionary.
Cleaning Up Spills  Level 2, Sample 2

A

Identify the Problem
Use pictures and/or words

The problem is: we have lots of spills.

My task is: to clean up chocolate pudding

B

My Choices of Materials

My first choice is sponge because: it will soak up the pudding.

My second choice is paper towel because: it is

My third choice is wood because:

it won't be able to soak up the pudding.
C

My Plan

1) What I Need
- pudding to split
- measuring spoon
- wood
- sponges
- napkins

2) What I Will Do
- I took a measuring spoon and poured pudding. I used wood. I used a napkin. I used sponges.

D

What Happened

Use pictures and/or words to show what you saw.

I saw that the spong worked well.

I saw that we needed two napkins.

I saw that the wood just made a bigger mess.
What I Learned: Part 1

Which material worked best to clean up the spill?
The material that worked best was a sponge.

Why was it the best? It was the best because it could soak up the pudding.

What other kinds of spills could it clean up?
It could clean up water. It could clean up pizza sauce. It could clean up apple juice.

What I Learned: Part 2

If you could use anything else in the world to clean up your spill, what would you use? Tell why.

I would use a cloth because it would pick up the pudding. I would use paper towel because it would soak up the pudding.
Teacher’s Notes

Understanding of Basic Concepts
- The student shows some understanding of the difference between objects and materials (e.g., [V] defines an object but has a less well-defined understanding of materials: “Well, an object is something that, like, is made out of materials. Materials are things that are just, like ... like ... by theirselves.”).
- The student chooses materials with some understanding of their properties (e.g., [P] What I Learned: Part 1: “It could clean up water. It could clean up pizza sauce. It could clean up apple juice.”; demonstrates some understanding of the properties of materials in choosing a sponge to clean up water and apple juice, but makes no reference to properties such as flexibility and absorbency).

Inquiry Skills
- The student identifies the problem to be solved with some clarity (e.g., [P] Identify the Problem: states that there are “lots of spills” in the classroom and that the task is “to clean up choclat puding” but does not refer to selecting the best cleaning material).
- The student provides somewhat logical reasons for the selection of material (e.g., [P] My Choices of Materials: explains that: “sponge ... will soke up the puding.”; “napkin ... wipe ups the puding”; while “wool ... won’t be abil to soke up the puding” [justifying why wool is only the third choice]).
- The student describes a modelled procedure with some accuracy (e.g., [V] describes the process in general terms with no key details such as measuring the spills, doing the experiment three times, or recording observations: Teacher: “What steps did you take to solve the problem?” Student: “Well, we tried different stuff to clean up the mess.”).
- The student makes observations with some accuracy (e.g., [P] What I Learned: Part 1: “The material thet worked best was a spong”).
- The student reports results using pictures and/or words with some clarity (e.g., [P] What Happened: “I saw thet we needed two napkins. I saw thet the wool just made a bigger mese [mess]”; includes pictures, but they do not clarify the written response).
- The student makes a somewhat reasonable recommendation (e.g., [V] Teacher: “If you could have anything else in the world to clean up your spill, what would you have used?” Student: “A sponge cloth.” Teacher: “And why would you choose that?” Student: “Because it would be like a sponge but it would be a little bit bigger like a cloth.” Teacher: “And why would that be good?” Student: “Because it would have sponge and it would be like a cloth and it would be, like, together, and it would work probably really good.”).
- The student explains why one material was more effective, with some connections to the observations (e.g., [V] Teacher: “Why do you think it [the sponge] worked so well?” Student: “Because it really soaked up a lot of stuff.”).

Communication of Required Knowledge
- The student demonstrates some ability to communicate observations and results (orally, pictorially, or in written form) (e.g., [V] Teacher: “Can you tell me all the things you could use to clean up the different spills on the floor?” Student: “For the sandwich you could use a broom or something like that.” Teacher: “What about the ketchup?” Student: “Ummm, a mop.” Teacher: “A mop. Why would that be good?” Student: “Because it would pick it up and it would pick up some ketchup.”).
- The student makes some use of appropriate science and technology vocabulary (e.g., [P] uses words such as “soak up, wipe up, pick up, megring spoon [measuring spoon]” but does not use science words, such as “absorbs, flexible, fair test” to describe the materials or processes used).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student provides somewhat logical reasons for choosing an everyday material to clean up a spill (e.g., [P] What I Learned: Part 2: “I would use paper towel because it would socke [soak] up the pudding. I would use cloth because it would pick up the pudding.”).

Comments/Next Steps
- The student should continue to explore the environment, to make careful observations, and to report them in more detail, using both words and pictures.
- The student should discuss the steps in a fair test and then apply them in a variety of new situations.
- The student should correct spelling errors by referring to resources such as word lists, wall charts, and a personal dictionary.
Cleaning Up Spills  Level 3, Sample 1

**A**

Identify the Problem
Use pictures and/or words

The problem is:
in our school there is a sticky spills

My task is:
to cleaned it up with the

---

**B**

My Choices of Materials

My first choice is **paper towel** because: it wood wip it up.

My second choice is **wet cloth** because: it get more stuff

My third choice is **a sponge** because: it absorb the rest.
C

My Plan

1) What I Need

2) What I Will Do

D

What Happened

Use pictures and/or words to show what you saw.

It was good. It was better. It was best.
What I Learned: Part 1

Which material worked best to clean up the spill?

Wet sponge.

Why was it the best?

Absorbs the glue and it wipes up the glue.

What other kinds of spills could it clean up?

Straw, gum, chocolate.

What I Learned: Part 2

If you could use anything else in the world to clean up your spill, what would you use? Tell why.

If it was glue, I would use soap and water with a sponge it absorbs.
Teacher’s Notes

Understanding of Basic Concepts
- The student shows general understanding of the difference between objects and materials (e.g., [V] “A crayon is an object. It is made out of wax and paper.”).
- The student chooses materials with general understanding of their properties (e.g., [P] My Choices of Materials: “a sponge … it absorb the rest [rest].”).

Inquiry Skills
- The student clearly identifies the problem to be solved (e.g., [V] “That there was a spill in the school and we had to choose three materials to clean it up and to see which one was the best.”).
- The student provides logical reasons for the selection of material (e.g., [V] “A paper towel and I choosed [chose] a wet cloth and a wet sponge … because I thought they would work good.” Teacher asks why. Student: “Because they would absorb the glue and the stickiness.”).
- The student describes a modelled procedure with general accuracy (e.g., [V] “We tested every material that we choosed [chose] and then we used them with whatever spill we had. We would write down which one was the best.”).
- The student makes observations with accuracy (e.g., [V] “The sponge that was wet … [was best] because it absorbed the glue and the stickiness.”).
- The student reports results using pictures and/or words with general clarity (e.g., [P] What Happened: ranks the materials in order of effectiveness: “paper towels … good”; “wet cloth … better”; “sponge … best”).
- The student makes a reasonable recommendation (e.g., [V] “I would use a paper towel to pick up the sandwich and to wipe up some of the juice … because you could pick up the sandwich with a paper towel and get another one to wipe up the juice, it would absorb it, and get the stickiness.”).
- The student explains why one material was more effective, with clear connections to the observations (e.g., [P] What I Learned: Part 1: observes that the “wet sponge” worked best because “It absorbed the glue and it wipe up [wiped up] the glue”).

Communication of Required Knowledge
- The student demonstrates considerable ability to communicate observations and results (orally, pictorially, or in written form) (e.g., [P] What Happened: organizes the observations into a chart that incorporates both pictures and words).
- The student makes general use of appropriate science and technology vocabulary (e.g., [P] “materials, sticky, absorb”).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student provides logical reasons for choosing an everyday material to clean up a spill (e.g., [P] What I Learned: Part 2: “If it was glue I would use a pail with soapy water with a sponge it absorb.”).

Comments/Next Steps
- The student was able to discern, through exploration, that wet materials would absorb the spill more readily than dry materials.
- The student needs to consolidate understanding of a fair test (e.g., measuring amount spilled while changing the material used to clean up).
- The student should edit his or her work to correct spelling errors.
Cleaning Up Spills  Level 3, Sample 2

Identify the Problem
Use pictures and/or words

The problem is: we had spills and it made a mess.

My task is: to clean theory glitter spill with the best materials.

My Choices of Materials

My first choice is a dishcloth because: it's absorbent.

My second choice is paper towel because it's flexible.

My third choice is thin plastic because: more flexible.
C

My Plan

1) What I Need
   a dish cloth, a paper towel, a thin plastik, and a glitter pen

2) What I Will Do
   clean it up with the best material.

D

What Happened

Use pictures and/or words to show what you saw.

- A dishcloth, a thin plastic, and a cleaner.
What I Learned: Part 1

Which material worked best to clean up the spill? Thin plastic

Why was it the best? Because it's flexible

What other kinds of spills could it clean up?

sand pencil shaving

What I Learned: Part 2

If you could use anything else in the world to clean up your spill, what would you use? Tell why.

It's very flexible paper towels
Teacher’s Notes

Understanding of Basic Concepts
- The student shows general understanding of the difference between objects and materials (e.g., [V] “This object is a crayon and it’s made out of wax and paper and dye. Material is stuff that the object is made out of and an object is a thing made out of material.”).
- The student chooses materials with general understanding of their properties (e.g., [P] My Choices of Materials: notes that “a Dish cloth” is “absorbent” and “paper towel” and “thin plastic” are “flexible”).

Inquiry Skills
- The student clearly identifies the problem to be solved (e.g., [V] “I had to solve a problem that was I had a spill and it … my spill was a dry glitter spill and I had to clean it up with the best material.”).
- The student provides logical reasons for the selection of material (e.g., [V] “I used three materials that was … my first choice was a dish cloth because, I used it because it was flexible and my second choice was paper towel because it was absorbent, my third choice was thin plastic because that was flexible, too.”).
- The student describes a modelled procedure with general accuracy (e.g., [P] My Plan: identifies the materials to be tested and the general use to be made of them – “clean it up with the best material” – but omits details of fair testing such as measuring the spill, recording observations).
- The student makes observations with accuracy (e.g., [P] What I Learned: Part 1: states that thin plastic worked best “because it’s flexible”).
- The student reports results using pictures and/or words with general clarity (e.g., [P] What Happened: provides three labelled pictures, one for each material tested: “dishcloth”, “clenex”, “thin plastic”; What I Learned: Part 1: states that “thin plastic” worked best).
- The student makes a reasonable recommendation (e.g., [V] “Thin plastic because it was flexible and it’s good for picking up stuff.”).
- The student explains why one material was more effective, with clear connections to the observations (e.g., [P] What I Learned: Part 1: chooses “thin plastic” because “it’s flexible” and can clean up similar spills: “sand”, “pensel shaving”).

Communication of Required Knowledge
- The student demonstrates considerable ability to communicate observations and results (orally, pictorially, or in written form) (e.g., [V] “Paper towel because it’s flexible and it’s a little bit absorbent and it’s good for even picking up dry spills.”).
- The student makes general use of appropriate science and technology vocabulary (e.g., [V] “dry spill, transparent, absorbent, flexible”; uses terms appropriately in oral and written work).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student provides logical reasons for choosing an everyday material to clean up a spill (e.g., [V] “To clean up the ketchup I would clean it up with some cloth like some big cloth and because it’s like heavy, sometimes if it’s big it’s be heavy and it’s flexible and absorbent and it’s really good for cleaning up lots of different kinds of spills.”).

Comments/Next Steps
- The student uses a multisensory approach when differentiating between objects and materials.
- The student demonstrates a logical and sequential approach in oral explanations.
- The student should continue to work through the process of fair testing and to record procedures and relevant observations.
- The student should expand on ideas, especially in written work.
- The student should correct spelling errors by referring to resources such as word lists, wall charts, and a personal dictionary.
Cleaning Up Spills  
Level 4, Sample 1

A

Identify the Problem
Use pictures and/or words

The problem is: we have lots of spills.

My task is: to pick up the spills with the best materials

B

Paint Spill

My Choices of Materials

My first choice is a *paper towel* because: it well absorb the paint spill

My second choice is *plastek* because: it will push the spill off the floor.

My third choice is a *sponge* because: it well absorbs the paint
My Plan

1) What I Need
   1. I need a measuring cup.
   2. I need a spill. (Paint)
   3. I need 3 materials.

2) What I Will Do
   1. I will take my spill and pour it into the measuring cup.
   2. I will pour my spill on the table.
   3. I will take one of my materials and try to wipe my spill.
   4. I will look at what happens.

What Happened

Use pictures and/or words to show what you saw.

1. The sponge absorb the paint
2. The paint was to slippery to clean it up.
3. The paint was too hard to clean it up.
What I Learned: Part 1

Which material worked best to clean up the spill?
The sponge was the best to clean it up.

Why was it the best?
It was flexible and it absorbed.

What other kinds of spills could it clean up? It can clean water or only liquid.

What I Learned: Part 2

If you could use anything else in the world to clean up your spill, what would you use? Tell why. A mope because it can soak it up.

Paint

Mope
Teacher’s Notes

Understanding of Basic Concepts
- The student shows thorough understanding of the difference between objects and materials (e.g., [V] “The difference between an object and a material is the object is the thing and the material is what it is made out of.”).
- The student chooses materials with an in-depth understanding of their properties (e.g., [P] My Choices of Materials: “paper towel … well absorb the pain spill.”; “a spong [sponge] … well absorbs the paint.”).

Inquiry Skills
- The student clearly and precisely identifies the problem to be solved (e.g., [P] Identify the Problem: “we have lots of spills”; the task is “to pick up the spills with the best materials.”).
- The student provides insightful reasons for the selection of material (e.g., [V] “The sponge … because I thought it would absorb the paint … the paint would just soak in.”).
- The student describes a modelled procedure with precision (e.g., [P] My Plan: identifies four sequential steps: 1. measuring the spill; 2. making the spill; 3. testing the materials; 4. recording observations).
- The student makes insightful and precise observations (e.g., [P] What Happened: “The spong absorb the paint”; “plastic … was to [too] slippery to clean it up.”).
- The student reports results using pictures and/or words with clarity and precision (e.g., [P] What Happened: identifies the spill – “paint” – and the materials – “spong”, “plastic”, “paper towel” – in labelled pictures).
- The student makes a thoroughly reasoned recommendation (e.g., [P] What I Learned: Part 1: “The sponge was the best to clean it up” because “it was flexible and it abored [absorbed]”).
- The student explains why one material was more effective, with insightful connections to the observations (e.g., [V] “The plastic wasn’t too good, it was too slippery.”).

Communication of Required Knowledge
- The student demonstrates extensive ability to communicate observations and results (orally, pictorially, or in written form) (e.g., [P] What Happened: provides labelled pictures; [V] displays a high level of confidence and precision in oral presentations).
- The student makes extensive use of appropriate science and technology vocabulary (e.g., [V] in oral responses, makes frequent and effective use of the words “absorbed” and “flexible”; [P] uses terms such as “megring [measuring] cup, likwed [liquid], soke [soak], absorbs, flexible”).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student provides insightful reasons for choosing an everyday material to clean up a spill (e.g., [V] “For the pickle I would use a paper napkin … because it is flexible and you can grab it up.”).

Comments/Next Steps
- The student could continue to focus on including more science and technology vocabulary and providing further supporting details when answering questions.
- The student should correct spelling errors by referring to resources such as word lists, wall charts, and a personal dictionary.
Cleaning Up Spills  Level 4, Sample 2

**Identify the Problem**

*Use pictures and/or words*

**The problem is:** We have a lot of different spills. Pay spill water spill is wet and slippery food spill is chunky and messy.

**My task is:** Is to find the best materials to clean up a spill.

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**My Choices of Materials**

- **My first choice is** tissue paper because: It would absorb the soap.
  - Purple soap
  - Tissue paper

- **My second choice is** sponge because: It would absorb the soap and it is soft.
  - Purple soap
  - Sponge

- **My third choice is** plastic because: I could scoop up the soap and plastic is bendable.
  - Purple soap
  - Plastic
My Plan

1) What I Need
1. I need a measuring cup
2. I need a spill
3. I will need 3 materials.

2) What I Will Do
1. I will take my measuring cup and pour my spill in it.
2. I will pour my spill on the table.
3. I will take my first material and clean my spill.
4. I will look at what happens.
5. I will take my two other materials and put it on my spills.
6. I will see what material worked the best.

What Happened

Use pictures and/or words to show what you saw.

The sponge is flexible and was able to absorb the soup.
The tissue paper was able to scoop up the soap.
The plastic was too flexible and slippery and smeared the soap.
What I Learned: Part 1

Which material worked best to clean up the spill?
The sponge worked the best.

Why was it the best?
It was the best because it was able to absorb the soup.

What other kinds of spills could it clean up?
Juice spill, marker drawn on floor or table, Paint spill.

What I Learned: Part 2

If you could use anything else in the world to clean up your spill, what would you use? Tell why.

If I could use anything in the world, it would be paper towel because it would absorb my soap spill.
Teacher’s Notes

Understanding of Basic Concepts
- The student shows thorough understanding of the difference between objects and materials (e.g., [V] “The sharpener is the object and the materials are metal and plastic.”).
- The student chooses materials with an in-depth understanding of their properties (e.g., [P] My Choices of Materials: chooses “sponge” because “it would absorb the soap and it is soft.”).

Inquiry Skills
- The student clearly and precisely identifies the problem to be solved (e.g., [V] clearly identifies the purpose of the experiment: “to see which materials would pick up the spills the best”; [P] Identify the Problem: “to find the best materials to clean up a spill.”).
- The student provides insightful reasons for the selection of material (e.g., [P] My Choices of Materials: chooses “plastic” because “I could scoup up the soap and plastic is bendable.”).
- The student describes a modelled procedure with precision (e.g., [V] “We got one plastic cup and filled it with our spill and we dumped it three times on the table and then we picked our ... and got our three materials and we thought which one would work the best and then we took one of our materials and wiped one of the spills and see if ... And we keep it there and then we did the other two and then we take them off and see which one worked the best.”).
- The student makes insightful and precise observations (e.g., [P] What Happened: “The plastic was too flexible and slippery and smeared the soap.”).
- The student reports results using pictures and/or words with clarity and precision (e.g., [P] What Happened: “The tissue paper was very flexible and was able to scoup up the soup.”).
- The student makes a thoroughly reasoned recommendation (e.g., [V] “The sponge because it was flexible and it would absorb the spill.”).
- The student explains why one material was more effective, with insightful connections to the observations (e.g., [P] What I Learned: Part 1: “The sponge worked the best ... It was the best because it was able to absorb the soup [soap].”).

Communication of Required Knowledge
- The student demonstrates extensive ability to communicate observations and results (orally, pictorially, or in written form) (e.g., [V] displays confidence when discussing observations; [P] Identify the Problem: uses words and labelled pictures to provide a detailed explanation of the problem).
- The student makes extensive use of appropriate science and technology vocabulary (e.g., [P] “dry, absorb, measuring cup, bendable, flexible, slippery, materials”).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student provides insightful reasons for choosing an everyday material to clean up a spill (e.g., [V] relates all processes and choices to the type of spill and the properties of materials: “I would use paper towel because it would absorb the juice and I’d use my hands to pick up the sandwich and I’d use a paper towel to wipe up the ketchup because the juice and ketchup would absorb it and my hands would be able to grab the sandwich because it was dry and the pickle I would use a paper towel so I could grab a pickle and I’d use a paper towel to wipe up the juice.”).

Comments/Next Steps
- The student communicates effectively and confidently both in print and orally.
- The student could begin to design and carry out new experiments that have real-life applications.
Science and Technology Exemplar Task
Grade 1
Teacher Package

Titles: Cleaning Up Spills

Time Requirements: 265 minutes (over several class periods)

Introductory activities
• Pre-task 1: 30 minutes
• Pre-task 2: 30 minutes
• Pre-task 3: 40 minutes

Exemplar task
• Part 1: 60 minutes
• Part 2: 45 minutes
• Part 3: 60 minutes

Description of the Task
Students will select and test three materials to determine which one is best to use when cleaning up a specific kind of spill. They will make recommendations based on their observations and prior experiences.

Students will complete the worksheets provided in this package and submit selected worksheets for assessment. They will also be asked to respond orally to questions posed by the teacher, and these interviews will be videotaped. The videotapes will also be used for purposes of assessment.

Scenario and Instructions for Students
Students should be presented with the following scenario and set of instructions:

In class, students often have to clean up a variety of spills (e.g., of sand, paint, glue, food, or drink). Find out what material works best for cleaning up a particular kind of spill.

Your task is to:
• describe your spill (dry, wet, sticky, etc.);
• choose three different materials (e.g., paper towels, napkins, newspaper) that you think will work well;
• tell why you chose them;

• decide how you will test the three materials in a fair way;
• test each of them;
• show which material best cleans up the spill;
• tell why you think it is the best;
• share what you learned.

Curriculum Expectations Addressed in the Task
Note that the codes that follow the expectations are from the Ministry of Education’s Curriculum Unit Planner (CD-ROM).

Students will:
1. distinguish between objects and materials (e.g., scissors are objects, and they can be made of metal and/or plastic), and identify and describe the properties of some materials (e.g., flexibility of plastic, hardness of wood) (1s24);
2. investigate the properties of materials and make appropriate use of materials when designing and making objects (1s25);
3. describe the function of specific materials in manufactured objects that they and others use in daily life (1s26);
4. ask questions about and identify needs and problems related to objects and materials, and explore possible answers and solutions (e.g., test materials to determine which ones insulate more efficiently; test different fabrics to determine which are waterproof) (1s34);
5. plan investigations to answer some of these questions or solve some of these problems (1s35);
6. use appropriate vocabulary in describing their investigations, explorations, and observations (1s36);
7. record relevant observations, findings, and measurements, using written language, drawings, charts, and concrete materials (e.g., make a display board and record the results of their testing of chalk on different materials) (1s37);
8. communicate the procedures and results of investigations for specific purposes, using demonstrations, drawings, and oral and written descriptions (e.g., display examples of materials tested and indicate which ones were best for writing on) (1s38).
Based on the expectations being assessed, the following “big ideas” have been identified for this task:

- Objects are made from materials.
- Materials are distinct because each has specific properties.
- The characteristics and functions of an object depend on the properties of the materials from which it is made.

**Teacher Instructions**

**Prior Knowledge and Skills Required**

Before attempting the task, students should have had experience with the following:

- identifying the properties of different materials
- describing materials using their senses
- using a simple inquiry process for Grade 1 (See “Exemplar Task”, below)
- using a simple experimental method and conducting a fair test (e.g., a test in which all other things are kept the same while one thing is changed)
- communicating findings orally and recording their findings using pictures and/or words

**The Rubric**

The rubric* provided with this exemplar task is to be used to assess students’ work. The rubric is based on the achievement levels outlined on page 13 of The Ontario Curriculum, Grades 1-8: Science and Technology, 1998.

Introduce the task-specific rubric to students at least one day before administering the task. Copy the rubric for students or make a transparency to use with the class. You may find it useful to rephrase the rubric for students to help them understand it.

Review the elements of the rubric with students to ensure that they understand the criteria and the descriptions for achievement at each level. Allow ample class time for a thorough reading and discussion of the assessment criteria outlined in the rubric.

When using the rubric to assess student work, remember that scientific content and processes should be valued over written language skills, especially with younger students.

**Accommodations**

Accommodations that are normally provided in the regular classroom for students with special needs should be provided in the administration of the exemplar task.

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*The rubric is reproduced on pages 14–15 of this document.*
4. Introduce students to a classroom search activity. Have students work in groups and assign each group a property (e.g., flexible, hard, cold) to search for in materials found in the classroom. Provide each group with a large piece of chart paper on which to record a list of materials that share the assigned property. See Appendix 1 for a sample. Students should be encouraged to explain their choices to the group before adding them to the chart. Have each group share its findings with the class.

Pre-task 3: Objects Are Made of Materials With Properties
1. Review the definition of the word object (objects are things that are made of one or more materials).
2. Brainstorm with students a list of objects and the materials from which they are made.
3. Introduce students to the activity provided in Appendix 2, using examples such as:
   - A window is made out of glass because you can see through glass.
   - A window is not made out of paper because the rain would come through it.
   Encourage students to come up with several different reasons for each as you work through the examples orally.
4. Have students complete the activity in Appendix 2. Encourage students to think of several different responses and choose one to record. Have students then illustrate each sentence that they have completed.
5. Do a pair-share or have students share responses in small groups.

Exemplar Task

Part 1: Planning
1. Review the scenario with students.
2. Remind students that each will be working independently. Establish the criteria that students will have to meet by reviewing a simplified version of the rubric or by posting a criteria chart.
3. Have each student use the “Identify the Problem” worksheet in the Student Package (see Appendix 3) independently and restate the problem (e.g., “The problem is that we have lots of spills in our classroom”) and the task (e.g., “My task is to find the best material[s] to clean up a glue spill”), using pictures and/or words.
4. Ask each student then to select three different materials for the clean-up from those available for testing. Remind students to think of the properties of the spills as they try to determine the best materials to clean them up. Tell them that they will have to predict which will do the best clean-up job.

Part 2: Experimenting
1. After each student finishes recording his or her plan, have him or her do the experiments with the three clean-up materials chosen.
2. Ask students to record their findings and conclusions on the “What Happened” worksheet (see Appendix 6) and on the “What I Learned” worksheets (see Appendices 7 and 8). Encourage students to record their responses as fully as possible, using pictures, labelled diagrams, and/or words.

Part 3: Concluding and Reflecting
When students complete their experiments, it is important that they share their results in small groups and talk about their successes. Reviewing what went well and what did not go well helps students learn the inquiry process. Encourage students to share ideas about ways in which they can use what they learned. Throughout the sharing, encourage students by using “I wonder” questions (e.g., “I wonder what else this material would have cleaned up?”; “I wonder what would have happened if you had used ______ instead of ______?”).

About the Videotaping
For this video exemplar, teachers were asked to set the stage, as described below, for students to be videotaped individually by TVOntario. Teachers were present for the videotaping and provided the questions/prompts listed below to help students articulate their understanding/learning.
- For the taping, have a basket or box of familiar materials and objects from the classroom available for students to select to answer the first prompt.
- A picture prompt is included to be shown to students as you read the scenario (see page 10).
- To create a safe, non-threatening environment for students, it is essential that you, the student’s teacher, ask the questions.
- During the videotaping, students should have their completed student booklets available to refer to if they want them.

*The worksheet “I Wonder” is not included in the samples of student work reproduced in this document.
The following video prompts were used during the videotaping of the investigation:

- Use something from the basket/box of classroom items to help explain the difference between objects and materials.
- What problem were you solving?
- What steps did you take to solve the problem?
- Which three materials did you choose? Why did you choose them?
- Which material was most successful in cleaning up your spill?
- Why do you think it worked so well?
- If you could have used anything else in the world to clean up your spill, what would you have used? Why?
- A friend has come for lunch at your house and is having a sandwich with a pickle and a glass of juice. As you are carrying your friend’s lunch to the table, you bump into a chair. The next thing you know, the juice, sandwich, and pickle are all over the floor. The sandwich, with ketchup on it, has landed upside down in the middle of it all. What a mess! Tell me all the things you could use to clean up the different spills on the floor. Explain why you would choose each of them.
- Tell me one of your “I wonders”.

Appendix 1

Pre-task 2: Teacher Sample

Have students create one chart for each property being observed. Students can draw, cut, and paste, or write their examples.
Appendix 2

Pre-task 3: Student Activity

A ______________ is made of __________________
because ________________________________.

A ______________ is NOT made of ________________
because ________________________________.
Appendix 3
Identify the Problem

Use pictures and/or words.

The problem is:

My task is:

Appendix 4
My Choices of Materials

My first choice is _________________ because:

My second choice is _________________ because:

My third choice is _________________ because:
Appendix 5
My Plan

1) What I Need

2) What I Will Do

Appendix 6
What Happened

Use pictures and/or words to show what you saw.
Appendix 7
What I Learned: Part 1

Which material worked best to clean up the spill?

Why was it the best?

What other kinds of spills could it clean up?

Appendix 8
What I Learned: Part 2

If you could use anything else in the world to clean up your spill, what would you use? Tell why.
Appendix 9

I Wonder
Grade 2

Structures and Mechanisms
The Ontario Curriculum – Exemplars, Grades 1 and 2: Science and Technology

Making a Toy

The Task
Students were asked to build a toy for a young child incorporating mechanisms and simple machines. Specifically they were to:

- clarify the problem;
- brainstorm some possible solutions;
- draw design sketches for three of the solutions;
- choose one sketch as their plan;
- design and build a model;
- test the model and make any necessary changes;
- reflect on their learning.

For the scenario and task instructions that were presented to students, see page 102.

Expectations
This task gave students the opportunity to demonstrate their achievement of all or part of each of the following selected overall and specific expectations from the strand Structures and Mechanisms: Grade 2 – Movement. (The codes that follow the expectations are from the Ministry of Education’s Curriculum Unit Planner.)

Students will:
1. describe the position and movement of objects, and demonstrate an understanding of how simple mechanisms enable an object to move (2s66);
2. design and make simple mechanisms, and investigate their characteristics (2s67);
3. recognize that different mechanisms and systems move in different ways, and that the different types of movement determine the design and the method of production of these mechanisms and systems (2s68);
4. ask questions about and identify needs or problems related to structures and mechanisms, and explore possible answers and solutions (2s74);
5. plan investigations to answer some of these questions or solve some of these problems, and describe the steps involved (2s75);
6. communicate the procedures and results of investigations and explorations for specific purposes, using drawings, demonstrations, and oral and written descriptions (2s78).
**Prior Knowledge and Skills**

To complete this task, students were expected to have some knowledge or skills related to the following:

- attaching axles and wheels
- making hinges and other simple linkages
- recognizing different simple machines
- using a design-process model
- connecting parts to create movement in different ways and directions

In the teacher’s notes and comments accompanying the student samples that follow, the examples cited are either from the student workbooks (indicated by a “P”, for “print”) or from the videotape (indicated by a “V”).

For information on the process used to prepare students for the task and on the materials and equipment required, see the Teacher Package, reproduced on pages 102–109 of this document.
### Task Rubric – Grade 2: Making a Toy

<table>
<thead>
<tr>
<th>Expectations*</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Understanding of Basic Concepts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The student:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>demonstrates limited understanding of how mechanisms enable movement and changes in direction</td>
<td>demonstrates some understanding of how mechanisms enable movement and changes in direction</td>
<td>demonstrates general understanding of how mechanisms enable movement and changes in direction</td>
<td>demonstrates thorough understanding of how mechanisms enable movement and changes in direction</td>
</tr>
<tr>
<td><strong>Design Skills</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The student:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- identifying the problem/need</td>
<td>describes with limited clarity the challenge of designing and building a model of a toy incorporating simple machines</td>
<td>describes with some clarity the challenge of designing and building a model of a toy incorporating simple machines</td>
<td>clearly describes the challenge of designing and building a model of a toy incorporating simple machines</td>
<td>precisely describes the challenge of designing and building a model of a toy incorporating simple machines</td>
</tr>
<tr>
<td>4, 5</td>
<td>lists a few of the steps needed to execute the plan</td>
<td>lists some of the steps needed to execute the plan</td>
<td>lists most of the steps needed to execute the plan</td>
<td>lists in a detailed manner all or almost all of the steps needed to execute the plan</td>
</tr>
<tr>
<td>- making the plan</td>
<td>creates a minimally labelled plan</td>
<td>creates a partially labelled plan</td>
<td>creates a fully labelled plan</td>
<td>creates a detailed, fully labelled plan</td>
</tr>
<tr>
<td>5</td>
<td>makes a few modifications to the plan as needed</td>
<td>makes some modifications to the plan as needed</td>
<td>makes appropriate modifications to the plan as needed, giving reasons for the modifications</td>
<td>makes appropriate, detailed modifications to the plan as needed, giving reasons for the modifications</td>
</tr>
<tr>
<td>- executing and evaluating the plan</td>
<td>creates a model that resembles the plan to a limited extent</td>
<td>creates a model that resembles the plan to some extent</td>
<td>creates a model that resembles the plan, including most recorded modifications</td>
<td>creates a model that closely resembles the plan, including all or almost all recorded modifications</td>
</tr>
<tr>
<td>2</td>
<td>makes limited improvements to the model</td>
<td>makes some improvements to the model</td>
<td>makes considerable improvements to the model</td>
<td>makes insightful improvements to the model</td>
</tr>
<tr>
<td>Expectations*</td>
<td>Level 1</td>
<td>Level 2</td>
<td>Level 3</td>
<td>Level 4</td>
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<tr>
<td></td>
<td>grade 6</td>
<td>grade 3</td>
<td>grade 6</td>
<td>grade 6</td>
</tr>
<tr>
<td>Communication of Required Knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>The student:</td>
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<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>makes limited use of appropriate science and technology vocabulary to describe simple machines and their mechanisms</td>
<td>makes some use of appropriate science and technology vocabulary to describe simple machines and their mechanisms</td>
<td>makes general use of appropriate science and technology vocabulary to describe simple machines and their mechanisms</td>
<td>makes extensive use of appropriate science and technology vocabulary to describe simple machines and their mechanisms</td>
<td></td>
</tr>
<tr>
<td>explains with limited clarity how the mechanism or simple machine is used to create movement, including changes in speed and direction</td>
<td>explains with some clarity how the mechanism or simple machine is used to create movement, including changes in speed and direction</td>
<td>explains clearly how the mechanism or simple machine is used to create movement, including changes in speed and direction</td>
<td>explains precisely how the mechanism or simple machine is used to create movement, including changes in speed and direction</td>
<td></td>
</tr>
<tr>
<td>provides a simple explanation of how the toy could be used to improve fine-motor skills</td>
<td>provides a somewhat clear explanation of how the toy could be used to improve fine-motor skills</td>
<td>provides a clear explanation of how the toy could be used to improve fine-motor skills</td>
<td>provides a complex and detailed explanation of how the toy could be used to improve fine-motor skills</td>
<td></td>
</tr>
</tbody>
</table>

| Relating of Science and Technology to Each Other and to the World Outside the School | | | |
| The student: | | | |
| 3 | | | |
| describes in limited detail similarities between the model and mechanisms and simple machines in real-life objects | describes in some detail similarities between the model and mechanisms and simple machines in real-life objects | describes in detail similarities between the model and mechanisms and simple machines in real-life objects | describes in rich detail similarities between the model and mechanisms and simple machines in real-life objects |

*The expectations that correspond to the numbers given in this chart are listed on page 58.

**Note:** This rubric does not include criteria for assessing student performance that falls below level 1.
Making a Toy  Level 1, Sample 1

What I Need To Do

1. My job is to:
   Make a toy and explain how it works to the community man.

I need to:
   Get a stick and put circles on it. I have to cut it first too.

My Design Sketches

Design Sketch 1

Design Sketch 2

Design Sketch 3
My Working Plan
Label Your Work:

I added a plastic cup and a stick, a wheel and ax, something and this white stuff. And a spring and a stick and a donk.

I chose this 15 because it's the only one I can think of.

My List of Materials

I will have a shoe box and two sticks, row wheels, and a glue gun some string and scissors.
**My Step-By-Step Procedures**
( Remember to number your steps)

1. Gather materials
2. Get shoe box milk carton
3. Stack sticks and poke them through the shoe box, then put two wheels on each stick
4. Cut hole triangle shape not all the way through and at the top cut a slit and on the sides cut and then glue them on it.

**My Reflections**

1. What simple machines did you use, and how did you connect any moving parts?
   - I used a wheel and axle and I connected the wheel on the axle with a glue gun and I used a wheel and a spinner too.

2. What changes did you make to improve your toy?
   - I made two doors and I made a spinner and a wheel and a seat with a pole over it.

3. How did you use simple machines to make something move faster and/or change direction?
   - The wheel and axle make the car move and change direction.
4. How can your toy be used to help a young child to improve his or her fine motor skills?

They have to move it and learn the small parts.

5. Identify and describe an object in the outside world that uses one of the same simple machines you used in your model to create movement.

A dear has the same movement as mine.

6. What are other ways we use simple machines to make our lives more enjoyable?

A ladder is enjoyable and a crane.
**Teacher’s Notes**

**Understanding of Basic Concepts**
- The student demonstrates limited understanding of how mechanisms enable movement and changes in direction (e.g., [P] My Reflections [3]: identifies what the mechanism is – “The wheel and axle make the car move and change direction” – rather than how the mechanism works).

**Design Skills**
- The student describes with limited clarity the challenge of designing and building a model of a toy incorporating simple machines (e.g., [P] What I Need To Do: omits reference to the design process: “Make a toy and explain how it works …”).
- The student lists a few of the steps needed to execute the plan (e.g., [P] My Step-By-Step Procedures: includes five numbered steps: steps 1 and 2 refer to materials; step 3 describes attaching “wheels” to “stiks” [axles]; steps 4 and 5 refer to attaching “stren” [string] to the toy).
- The student creates a minimally labelled plan (e.g., [P] My Working Plan: refers to a wheel and axle and a hinge).
- The student makes a few modifications to the plan as needed (e.g., [P] My Working Plan: “I added a cup and a stick … and a door.”).
- The student creates a model that resembles the plan to a limited extent (e.g., [V] includes additional hatches on the roof that were not shown on the plan).
- The student makes limited improvements to the model (e.g., [V] “I was going to use these pipe cleaners to put … do the wheels but it didn’t work …”).

**Communication of Required Knowledge**
- The student makes limited use of appropriate science and technology vocabulary to describe simple machines and their mechanisms (e.g., [V] “I connected the wheels on to the sticks”; [P] What I Need To Do [2]: “get a stick and put circles on it”).
- The student explains with limited clarity how the mechanism or simple machine is used to create movement, including changes in speed and direction (e.g., [P] My Reflections [3]: “The wheel and axle make the car move and change direction.”; links the machine to movement but does not say how it works).

- The student provides a simple explanation of how the toy could be used to improve fine-motor skills (e.g., [V] “They have to use their fingers to roll it and stuff.”; [P] My Reflections [4]: “They have to move it and toch [touch] the small partes.”).

**Relating of Science and Technology to Each Other and to the World Outside the School**
- The student describes in limited detail similarities between the model and mechanisms and simple machines in real-life objects (e.g., [V] “A car uses a wheel and axle.”; [P] My Reflections [5]: “A car has the same movement as mine.”).

**Comments/Next Steps**
- The student needs to acquire science and technology vocabulary and use it in both oral and written responses.
- The student should add detail to responses.
- The student needs to develop a better understanding of the design process (e.g., modifications should be made to improve design rather than only to improve appearance).
Making a Toy

What I Need To Do

1. My job is to:
   
   create a toy for little kids
   and use simple machine.

   I need to:
   
   Design a toy and plan
   and to design my toy.
   I need to think of what
   I am to need and it is
   spond to have to have
   a wheel and axle for the
   little kids and toy.

My Design Sketches

Design Sketch 1

Design Sketch 2

Design Sketch 3
C

My Working Plan
Label Your Work:

first I needed to find a cardboard box and
then wooden bowling and add wheels and axle and paint

D

My List of Materials

wooden bowling and A wooden
box and wheels and paint

* dowelling
My Step-By-Step Procedures
( Remember to number your steps)

1. I got a box
2. wooden bowl
3. Elastiks
4. I got for wheels
5. Then I pantebit

* painted it

My Reflections

1. What simple machines did you use, and how did you connect any moving parts?
   wheels and axles, with
   2 wooden bowl and 3 Elastiks

2. What changes did you make to improve your toy?
   What I change is my wobbly wheels.
   case I hab pipe cleaners put
   they cibint work.

3. How did you use simple machines to make something move faster and/or change direction?
   wheels and axles
4. How can your toy be used to help a young child to improve their fine motor skills?

- be pushing it with their fingers

5. Identify and describe an object in the outside world that uses one of the same simple machines you used in your model to create movement.

- a bus

6. What are other ways we use simple machines to make our lives more enjoyable?

- Marshals or in vehicles

- so they can go places

* machines
Teacher’s Notes

Understanding of Basic Concepts
- The student demonstrates limited understanding of how mechanisms enable movement and changes in direction (e.g., [P] My Reflections [1], [3]: “wheels and axles with 2 wooden bowel and 3 Elastiks”; identifies simple machines but not how they work).

Design Skills
- The student describes with limited clarity the challenge of designing and building a model of a toy incorporating simple machines (e.g., [P] What I Need To Do [2]: “Design a toy and planet [plan it] … think of whah I am to neeb [need] and it is spost to have … a wheel and axle …”).
- The student lists a few of the steps needed to execute the plan (e.g., My Step-By-Step Procedures: lists five steps that identify materials to be used but not the process of assembly).
- The student creates a minimally labelled plan (e.g., [P] My Design Sketches: provides three design sketches with titles but no labels; My Working Plan: provides a simplistic diagram with minimal labelling).
- The student makes a few modifications to the plan as needed (e.g., [P] modifies the model slightly – My Reflections [2]: “What I change is my wobbly [wobbly] wheels …” – but does not record changes in the working plan).
- The student creates a model that resembles the plan to a limited extent (e.g., [V] builds a model of a small painted box with four wheels and axles).
- The student makes limited improvements to the model (e.g., [V] modifies the model by adding elastics: “I put the elastic there so my wheels would stay on.”).

Communication of Required Knowledge
- The student makes limited use of appropriate science and technology vocabulary to describe simple machines and their mechanisms (e.g., [P] “wheel and axle”; [V] “simple machines”).
- The student explains with limited clarity how the mechanism or simple machine is used to create movement, including changes in speed and direction (e.g., [P] My Reflections [1], [3]: “Wheels and axles”; [V] “I didn’t change something to go that way or that way … I attached the wheels”).

- The student provides a simple explanation of how the toy could be used to improve fine-motor skills (e.g., [V] Teacher: “How can your toy be used to help a young child to improve … fine-motor skills?” Student: “By pushing it.”).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student describes in limited detail similarities between the model and mechanisms and simple machines in real-life objects (e.g., [V] Teacher: “Identify and describe an object in the outside world that uses one of the same simple machines.” Student: “A bus.”).

Comments/Next Steps
- The student needs to continue to develop an understanding of other simple machines and their applications in real-life objects.
- The student needs to expand use of appropriate science and technology vocabulary.
- The student needs to discuss the steps in the design process and then add detail to responses.
- The student should correct spelling errors by referring to resources such as word lists, wall charts, and a personal dictionary.
Making a Toy  Level 2, Sample 1

What I Need To Do

1. My job is to:
   My job is to make a toy to improve a child's fine motor skills.

   I need to:
   I need to make a plan, go over my plan.

My Design Sketches

Design Sketch 1

Design Sketch 2

Design Sketch 3
C

My Working Plan
Label Your Work:

D

My List of Materials

glue, tongue depressor, box, wheels
paper, clothespins, pushpins
My Step-By-Step Procedures
(Remember to number your steps)

1. Get my box.
2. Put on my wheels.
3. I’m going to glue my tongue depressor to make my incline plane.
4. I make my hole in my box to make my sun ruff.

My Reflections

1. What simple machines did you use, and how did you connect any moving parts?
   
   My simple machines are an inclined plane and a wheel and axle.

2. What changes did you make to improve your toy?
   
   The change I made was no handle on the door and I put paper fasteners instead of dowels. I didn’t put the sun ruff on instead of putting a small stick I put a piece of cardboard.

3. How did you use simple machines to make something move faster and/or change direction?

   You have to push it to make it move faster. I used an inclined plane to make the paper ball.
4. How can your toy be used to help a young child to improve his or her fine motor skills?

You can push it, or you can pick it up and turn it sideways.

5. Identify and describe an object in the outside world that uses one of the same simple machines you used in your model to create movement.

The wheels because cars use when they move.

6. What are other ways we use simple machines to make our lives more enjoyable?

Your bike has a wheel and axle.
Teacher’s Notes

Understanding of Basic Concepts
- The student demonstrates some understanding of how mechanisms enable movement and changes in direction (e.g., [P] My Reflections [3]: “You haft to push it to make it move faster. I uesed a inclined plane to make the paper ball.”; [5]: “The wheels because cars ues when they move.”).

Design Skills
- The student describes with some clarity the challenge of designing and building a model of a toy incorporating simple machines (e.g., [P] What INeed To Do [1]: “… make a toy to inproof [improve] a chilenld’s [child’s] fine motor skill’s”; [2]: “… make a plan. go over my plane.”).
- The student lists some of the steps needed to execute the plan (e.g., [P] My Step-By-Step Procedures: lists four steps).
- The student creates a partially labelled plan (e.g., [P] My Working Plan: includes labels for “box, paper wheels, tongue depressors, glue”).
- The student makes some modifications to the plan as needed (e.g., [P] My Working Plan: removes “stick”; [V] Student: “I was going to put a wheel and axle, but it kept on falling off ‘cause I couldn’t find anything to keep it on, so I put a paper fastener instead.”).
- The student creates a model that resembles the plan to some extent (e.g., [V] omits the ramp shown in the video from the working plan).
- The student makes some improvements to the model (e.g., [P] My Reflections [2]: “… no handel on the door. and I put paper fasteners insted of dowels. and I didn’t put the sun ruff [roof] on …”).

Communication of Required Knowledge
- The student makes some use of appropriate science and technology vocabulary to describe simple machines and their mechanisms (e.g., [P] My Reflections: “wheels, inclined plane, axel”).
- The student explains with some clarity how the mechanism or simple machine is used to create movement, including changes in speed and direction (e.g., [P] My Reflections [3]: “You haft to push it to make it move faster.”; [V] “… I used the wheels to make it go faster …”).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student describes in some detail similarities between the model and mechanisms and simple machines in real-life objects (e.g., [P] My Reflections [5]: “The wheels because cars ues when they move.”; [V] “… a bike because of the wheels …”).

Comments/Next Steps
- The student needs to develop skills in clarifying the problem and identifying the components of a task.
- The student should explore different ways in which simple machines and mechanisms can create changes in speed and direction.
- The student needs to work on recording modifications clearly.
- The student is starting to understand the need to use appropriate science and technology vocabulary to communicate effectively.
- The student should correct spelling errors by referring to resources such as word lists, wall charts, and a personal dictionary.
What I Need To Do

1. My job is to:
   - plan what I am going to do and build my toy. Then I explain to people how it develops.

I need to:
   - make a plan, build the toy, and tell you about it.
My Working Plan
Label Your Work:

My List of Materials

- wheels
- box
- cardboard
- stick
- tape
- glue
- pipe cleaners
- wooden stamp

You have to push the car. You push the back. The reason I chose this design because it is easy.
My Step-By-Step Procedures
(Remember to number your steps)

1. Gather materials.
2. Put the stick in two wheels.
3. Glue paper on the wheels.
5. Make doors.
6. Glue straw to the bottom.

My Reflections

1. What simple machines did you use, and how did you connect any moving parts?
   I used a wheel and axle and hinge. I connect the moving by gluing, taping, and sticking.

2. What changes did you make to improve your toy?
   I changed the rubber band to tape.

3. How did you use simple machines to make something move faster and/or change direction?
   Just push it to make it go faster.
   To change direction just push the side.
4. How can your toy be used to help a young child to improve his or her fine motor skills?

It can open and close and you have to push to move.

5. Identify and describe an object in the outside world that uses one of the same simple machines you used in your model to create movement.

A car has a hinge and a wheel and axle.

6. What are other ways we use simple machines to make our lives more enjoyable?

- skateboards, teeter totter, baseball bat, hockey stick are fun.
Teacher’s Notes

Understanding of Basic Concepts
- The student demonstrates some understanding of how mechanisms enable movement and changes in direction (e.g., [P] My Reflections [3]: “Just push it to make it go faster. To change direction, just push the side.”).

Design Skills
- The student describes with some clarity the challenge of designing and building a model of a toy incorporating simple machines (e.g., [P] What I Need To Do [1]: “… plan what I am going to do and build my toy. Then I explain to people how it develops”).
- The student lists some of the steps needed to execute the plan (e.g., [P] My Step-By-Step Procedures: lists six steps in appropriate order).
- The student creates a partially labelled plan (e.g., [P] My Working Plan: provides labels for “wheel and axle, stick and wheel, box, hinge, cardboard”).
- The student makes some modifications to the plan as needed (e.g., [P] My Reflections [3]: changes some fastening materials from rubber bands to tape).
- The student creates a model that resembles the plan to some extent (e.g., [V] uses the “stick and wheel [wheel and axle] and hinge” in the model).
- The student makes some improvements to the model (e.g., [V] “… I just changed the bottom … took the rubber bands out and put tape … because I couldn’t open the door.”).

Communication of Required Knowledge
- The student makes some use of appropriate science and technology vocabulary to describe simple machines and their mechanisms (e.g., [P] “wheel and axle, hinge, design”).
- The student explains with some clarity how the mechanism or simple machine is used to create movement, including changes in speed and direction (e.g., [V] demonstrates the movement of the hinged door while stating “I couldn’t open the door … “).
- The student provides a somewhat clear explanation of how the toy could be used to improve fine-motor skills (e.g., [P] My Reflections [4]: “It can open and close and you have to push to move.”; [V] demonstrates the pushing action and states, “… you can push it.”).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student describes in some detail similarities between the model and mechanisms and simple machines in real-life objects (e.g., [P] My Reflections [5]: “A car has a hinge and a wheel and axle.”).

Comments/Next Steps
- The student demonstrates some understanding of the design process.
- The student should continue to explore different ways simple machines create changes in speed and direction of movement.
- The student should work on providing more detailed responses and using more science and technology vocabulary in written and oral work.
Making a Toy  Level 3, Sample 1

A

What I Need To Do

1. My job is to:

   Make a toy for younger children, to develop fine motor skills. To have moving parts for the children to move and learn fine motor skills. The toy has to have at least two simple machines.

   I need to:

   Design my toy by sketching it and planning, so I know what I’m going to do. And I also have to modify it if it didn’t work or I didn’t make it right.

B

My Design Sketches

Design Sketch 1

Design Sketch 2

Design Sketch 3
My Working Plan
Label Your Work:

Some things that move are wheels
Canister
Hinge

I chose this design because I have a brother and he gave me an idea.

My List of Materials

1. Cardboard
2. Wooden wheels
3. Glue gun
4. Dowel
5. Crow's pegs
6. Film container
7. Straw
8. Cardboard
9. Toothpick
10. Straw
My Step-By-Step Procedures
(Remember to number your steps)

1. I got a card.
2. Then some dowel and another piece of cardboard and cut the dowel and glued it in. Then I got some clear pegs and glued the clear pegs. Then I put the dowel in the clear pegs and put the wheels on and glued some cardboard on the dowel. Then I put some popsicle sticks on the sides and made a window with popsicle sticks all over. I made a door out of cardboard and used a toothpick and a straw and glued it all over. I made a roof out of cardboard.

My Reflections

1. What simple machines did you use, and how did you connect any moving parts?
   - I used a hot glue gun to connect the hinges on my door and to connect the cardboard on the end of the dowel.

2. What changes did you make to improve your toy?
   - I was going to make the sides of the tractor with wood but instead I used popsicle sticks so it wouldn’t be so heavy.

3. How did you use simple machines to make something move faster and/or change direction?
   - I used a hinge because if I just glued it it would move but not as fast.
4. How can your toy be used to help a young child to improve his or her fine motor skills?

opening and closing the door and pushing the door back and forth.

5. Identify and describe an object in the outside world that uses one of the same simple machines you used in your model to create movement.

a car has a door axles and wheels just like my tractor.

6. What are other ways we use simple machines to make our lives more enjoyable?

a hinge makes our lives more enjoyable because if it was not on a door then we would have to have the door open or shut.
Teacher’s Notes

Understanding of Basic Concepts
- The student demonstrates general understanding of how mechanisms enable movement and changes in direction (e.g., [V] “... if it didn’t have any wheels it would sort of be hard to move it and it wouldn’t go as fast ... lift up the doo...” [P] My Reflections [3]: “I used a hinge because if I just glued it it would move but not as fast.”).

Design Skills
- The student clearly describes the challenge of designing and building a model of a toy incorporating simple machines (e.g., [P] What I Need To Do [2]: “Design my toy by sketching it and planning ... modify it ...”).
- The student lists most of the steps needed to execute the plan (e.g., [P] My Step-By-Step Procedures: does not number the steps, but provides a clear and detailed description, specifying the materials used at each stage and what is done with them).
- The student creates a fully labelled plan (e.g., [P] My Working Plan: includes labels of “wheels, hinges, lever [lever]”).
- The student makes appropriate modifications to the plan as needed, giving reasons for the modifications (e.g., [P] My Reflections [2]: “… instead I used popsicle sticks so it wouldn’t be so heavy.”; [V] “so the wheels wouldn’t fall off when you moved the machine”).
- The student creates a model that resembles the plan, including most recorded modifications (e.g., [P] My Working Plan: uses heavily shaded areas to indicate modifications).
- The student makes considerable improvements to the model (e.g., [V/P] realizes that the toy is too heavy and uses a different material than planned [popsicle sticks instead of wood] to fix the problem).

Communication of Required Knowledge
- The student makes general use of appropriate science and technology vocabulary to describe simple machines and their mechanisms (e.g., [V/P] “hinges, wheels and axles, design, modify, lever”).
- The student explains clearly how the mechanism or simple machine is used to create movement, including changes in speed and direction (e.g., [P] My Reflections [3]: “I used a hinge because if I just glued it it would move but not as fast.”; [V] “… if it didn’t have any wheels it would sort of be hard to move it and it wouldn’t go as fast.”).
- The student provides a clear explanation of how the toy could be used to improve fine-motor skills (e.g., [V] demonstrates while describing: “… lift up the doors … play with the blocks ... and have to get them in the right place”; [P] My Reflections [4]: “opening and closing [closing] the door and pushing the tractor back and forth.”).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student describes in detail similarities between the model and mechanisms and simple machines in real-life objects (e.g., [P] My Reflections [5]: “a car has a door axels and wheels just like my tractor.”; [V] “The hinge, if we didn’t have a hinge on our door we would either have to leave our door shut, open or don’t have a door at all.”).

Comments/Next Steps
- The student demonstrates a good understanding of the task.
- The student needs to continue to develop written communication by including more details in the labelled plan and organizing steps sequentially using numbers.
- The student should correct spelling errors by referring to resources such as word lists, wall charts, and a personal dictionary.
What I Need To Do

1. My job is to:
   Make a toy for a small child to develop fine motor skills. The toy must have two simple machines.

I need to:
   Plan my toy and then I have to build my toy. Then I have to explain how it works in front of the cameras.
My Working Plan
Label Your Work:

I needed a box, wheels, elastic, sticks, glue, scissors, tape.

The reason I chose this design is because I had a good plan.
My Step-By-Step Procedures
(Remember to number your steps)

1. Gather materials.
2. Take box.
3. Poke four holes in box.
4. Poke two sticks through holes.
5. Make hole in the bottom.
6. Attach elastic from top of the box to stick.
7. Make windows and door.

My Reflections

1. What simple machines did you use, and how did you connect any moving parts?
   I used a hinge and a wheel and axle.
   I glued two wheels onto an axle and put it through two holes. I cut out a door to make a hinge.

2. What changes did you make to improve your toy?
   I wanted to make a wind-up car but I couldn't because the elastic kept on breaking.

3. How did you use simple machines to make something move faster and/or change direction?
   I used a wheel and axle to make it go fast and push it back and forth so it can change direction.
4. How can your toy be used to help a young child to improve his or her fine motor skills?

They have to push the door open and shut.

5. Identify and describe an object in the outside world that uses one of the same simple machines you used in your model to create movement.

A seesaw has hinges and wheels and axles.

6. What are other ways we use simple machines to make our lives more enjoyable?

We use wheels and axles for bicycles and levers for seesaws and pulleys to pull stuff up.
Teacher’s Notes

Understanding of Basic Concepts
- The student demonstrates general understanding of how mechanisms enable movement and changes in direction (e.g., [P] My Reflections [3]: “I yoused a wheel and axle to make it go fast and push it back and forth so it can change direction.”; [V] “I used an axle to connect two wheels.”).

Design Skills
- The student clearly describes the challenge of designing and building a model of a toy incorporating simple machines (e.g., [P] What I Need To Do [1]: “Make a toy for a small child to develop fine motor skills. The toy must have two simple machines.”; [2]: “plan … build [build] … explain how it works …”).
- The student lists most of the steps needed to execute the plan (e.g., My Step-By-Step Procedures: lists seven steps).
- The student creates a fully labelled plan (e.g., [P] clearly indicates on the labelled plan the mechanisms used: “hinge, wheel and axle”).
- The student makes appropriate modifications to the plan as needed, giving reasons for the modifications (e.g., [P] indicates modification in My Working Plan drawing and makes reference to the change in My Reflections [2]: “I wanted to make a wind-up [wind-up] car but I couldn’t because the elastic cept on breaking.”).
- The student creates a model that resembles the plan, including most recorded modifications (e.g., [V] builds a model that clearly matches the working plan; [P] My Working Plan: records on plan that “elastic [elastic] did not work.”).
- The student makes considerable improvements to the model (e.g., [P/V] realizes, through testing, that the wind-up mechanism kept breaking, so substitutes a simpler mechanism).

Communication of Required Knowledge
- The student makes general use of appropriate science and technology vocabulary to describe simple machines and their mechanisms (e.g., [P] My Reflections [6]: “… wheels and axles for bicycles [bicycles] and levers for seesaws and pullys to pull stuf up.”; [V] “I used an axle to connect two wheels.”).
- The student explains clearly how the mechanism or simple machine is used to create movement, including changes in speed and direction (e.g., [V] “… used a wheel and axle to move and to change directions you push it forward and backwards.”; [P] My Reflections [3]: “I yoused [used] a wheel and axle to make it go fast …”).
- The student provides a clear explanation of how the toy could be used to improve fine-motor skills (e.g., [P] My Reflections [4]: “They have to push the door open and shut.”).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student describes in detail similarities between the model and mechanisms and simple machines in real-life objects (e.g., [V] “… a car uses a wheel and axle and hinge.”; [P] My Reflections [6]: “We use … levers for seesaws and pullys to pull stuf up.”).

Comments/Next Steps
- The student demonstrates a good understanding of the design process, including testing and modifying.
- The student could provide more detail in written and oral responses.
- The student should try to supply relevant reasons to support the choice of product design.
- The student should correct spelling errors by referring to resources such as word lists, wall charts, and a personal dictionary.
Making a Toy  Level 4, Sample 1

A

What I Need To Do

1. My job is to:
   Build and design a toy for a child to improve his/her fine motor skills. My project needs more than one simple machine such as: lever, wedge, inclined plane, screw, wheel, axle, pulley. It also needs to move.
   I need to: Go back to correct a mistake if I make one in my journal. In my journal I have to explain my simple machine toy.

B

My Design Sketches

Design Sketch 1

Dump truck

Design Sketch 2

Car

Design Sketch 3

Wheel, lever, axle, inclined plane, string, pulley
My Working Plan
Label Your Work:

Castle

cardboard
pin cloth
string

My List of Materials

Axe wheels
anchors

two clothes pins

construction paper

wood

toilet paper rolls

washers

paint
My Step-By-Step Procedures
(Remember to number your steps)
1. Pick out materials (no line)
2. Get box, glue box to other box
   2a. cut slits in paper towel rolls
3. Glue paper towel rolls to top box
4. Make inclined plane on top box
   next to the left hand side
5. Glue clothespins to paper towel rolls
6. Make wheels and glue axles
7. Clip wheels to clothespins
8. Punch 3 holes in a roll
9. Wrap string around wood
10. Put string through middle hole
   holes.
11. Put wood through left and right
    holes.
12. Pull string and tie to large
    piece of cardboard.

My Reflections
1. What simple machines did you use, and how did you connect any moving parts?
   My simple machines were: pulleys, lever, axle, wheels, inclined plane
to connect I used: knots, tape, and glue.
2. What changes did you make to improve your toy?
   I didn’t use a flag and/or make holders at the top. I didn’t use a pin or anchors either.
3. How did you use simple machines to make something move faster and/or change direction?
   I used an inclined plane with wheels and axles.
4. How can your toy be used to help a young child to improve his or her fine motor skills?

My toy uses pinching and turning skills to improve their fine motor skills.

5. Identify and describe an object in the outside world that uses one of the same simple machines you used in your model to create movement.

A hill uses an inclined plane. It is easier to go down than up. It is steep to make an object go down faster. A hill can come in three types: bumpy, smooth, grassy.

6. What are other ways we use simple machines to make our lives more enjoyable?

- A slide uses an inclined plane
- A skateboard uses wheels and axle
- A flashlight uses a screw
- A toy crane uses a pulley

These are all simple machines and make our life more enjoyable.
Teacher’s Notes

Understanding of Basic Concepts
- The student demonstrates thorough understanding of how mechanisms enable movement and changes in direction (e.g., [P] My Reflections [5]: “A hill uses an inclined plane.... It is steep to make an object go down faster.”).

Design Skills
- The student precisely describes the challenge of designing and building a model of a toy incorporating simple machines (e.g., [P] What I Need To Do [1]: provides numerous examples of simple machines that can be used: “My project needs more than one simple machine such as: lever, wedge, inclined plane, screw, wheel, axle, pulley.”).
- The student lists in a detailed manner all or almost all of the steps needed to execute the plan (e.g., [P] My Step-By-Step Procedures: lists twelve steps that include complex details such as the direction of placement of components).
- The student creates a detailed, fully labelled plan (e.g., [P] My Design Sketches [3] and My Working Plan: shows “wheels, axles, lever, string, pulley, inclined plane”).
- The student makes appropriate, detailed modifications to the plan as needed, giving reasons for the modifications (e.g., [P] My Working Plan: increases the angle of the inclined plane, records the change on the plan, and adds the word “bigger” to identify the change made).
- The student creates a model that closely resembles the plan, including all, or almost all, recorded modifications (e.g., [V] uses the levers, the “bigger” inclined plane, and the pulley in the model).
- The student makes insightful improvements to the model (e.g., [V] explains that the pin was removed to ensure safety for a young child and that it was consequently necessary to change the location of the pulley).

Communication of Required Knowledge
- The student makes extensive use of appropriate science and technology vocabulary to describe simple machines and their mechanisms (e.g., [P] My Reflections [6]: applies terms to devices in the outside world: “A slide uses an inclined plane. A skateboard uses wheels and axle. A flashlight uses a screw. A toy crane uses a pulley.”).
- The student explains precisely how the mechanism or simple machine is used to create movement, including changes in speed and direction (e.g., [P] My Reflections [5]: “A hill uses an inclined plane. It is easier to go down than up. It is steep to make an object go down faster.”).
- The student provides a complex and detailed explanation of how the toy could be used to improve fine-motor skills (e.g., [P] My Reflections [4]: “My toy uses pinching and turning skills to improve their fine motor skills.”).

Relating of Science and Technology to Each Other and to the World Outside the School
- The student describes in rich detail similarities between the model and mechanisms and simple machines in real-life objects (e.g., [P] My Reflections [5]: “A hill uses an inclined plane ...”; [6]: “A skateboard uses wheels and axle”).

Comments/Next Steps
- The student displays a high level of competence and knowledge in both oral and written responses.
- The student could include further complex details in labelling the drawing for the final plan.
What I Need To Do

1. My job is to:

Make a toy for young children to help them develop fine motor skills. The toy has to have moving parts and at least two simple machines.

I need to:

Design my toy, draw it, make it, test it and modify it if it doesn’t work.
My Working Plan
Label Your Work:

I chose this design because it was the neatest and looked the best.

My toy has six moving parts. The moving parts are the doors, the wheels, the axel and the trunk. The wheels and axels move because they are hinged and the rest move.

My List of Materials

1. Wooden wheels
2. Bladwels
3. Card board
4. Pens of wood
5. Toilet paper role
6. Film container
7. Straws
8. Saw
9. Glue gun
10. Cloth's pegs
My Step-By-Step Procedures
(Remember to number your steps)
1. First I did a sketch then
listed my materials.
2. After I sanded my wheels
and cut my dowels.
3. Then I cut my wood and
 glued the wood around the outside
of my base.
4. Then I glued my clothes pegs
to my base.
5. Then I cut popsicle sticks
to fit around my base
and kept doing that until
I got it the height I wanted it.
6. After I put card board around
my frame and made a hinge by
cutting straws to go on my
door and putting a dowel inside
then I did the same on the top and decorated it.

My Reflections
1. What simple machines did you use, and how did you connect
any moving parts?
   - I used wheels and axels, a ramp
     and a hinge. I connected the wheels
     by gluing clothes pegs to the
     bottom of my base and put my axels
     them and put my wheels on them.
     I made a truck instead of
     a car because I couldn't make
     the round part.

2. What changes did you make to improve your toy?
   - I made a truck instead of
     a car because you can
     roll it instead of pushing it.

3. How did you use simple machines to make something move
faster and/or change direction?
   - The wheels make my toy move
     faster because you can
     roll it instead of pushing it.
4. How can your toy be used to help a young child to improve his or her fine motor skills?

They have to use their fingers to open some doors and hold a little ball.

5. Identify and describe an object in the outside world that uses one of the same simple machines you used in your model to create movement.

A door uses a hinge. It usually is flat and wooden. A hinge makes side-to-side movement.

6. What are other ways we use simple machines to make our lives more enjoyable?

If we didn’t have a hinge, we wouldn’t be able to open and close doors. If we didn’t have wheels and axles, our cars wouldn’t move. If we didn’t have ramps, people in wheelchairs wouldn’t be able to get into some buildings.
Teacher’s Notes

Understanding of Basic Concepts
– The student demonstrates thorough understanding of how mechanisms enable movement and changes in direction (e.g., [P] My Reflections [3]: “The wheels make my toy move faster because you can roll it instead of pushing it.”; [5]: “A door uses a hinge it usealy is flat and wooden and a hinge makes side to side movement.”).

Design Skills
– The student precisely describes the challenge of designing and building a model of a toy incorporating simple machines (e.g., [P] What I Need To Do [2]: lists steps in the design process such as “draw, make, test, modify”).
– The student lists in a detailed manner all or almost all of the steps needed to execute the plan (e.g., [P] My Step-By-Step Procedures: lists six detailed steps, such as [6]: “After I put card bord around my frame and made a hinge by cutting straws to go on my door and putting a dowel inside then I did the same on the top and decorated it.”).
– The student creates a detailed, fully labelled plan (e.g., [P] My Working Plan: identifies “wheel, axle, hinge” on the diagram and itemizes the moving parts in more detail in a written statement.).
– The student makes appropriate, detailed modifications to the plan as needed, giving reasons for the modifications (e.g., [P] My Reflections [2]: “I made a truck insted of a car because I couldn’t make the rounded part.”).
– The student creates a model that closely resembles the plan, including all or almost all recorded modifications (e.g., [V] includes all the simple machines and mechanisms listed in the plan, and makes a truck rather than a car).
– The student makes insightful improvements to the model (e.g., [V] “... I decided to put a hinge on top ... put the wheels on and attached little squares of cardboard so they wouldn’t fall off ... I made hinges by cutting two pieces of big straw and putting a little piece of wood through. Then I glued the straws to the cardboard and made it move.”).

Communication of Required Knowledge
– The student makes extensive use of appropriate science and technology vocabulary to describe simple machines and their mechanisms (e.g., [P] My Working Plan: “… weels and axels move because they are round …”; My Reflections [5]: “… a hinge makes side to side movment.”); [V] distinguishes the screw as a simple machine and explains its function).
– The student explains precisely how the mechanism or simple machine is used to create movement, including changes in speed and direction (e.g., [P] My Reflections [3]: “… my toy move faster because you can roll it insted of pushing it.”).
– The student provides a complex and detailed explanation of how the toy could be used to improve fine-motor skills (e.g., [V] identifies and demonstrates several different fine-motor tasks to develop skills: “… pinching, grabbing, turning …”).

Relating of Science and Technology to Each Other and to the World Outside the School
– The student describes in rich detail similarities between the model and mechanisms and simple machines in real-life objects (e.g., [P] My Reflections [6]: “… If we didn’t have ramps people in wheel chairs wouldn’t be able to get into some buildings.”).

Comments/Next Steps
– The student demonstrates thorough understanding of the concepts and the design process.
– The student should be encouraged to consider different alternatives when beginning the design process, rather than producing three similar versions of one type of toy.
Teacher Package

Science and Technology Exemplar Task
Grade 2

Teacher Package

Title: Making a Toy

Time Requirements: 245 minutes (over several class periods)

Introductory activities
• Pre-task 1: 15 minutes
• Pre-task 2: 15 minutes
• Pre-task 3: 30 minutes
• Pre-task 4: 20 minutes
• Pre-task 5: 30 minutes

Exemplar task
• Part 1: 40 minutes
• Part 2: 80 minutes
• Part 3: 15 minutes

The student work is to be completed in its entirety at school.

Description of the Task
Students will build a toy for a young child incorporating mechanisms (systems of moving parts) made up of one or more simple machines (e.g., a wheel and axle, an inclined plane, a lever).

Students will complete the worksheets provided in this package and submit selected worksheets for assessment. They will also be asked to respond orally to questions posed by the teacher, and these interviews will be videotaped. The videotapes will also be used for assessment purposes.

Scenario and Instructions for Students
Students should be presented with the following scenario and set of instructions. Teachers should explain the task using vocabulary and details appropriate for Grade 2 students:

You will be sharing your design plan, a model of the toy, and an explanation of how the simple machines in the toy will help young children develop fine-motor skills. Your presentation will be part of an exhibit of toy designs that representatives of several big toy manufacturers will attend to find new designs that they can buy and manufacture.

Your task is to develop a toy that:
• contains a system of moving parts (a mechanism);
• includes more than one simple machine (e.g., a wheel and axle, a lever, an inclined plane);
• is no taller, wider, or longer than a letter-sized piece of paper.

You must explain how your model toy works, including how its parts move, which simple machines were used, and how the simple machines will help children develop fine-motor skills.

Curriculum Expectations Addressed in the Task
Note that the codes that follow the expectations relate to the Ministry of Education's Curriculum Unit Planner (CD-ROM).

Students will:
1. describe the position and movement of objects, and demonstrate an understanding of how simple mechanisms enable an object to move (2s66);
2. design and make simple mechanisms, and investigate their characteristics (2s67);
3. recognize that different mechanisms and systems move in different ways, and that the different types of movement determine the design and the method of production of these mechanisms and systems (2s68);
4. ask questions about and identify needs or problems related to structures and mechanisms, and explore possible answers and solutions (2s74);
5. plan investigations to answer some of these questions or solve some of these problems, and describe the steps involved (2s75);
6. communicate the procedures and results of investigations and explorations for specific purposes, using drawings, demonstrations, and oral and written descriptions (e.g., draw a sketch of an object they plan to make and another sketch of the object after it is made; tell the class the procedures they followed in making a vehicle or a container with a hinged lid) (2s78).
“Big Ideas”

Based on the expectations being assessed, the following “big ideas” have been identified for this task:

- Mechanisms can consist of one or more simple machines and can change the direction and speed of movement of an object.
- Simple machines make movement easier.
- Simple machines make life more enjoyable.

Teacher Instructions

Prior Knowledge and Skills Required

Before attempting the task, students should have had experience with the following:

- attaching axles and wheels (see Pre-task 5)
- making hinges and other simple linkages (e.g., with split-pin fasteners – see Pre-tasks 3 and 4)
- recognizing different simple machines
- using a design-process model (e.g., define the problem, brainstorm solutions, plan, make, modify, reflect – see Pre-task 2), including writing up a step-by-step procedure
- connecting parts to create movement in different ways and directions

The Rubric

The rubric* provided with this exemplar task is to be used to assess students' work. The rubric is based on the achievement levels outlined on page 13 of The Ontario Curriculum, Grades 1-8: Science and Technology, 1998.

Introduce the task-specific rubric to students at least one day before administering the task. Copy the rubric for students or create a transparency to use with the class. You may find it useful to rephrase the rubric for students to help them in their work.

Review the elements of the rubric with students to ensure that they understand the criteria and the descriptions for achievement at each level. Allow ample class time for a thorough reading and discussion of the assessment criteria outlined in the rubric.

Accommodations

Accommodations that are normally provided in the regular classroom for students with special needs should be provided in the administration of the exemplar task.

Classroom Set-up

Set up the classroom as you normally would for a science and technology task, allowing enough space for students to build their models.

Materials Needed

- various commonly found materials (from home or school), such as toilet-paper rolls, cereal boxes, cardboard, film or pill canisters, popsicle sticks, paper plates, different sizes of plastic containers, plastic straws, string
- teacher-provided materials, such as scissors, paper punch, glue, low-temperature glue guns, cardboard wheels, wooden dowels, pipe cleaners, straws, paper fasteners, tape, elastics

Safety Considerations

Remind students to work and build safely, especially if they plan to use a low-temperature glue gun. Students need to exercise caution, work in small groups of four to six, and have an adult supervisor whenever they use cutting, drilling, or gluing tools. Specific safety rules or reminders should be posted and taught, including the following:

- Keep tools below waist level.
- Wear goggles.
- Work slowly.
- Stay on task.

Task Instructions

Introductory Activities

The pre-tasks are designed to review and reinforce the skills and concepts that students will be using in the exemplar task.

The purpose of Pre-task 1 is to introduce the exemplar task, review the elements of the rubric, and allow time for students to ask questions for clarification. The purpose of Pre-task 2 is to review the design process with students. The purpose of Pre-tasks 3, 4, and 5 is to ensure that students have experience with various types of mechanisms and basic simple machines. If students already have this knowledge and these skills, they do not need to complete these pre-tasks in their entirety (so that less time will be required for this set of tasks); in such a case, the activities should be used to remind students of things they already know and are able to do related to mechanisms and simple machines.

Pre-task 1: Introduction of the Scenario and Instructions for Students

1. Present the scenario to the class, explaining what fine-motor skills are. Then discuss the scenario, making sure the students understand what it is about.
2. Have students recall different types of mechanisms (systems of moving parts) in their environment that might be useful for the scenario (e.g., a hinged door, a spinning wheel, a cart with a levered handle, something that rolls or rocks).
3. Review different types of simple machines, such as a wheel and axle (including pulley and gear), an inclined plane (including screw and wedge), and a lever. You may wish to post examples of simple machines for student reference.

*The rubric is reproduced on pages 60–61 of this document.
4. Review definitions of machine – an instrument designed to direct or change the application of force or motion – and mechanism – a system of moving parts that includes one or more simple machines.

5. Brainstorm with students the various types of toys that could be used to improve young children’s fine-motor skills.

Note: Consider bringing in or having students bring in for discussion purposes various “baby toys” that are designed to develop fine-motor skills.

Pre-task 2: Reviewing the Design Process
Review a design process, highlighting the following areas in particular:
• identify the problem;
• brainstorm possible solutions;
• create design sketches;
• develop a working plan;
• list materials;
• plan step-by-step procedures;
• make modifications to improve the design or model;
• reflect.

Remind students that whenever they make modifications to their models, they also need to revise their plans (e.g., by making the changes on the original designs using coloured pencil crayons and then underlining the changes).

Note: You may wish to post the design process (define the problem, brainstorm solutions, make sketches, develop a plan, list materials, outline steps, modify, reflect) in your classroom for student reference.

Pre-task 3: Making Hopping Hinges
This pre-task helps students review how to assemble a simple hinge (a mechanism that is a type of lever) and add an additional mechanism that enables it to move faster and change direction.

1. Give each student two pieces of corrugated cardboard or heavy Bristol board, each 10 cm x 10 cm square, one medium-sized elastic band, and two pieces of masking tape.
   Note: The corrugated cardboard is easier to use. If the Bristol board is too light, it will buckle.

2. Have students connect (hinge) the two squares by placing them side by side on the desk with a small space (approximately 4 mm) in between. (Students may need several tries to determine the best distance.) Ask them to tape the two squares together (see the accompanying diagram).

3. Have students puncture a small hole (using a pencil) towards the middle of the outer edge of each square opposite the tape hinge (see the diagram).

4. Ask students to cut their elastics and knot one end. (Teachers may find it saves time if the elastics are pre-cut with one end already knotted for students.) Have students thread the elastic through the hole of one square, with the knot to the outside, and continue to thread it through the hole in the other square, knotting the other end after it goes through the hole.

5. Have students test their hopping hinges by folding the squares, stretching the elastic until the two knots touch, then releasing, the squares. The hinge should rapidly “hop” upwards with the force of the energy from releasing the stretched elastic band.

6. If the hinge did not “hop”, students make changes, including changes to the distance between the two squares or the places where the elastic is attached. (Sometimes a drop of low-temperature glue applied to the elastic knot is needed to hold the elastic in place.)

![Finished hopping hinge diagram]
Pre-task 4: Making Levered Arms
This pre-task helps students review how to assemble a simple lever.

1. Give each student two pieces of 21.5 cm x 28 cm (8 1/2 in. x 11 in.) construction paper, another piece of coloured construction paper large enough for the student to trace his or her hand on it, a paper fastener, and a piece of tape.
2. Have each student fold each of the two pieces of construction paper in half, lengthwise, twice. Students punch a hole into one end of each folded piece (see the accompanying diagram) and attach the paper fastener through the two holes to create the levered arm.
3. Ask students to attach their hands to the end of their “arms”.
4. Have students test bending their levered arms.

Pre-task 5: Making Wheels and Axles
This pre-task helps students investigate various ways to create wheels and axles.

1. Using 1 cm x 1 cm wooden frames (or a piece of cardboard or coroplast, or a boxboard box) as a base, demonstrate various ways to attach wheels and axles, as suggested below:
   a) Drill four small holes in a wooden frame (i.e., where wheels would go) and screw in “screw eyes” (small screws with circular openings) to hold two wooden dowels or skewers (whose sharp ends you have sawed or cut off) parallel to the ends of the frame to form axles. Glue cardboard or wooden wheels of any reasonable size to the wooden dowel or skewer axles, which must fit inside the “screw eyes”.
   b) Glue four clothes pegs (with their openings enlarged by small pieces of folded paper, if necessary) on the wooden frame, cardboard, coroplast, or boxboard to hold dowel axles (see accompanying diagram).
   c) Glue four cardboard triangles (approximately 2–3 cm high), with holes drilled in the middle of them, to the inside edge of the wooden frame, or the outer edge of the cardboard, coroplast, or boxboard box, to hold the dowel axles.
   d) Drill holes in the sides of a wooden frame to hold the dowel axles.
   e) Cut paper or plastic straws into four pieces. Glue two pieces at each end of the wooden frame, cardboard, coroplast, or boxboard box to hold the dowel axles.
2. Have students then practise some of the techniques demonstrated with their own materials (e.g., a shoebox brought from home), either individually or in small groups.

Exemplar Task
The student worksheets “What I Need To Do”, “My Design Sketches”, “My Working Plan”, “My List of Materials”, “My Step-By-Step Procedures”, and “My Reflections” (see Appendices 1 to 6) are to be submitted for marking.

Part 1: Planning
1. Reread the scenario to the class and show students the materials that are available for them to use.
2. Have students complete the “What I Need To Do” worksheet (see Appendix 1). They will be clarifying the “problem” to solve or the design challenge when they complete “My job is to” and the components of the task (plan, make a model, give a presentation/explanation when they complete “I need to”).
3. Have students brainstorm as a class or in small groups possible “solutions” to the design challenge as identified in the scenario (i.e., design and build a toy).
4. Ask each student to use these brainstormed ideas, or others they think of themselves, and then choose three possible “solutions”.

5. Have each student draw three design sketches on the worksheet “My Design Sketches” (see Appendix 2) representing what the student might create to meet the design challenge.

6. Have each student choose one of his or her sketches to use to design and build the finished model and then create a labelled, detailed plan of the design using the worksheet “My Working Plan” (see Appendix 3). Ask students to consider what kind of movement their toys will have, including for changes in direction and speed (e.g., pushing, pulling, squeezing, turning), and to state why they chose their particular design.

Part 2: Designing and Building

1. Ask students to list the materials needed to complete their models on the worksheet “My List of Materials” (see Appendix 4).

2. Have students use the design process, referred to in Pre-task 2, to write a step-by-step procedure of how they will design and build their models, using the worksheet “My Step-By-Step Procedures” (see Appendix 5).

3. Now have students build the models they have designed.

4. When their models are completed, have students test their models to see if they move as intended and then make any necessary changes to the models. Ask students to make changes to their plans as well (as drawn on the “My Working Plan” worksheet), using coloured pencil crayons, to represent the changes made to their models.

Note: When the exemplar task is complete, as a class or in small groups, walk students through the process of underlining all of their coloured pencil crayon changes before submitting the work for marking. Underlining is needed because pencil crayon marks will not show up in the published version.

Part 3: Reflecting and Communicating (to be videotaped)

Have students reflect on their learning by responding to the questions in “My Reflections” (see Appendix 6).

Note: The questions in Appendix 6 were used to prompt student responses in the videotaped interviews. Students were also asked to record their reflections in words or pictures on the Appendix 6 worksheets.

Appendix 1

What I Need To Do

My job is to:

________________________________________________________

________________________________________________________

________________________________________________________

I need to:

________________________________________________________

________________________________________________________

________________________________________________________
Appendix 2

My Design Sketches

Design Sketch 1

Design Sketch 2

Design Sketch 3

Appendix 3

My Working Plan
Label Your Work
Appendix 4

My List of Materials

Appendix 5

My Step-By-Step Procedures

(Remember to number your steps)
### Appendix 6: Videotaping Questions

**My Reflections**

1. What simple machines did you use, and how did you connect any moving parts?

2. What changes did you make to improve your toy?

3. How did you use simple machines to make something move faster and/or change direction?

4. How can your toy be used to help a young child to improve his or her fine-motor skills?

5. Identify and describe an object in the outside world that uses one of the same simple machines you used in your model to create movement.

6. What are other ways we use simple machines to make our lives more enjoyable?
The Ministry of Education wishes to acknowledge the contribution of the many individuals, groups, and organizations that participated in the development and refinement of this resource document.