# How do the properties of materials affect their use?

**Science and technology Early Stage 1 learning sequence Material world**

**Learning sequence description**

Students investigate how the properties of materials determine their use in design solutions while introducing students to the material sciences and design thinking. Student investigate, plan and design a chair for their favourite teddy or doll to sit next to them while they are completing their school work at home. There is an optional ‘maker hour’ for students to produce, implement, test and evaluate their favourite toy’s chair.

## Syllabus outcomes and content

**STe-1WS-S** – observes, questions and collects data to communicate ideas

Students:

* make observations using senses through participation in guided scientific investigations
* record observations using drawings, simple digital recording methods, oral descriptions and/or simple visual representations
* represent ideas based on results of investigations.

**STe-2DP-T** – develops solutions to an identified need

Students:

* generate and express ideas for design possibilities
* explore and manipulate materials to discover possibilities of their uses
* produce designed solutions through iteration
* sequence steps to solve a problem with guidance
* evaluate success of design ideas, processes or solutions according to personal preferences and/or predetermined criteria
* consider and discuss the impact of a design solution within an environment.

**STe-4MW-ST** – identifies that objects are made of materials that have observable properties

Students:

* identify and describe how the properties of different materials suit their design purpose
* plan, design and evaluate a product considering an identified need or opportunity.

[Science and Technology K-6 Syllabus](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/science/science-and-technology-k-6-new-syllabushttps%3A/educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/science/science-and-technology-k-6-new-syllabus) © 2017 NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales.

# Lesson 1 – Identify the properties of materials and their design purpose

Students are learning to:

* describe the properties of familiar objects
* identify and group the materials of familiar objects
* investigate materials and their design purpose.

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| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 1.1 | Discuss and revise the properties of materials with students. Emphasise properties are descriptions that tell us how a material looks or feels. Discuss how using our hands and fingertips are the best ways to use our sense of touch to feel materials. Students use the hand shape activity 1.1 in the student workbook to investigate 5 different materials which have the properties of bumpy, smooth, rough, hard and soft. Students find and glue a small sample of each material onto the fingertip space. |  | Student workbook activity 1.1Title: How do materials feel on our fingertips? |
| 1.2 | Discuss and explain with students that materials are made into things we can touch. These are called objects. Objects have a job to do, or a purpose, and they need to be made from materials that can do that job. Watch and sing the [‘Materials and their properties song’.](https://safeYouTube.net/w/FpfF)Students go on a scavenger hunt around their home or school to find familiar objects which are made from the materials of wool, plastic, metal and fabric. They record their answers in the student workbook activity1.2. |  | [‘Materials and their properties song’.](https://safeYouTube.net/w/FpfF)Online videoStudent workbook activity 1.2Title: Material scavenger hunt |
| 1.3 | Ask students some funny questions about materials, objects and their purpose. For example – Would you use paper to make your shoes? Would spaghetti make a great belt? Do you own a metal jacket? Is your computer made from wool? Why not? Have student give reasons for their answers. Students investigate why objects are made with certain materials by completing the cut and paste activity 1.3 in the student workbook. |  | Student workbook activity 1.3Title: Match the reason why |
| 1.4 | Read and discuss the story [‘Goldilocks and the three bears’](https://safeYouTube.net/w/UkfF) with students. Focus on the part of this narrative about the three bear’s chairs and how they all look different and have different properties because of their materials. Students investigate all the types of chairs in their own house, backyard or school. Using the chair data table on worksheet 1.4, students choose 5 different types of chair and draw pictures or take photos of them. They investigate and name the purpose and materials for each chair. For example, a lounge chair, made for watching television or reading, made from leather and wood. |  | [‘Goldilocks and the three bears’](https://safeYouTube.net/w/UkfF)Online narrative- fairy taleStudent workbook activity 1.4Title: Chairs in my house |
| 1.5 | Students investigate some examples of magnificent and unusual chairs and seats. These chairs use different materials and have different properties, but they also look very different and have been made for different purposes such as art or for meetings. Students make a collage of some magnificent, interesting or unusual chairs they can find in magazines, catalogues or online. Use the student workbook activity 1.5. |  | Student workbook activity 1.5Title: Magnificent chairs and seats |
| 1.4 | **Opportunity for monitoring student learning**Chairs in my house activity 1.4 – practical activityStudents investigate the types of chairs in their house or classroom. They collect data for 5 chairs in the form of labelled pictures or drawings and then identify the purpose and materials for each chair.**What to look for*** investigates and collects familiar chair data correctly
* identifies a purpose for each chair chosen
* identifies the materials for each chair chosen.
 |  | Student workbook activity 1.4Title: Chairs in my house |

# Lesson 2 – Plan, design and evaluate a product for a need

Students are learning to:

* plan and design a product for a need – a chair for their favourite teddy or doll.
* investigate materials suitable for a purpose
* meet set task criteria
* predict if the design will work and why

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| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 2.1 | Students plan and design a chair for their favourite toy to sit next to them on their desk while they are doing their school work at home. The criteria for the task is:1. The chair is big enough for the toy to fit.
2. The toy cannot touch the desk when it is sitting in the chair.
3. The chair must look magnificent, different or unusual.

Students consider the household materials they can use in their design by completing the materials hunt in the student workbook, activity 2.1, assisted by an adult. |  | Student workbook activity 2.1Title: Materials for my toy’s chair |
| 2.2 | Using the planning template in activity 2.2, students draw the chair, with their toy sitting in it, in the centre space. Around the drawing students label and identify the materials used for the different parts of the chair, as well consider how the materials will hold together.  |  | Student workbook activity 2.2Title: Time to plan |
| 2.3 | Students answer the yes/no questions about their design plan in the student workbook activity 2.3. This helps students predict if their design meets the set criteria of purpose, material selection and aesthetics and if they are ready to build. |  | Student workbook activity 2.3Title: Questioning and predicting |
| 2.3 | **Opportunity for monitoring student learning**Time to plan activity 2.2 – practical activityQuestioning and predicting activity 2.3 – practical activityStudents use the information and knowledge they have gathered about properties, materials and their purpose to design a chair for their favourite teddy or doll. The plan identifies and represents chosen materials and interesting aesthetics for the chair design, while considering techniques to hold the materials together. Students question and predict if the following criteria has been met:1. The chair is big enough for the toy to fit
2. The toy cannot touch the desk when it is sitting in the chair
3. The chair must look magnificent, different or unusual

 **What to look for*** a completed, clear and detailed drawing of the student’s favourite teddy or doll sitting in the chair
* descriptive details of the plan organised by labels, arrows, words and ideas linking the drawing to materials, aesthetics and fastenings
* prediction of the success of the student’s plan through the consideration of criteria questions.
 |  | Student workbook activity 2.2Title: Time to planStudent workbook activity 2.3Title: Questioning and predicting |

# Lesson 3 – Optional maker hour

Students are learning to:

* produce and implement a design that has a purpose – a chair for their favourite teddy or doll
* test and evaluate the design
* communicate and share results about the design success.

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| Item | Learning experience | Differentiation strategies and/or adjustments | Resources |
| 3.1 | Students use the material list and their plan to begin making the chair for their favourite teddy or doll. |  | Student workbook activity 2.1Title: Materials for my toy’s chairStudent workbook activity 2.2Title: Time to plan |
| 3.2 | After the chair has been completed, students test if the chair can fit their toy and if the chair’s materials can successfully hold their toy from the desk surface without it collapsing. Students reflect on the materials they chose and consider and analyse if these materials have met their purpose. Students also reflect on the aesthetics of the chair to consider and analyse if the product looks magnificent, interesting or different. Students record their reflections in the student workbook by answering yes/no and short answer question prompts. |  | Student workbook activity 3.2Title: Testing and evaluating |
| 3.3 | Students take a picture or video of their toy sitting on the chair and send it to their teacher as part of an online student/teacher conference. Alternatively, or in addition, students can take their chair and toy into school to share their plan and reflections with their teacher and classmates. A picture can be taken at school of their final product and glued into their student workbook. Teachers have a space in the booklet for written feedback after the verbal conference. |  | Student workbook activity 3.3Title: Communicating and sharing |
| 3.3 | **Opportunity for monitoring student learning**Communicating and sharing activity 3.3 – presentation and/or conferenceStudents present their completed product to their teacher in an online conference and/or during a news item, or small group share, with their teacher and class. Students verbally identify, describe and discuss details of the production process and their reflections.**What to look for*** presents a completed chair for their favourite teddy or doll
* describes the making and testing process with detail
* justifies what materials and techniques worked well, what was changed or altered from the plan and why.
 |  | Student workbook activity 3.2Title: Testing and evaluatingStudent workbook activity 3.3Title: Communicating and sharing |

**Reflection and evaluation**

These simple questions may help you reflect on your students’ learning and plan for next steps.

What worked well and why?

What didn’t work and why?

What might I do differently next time?

What are the next steps for student learning based on the evidence gathered?