# APPROACHES TO MAKER EDUCATION

Maker Ed

This resource offers three approaches to integrating making and learning. Each approach aids you in designing for different types of learning, and together the approaches can support you in planning robust sequences or progressions of learning that build on one another—all while activating the multi-faceted potential of making.

## WHAT IS MAKER EDUCATION?

We define making simply and openly: Making is hands-on and learner-driven.

- **Hands-on**: It involves encounters with physical, digital, or virtual tools and materials. This open definition allows you to include making in many varieties of media and activities (such as gardening, cooking, and physical computing).
- **Learner-driven**: Learners define and drive their own learning and do so in a variety of ways. They make meaning out of their experience and learning, they determine their path into learning, and they set their own goals along their path. Even in formal education environments, where educators set long-term learning goals for their learners, learners nevertheless have the opportunity to figure things out on their own.

## APPROACHES AND GOALS

Making can support learning in many ways. Here we focus on three of the most common. The goals you set for your learners can relate to academic content knowledge (e.g., ratios in math), a particular set of skills (e.g., pattern recognition or soldering), or a mindset (e.g., problem solving or critical thinking). Making has the power to support all of these types of learning simultaneously, in a single activity, whether that is a lesson in school, a drop-in experience in a museum, or a self-directed learning module online.

### TINKER TO DISCOVER

Learners develop an initial understanding through tinkering and making. Learners work toward short-term learning goals and then explore, make, and own their discoveries.

### MAKE TO LEARN

Learners build on, deepen, or cement understanding through making.

### APPLICATION PROJECT

Learners apply their understanding in order to make a specific project, deepening and showcasing their knowledge.

# APPROACHES TO ACTIVITY DESIGN

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Every activity has two dimensions: what you plan and structure in advance and how you facilitate it in the moment. Each approach meets the key considerations and elements of both dimensions (explored below) in a different way.

## COLLABORATION AND GROUP WORK

Learning is a social activity and knowledge is co-constructed by learners together. For this reason and others, the three approaches are most effective when learners have the opportunity to make, think, and reflect together. Group size and composition can vary dramatically within and across activities, but whatever the formation, group work allows learners to draw from the experience and expertise of others, all while sharpening soft skills related to communication, collaboration, and critical thinking.

Whether you intend your learners to tinker to discover, make to learn, or apply understanding in order to make, be sure to consider the following set of questions when planning for group work.

- How will I monitor group dynamics?
- What strategies will I use to intervene when potentially harmful or problematic actions occur (e.g., inequitable access to tools and materials)?
- How will I support my learners to set norms of collaboration?

**Structure and Scaffolds**

While planning any activity, you will set short- and long-term learning goals and create structures, scaffolds, and supports to guide your learners toward those goals. The approaches aid you in determining who sets learning goals and when, how you prompt or invite your learners into an activity, how you deliver instructions and/or tasks (whether written, verbal, or both), and what scaffolds you supply.

**Tools and Materials of Making**

The variety of tools and materials of making is virtually endless! Activities as diverse as sewing, woodworking, cooking, and physical computing all offer learners opportunities to explore, discover, create, and learn in a hands-on, minds-on way. Whatever the form of making you choose, curate tools and materials in alignment with the learning you hope to see.

**Looking for Signs of Learning**

The interactive and hands-on nature of making leaves behind many traces of learning. How will you and/or your learners capture and record those traces of learning and how will you and/or your learners reflect on and make meaning out of their experience? Each approach allows different opportunities to document and assess learning.

**Progressions and Sequences of Learning**

All learning experiences build on, interact with, and integrate with others. Whatever individual activity or lesson you're designing, think about where it falls in a sequence or progression of learning. The approaches can help you consider and refine what you hope and expect your learners will bring with them into your activity or lesson, as well as where you want your learners to go next.

**Facilitation**

As your learners make and learn, you will facilitate their learning in the moment, by circulating the room, observing learners in activity, and making interventions. All of the approaches share a common framework for facilitating learning experiences that addresses: how you prompt or guide your learners in an activity, when and how to make interventions in order to refocus learning and address misconceptions, how you probe for and assess understanding in the moment, and how you monitor your learners' affect (e.g., frustration levels).

# TINKER TO DISCOVER

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Learners develop initial understanding through hands-on exploration. While the educator generally has long-term objectives for what students will come to understand, short-term outcomes and paths may be different for individuals or groups of learners. Educators support learners by defining the materials students will tinker with, but how students use the materials, and therefore what they discover, is open. As learners make discoveries and share them with the group, they build understanding of the concepts.

## STRUCTURES AND SCAFFOLDS

- Approach invites open-ended exploration of specific materials and/or phenomena
- Learners set in-the-moment goals
- Educator defines long-term learning goals
- Learners decide how they will use available tools and materials
- Learners make their own meaning out of the experience
- Learners follow different paths
- Learners reflect on their process as well as their learning

## PROGRESSIONS AND SEQUENCES OF LEARNING

- Introduces new content
- Learners build on understanding through ongoing explanation

## TOOLS AND MATERIALS OF MAKING

- Curate tools and materials
- Limit tools and materials to help focus discoveries
- Offer a diversity of materials to multiply pathways of discovery

## LOOKING FOR SIGNS OF LEARNING

- Support your learners to document their own discoveries (e.g., ask them to write down and share with their peers)
- Use discoveries your learners make to inform where you will go next with them
- Learners reflect on learning goals

## FACILITATION

**When you circulate around the room during an activity:**

- Allow for a variety of outcomes and discoveries
- Ask open-ended questions
- Celebrate curiosity and discovery
- Don't correct misconceptions in the moment
- Offer alternative prompts or new definitions that allow learners to uncover or contradict misconceptions
- Don't front-load vocabulary

**As you probe for your learners' understanding:**

- Have learners document discoveries for everyone to see
- Ask learners to explain their thinking (e.g., "What makes you say that?")

# MAKE TO LEARN

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Learners build, deepen, or cement understanding by making. The educator defines the learning goals and provides structure, scaffolds, and support for learners.

## STRUCTURES AND SCAFFOLDS

- Educator defines short- and long-term learning goals
- Learners make meaning through experience
- Educator creates structure by setting a path, defining tasks, and asking questions to scaffold learning
- Educator gives explicit instructions (verbal and/or written)
- Learners reflect on content, skill, and mindset development

## PROGRESSIONS AND SEQUENCES OF LEARNING

- Cements understanding of newly introduced or previously explored content
- Builds on or focuses learning after *Tinker to Discover*

## TOOLS AND MATERIALS OF MAKING

- Curate tools and materials to meet learning outcome
- Offer choice in materials to promote creativity and self-expression

## LOOKING FOR SIGNS OF LEARNING

- Focus learner reflection on the identified learning goals

## FACILITATION

**When you circulate around the room during an activity:**

- Ask questions to guide learners toward the desired outcome
- Celebrate as learners develop understanding, skill, and mindset
- Refocus learners using a question
- Introduce vocabulary in a structured way throughout the activity

**As you probe for your learners' understanding:**

- Ask questions that probe at understanding of a particular topic
- Ask learners to explain their thinking (e.g., "What makes you say that?")

# APPLICATION PROJECT



Learners apply understanding in order to make and have the opportunity to demonstrate—and, in the process, deepen—learning. Educators can use made artifacts in order to assess learning.

## STRUCTURES AND SCAFFOLDS

- Approach includes opportunities for learners to make, reflect, and explain
- Educator defines short- and long-term learning goals
- Educator defines parameters and/or offers constraints
- Educator assembles and offers related resources and references
- Educator supports learners to show what they know related to specific learning goals
- Learners create projects that demonstrate understanding
- Learners make their understanding explicit (e.g., in written reflections and/or oral share-outs)

## PROGRESSIONS AND SEQUENCES OF LEARNING

- Occurs later in a sequence and solidifies understanding

or

- Frames an entire sequence with context for all of the learning

## TOOLS AND MATERIALS OF MAKING

- Allow for a diversity of materials to promote creativity and self-expression

## LOOKING FOR SIGNS OF LEARNING

- Use the made artifact as an assessment of your learners' understanding
- Incorporate the learner's thinking and reflections (e.g., in the form of an artist's statement)

## FACILITATION

**When you circulate around the room during an activity:**

- Refocus learners toward the provided prompt
- Facilitate learners to show their understanding by supporting them with technical skills
- Remind learners of parameters or constraints

**As you probe for your learners' understanding:**

- Ask learners to explain their design choices in terms of the specified learning goals
- Ask learners how they will share their understanding with different audiences