



Exploratorium Learning Dimensions

Initiative & Intentionality	Social & Emotional Engagement	Creativity & Self-Expression	Conceptual Understanding	Problem Solving & Critical Thinking
<ul style="list-style-type: none">• Setting one's own goal• Taking intellectual and creative risks; working without a blueprint• Complexifying over time• Persisting through and learning from failures• Adjusting goals based on physical feedback and evidence	<ul style="list-style-type: none">• Building on or remixing the ideas and projects of others• Teaching and helping one another• Collaborating and working in teams• Recognizing and being recognized for accomplishments and contributions• Developing confidence• Expressing pride and ownership	<ul style="list-style-type: none">• Responding aesthetically to materials and phenomena• Connecting projects to personal interests and experiences• Playfully exploring• Expressing joy and delight• Using materials in novel ways	<ul style="list-style-type: none">• Controlling for variables as projects complexify• Constructing explanations• Using analogues and metaphors to explain• Leveraging properties of materials and phenomena to achieve design goals	<ul style="list-style-type: none">• Troubleshooting through iterations• Moving from trial-and-error to fine tuning through increasingly focused inquiries• Developing work-arounds• Seeking ideas, assistance and expertise from others

The [Exploratorium's Learning Dimensions of Making and Tinkering one-pager](#) is freely available in a number of languages on their site.

DIMENSIONS OF LEARNING FOR MAKING AND TINKERING

Levels of Agency	Initiative & Intentionality	Social & Emotional Engagement	Creativity & Self Expression	Conceptual Understanding	Problem Solving & Critical Thinking
Responding Initial interactions and observations	Initial Engagement	Working Side by Side	Browsing Materials	Noticing the Phenomena	Making Initial Observations
	Active Participation	Building Together	Personalizing Projects	Asking Questions	Engaging in Trial-and-Error
Exploring Probing the problems, variables, and possible solutions	Expressing Intentionality	Modeling for Others	Playfully Exploring	Observing the Variables	Learning Through Failure
	Persisting in the Problem Space	Collaborating with Others	Striving to Create a Unique Solution	Seeking Explanations	Honing in On Key Variables
	Taking Intellectual and Creative Risks	Mentoring Others	Applying Aesthetic Solutions to Achieve Design Goals	Expressing Tentative Theories	Testing more Focused Solutions
Owning Taking intellectual risks, applying understanding, and contributing to the community	Shifting Project Goals	Co-Leading Group Activities	Recognizing the Creative Work of Others	Constructing Explanations	Applying Unique Solutions
	Planning a New Idea	Creating New Activities	Re-mixing and Re-building	Expressing Conceptual Understanding	Eager to Find a new Problem to Solve

Initiative & Intentionality: Actively leading the learning pathway

Level of Agency	Actions / Intentions	Indicators
Responding Developing an initial idea	Active Participation	<ul style="list-style-type: none"> • making adjustments • seeking help • showing curiosity
	Initial Engagement	<ul style="list-style-type: none"> • identifying initial interest • participating in a step-by-step activity • copying an example
Exploring Complexifying over time	Taking Intellectual and Creative Risks	<ul style="list-style-type: none"> • trying a solution that may not work • pursuing ideas without checking with a “teacher” first
	Persisting in the Problem Space	<ul style="list-style-type: none"> • staying engaged when something doesn’t work • valuing info from failed experiments • solving a problem and moving onto a new one
	Expressing Intentionality	<ul style="list-style-type: none"> • testing tentative ideas • sharing ideas and goals with others • setting one’s own goal
Owning Pursuing new ideas	Planning a New Idea	<ul style="list-style-type: none"> • sketching or planning the next idea • pursuing project ideas between contexts (i.e. home, school, museum)
	Shifting Project Goals	<ul style="list-style-type: none"> • adjusting goals based on physical feedback and evidence • following pathways of personal interest

Social & Emotional Engagement: Collaborating with and contributing to the community

Level of Agency	Actions / Intentions	Indicators
Responding Entering the community	Working Side-by-Side	<ul style="list-style-type: none"> • building alongside others • noticing what others are making • sharing space, tools, and materials
	Building Together	<ul style="list-style-type: none"> • working individually on a collaborative project • adding to a group construction • expressing pride and ownership
Exploring Interacting with the community	Modeling for Others	<ul style="list-style-type: none"> • being recognized for ideas • developing / displaying confidence • giving and receiving feedback
	Collaborating with Others	<ul style="list-style-type: none"> • physically and intellectually connecting with another project • working with someone on a shared vision • collaboratively working in teams
	Mentoring Others	<ul style="list-style-type: none"> • becoming a repeat participant • teaching and helping one another • applying understanding to someone else's project
Owning Becoming central to the community	Co-Leading Group Activities	<ul style="list-style-type: none"> • co-facilitating activities • recruiting others to participate • planning and preparing the activity setup
	Creating New Activities	<ul style="list-style-type: none"> • developing / leading new activities for others • making a space for new group experiences • documenting the experiences for other learners & educators



Creativity & Self Expression:

Responding aesthetically to materials and phenomena

Level of Agency	Actions / Intentions	Indicators
Responding Noticing aesthetic possibilities	Browsing Materials	<ul style="list-style-type: none"> manipulating materials or mechanisms finding familiar and unfamiliar materials expressing joy and delight
	Personalizing Projects	<ul style="list-style-type: none"> decorating or modifying an example expressing personal narratives connecting projects to personal interests and experiences
Exploring Exploring aesthetic affordances	Playfully Exploring	<ul style="list-style-type: none"> responding aesthetically to materials and phenomena project focus is inspired by materials participating with enthusiasm
	Striving to Create a Unique Solution	<ul style="list-style-type: none"> testing the unique qualities of materials identifying related project problems in other people's work using metaphor and analogy as design input
	Applying Aesthetic Solutions to Achieve Design Goals	<ul style="list-style-type: none"> using materials in novel ways prioritizing aesthetic choices explaining purposeful design decisions
Owning Harnessing aesthetic applications	Recognizing the Creative Work of Others	<ul style="list-style-type: none"> noticing the aesthetic choices of others engaging in critical aesthetic dialogue acknowledging relationships between different project outcomes
	Re-mixing and Re-building	<ul style="list-style-type: none"> modifying one project into another freely expanding the palette of materials utilizing materials from other places



Conceptual Understanding:

Developing understanding over time

Level of Agency	Actions / Intentions	Indicators
Responding Identifying the concept(s)	Noticing the Phenomena	<ul style="list-style-type: none"> • observing and noticing • initial interactions
	Asking Questions	<ul style="list-style-type: none"> • noticing the unexpected • expressing confusion • striving to understand
Exploring Probing the concept(s)	Observing the Variables	<ul style="list-style-type: none"> • playing with key variables • keeping track of the results
	Seeking Explanations	<ul style="list-style-type: none"> • controlling for variables as projects complexify • testing new ideas for confirmation of understanding
	Expressing Tentative Theories	<ul style="list-style-type: none"> • testing a design solution • sharing an “aha” moment (articulating insights) • recognizing the limits of a current design
Owning Mastering the concept(s)	Constructing Explanations	<ul style="list-style-type: none"> • carrying out research online • creating models to further conceptual understanding • identifying related real-world ideas
	Expressing Conceptual Understanding	<ul style="list-style-type: none"> • applying solutions to new problems • using analogues and metaphors to explain • defending or arguing current understanding



Problem Solving & Critical Thinking:

Troubleshooting through iteration

Level of Agency	Actions / Intentions	Indicators
Responding Identifying a problem	Making Initial Observations	<ul style="list-style-type: none"> noticing affordances of materials and phenomena becoming intrigued by the phenomena
	Engaging in Trial-and-Error	<ul style="list-style-type: none"> testing and observing evaluating initial tests trying something more than once
Exploring Iterating solutions to a problem	Learning Through Failure	<ul style="list-style-type: none"> identifying areas of surprise seeing similar problems in others' work noticing what's not working
	Honing in on Key Variables	<ul style="list-style-type: none"> troubleshooting through iterations dissecting problem components describing the problem to others
	Testing More Focused Solutions	<ul style="list-style-type: none"> stepping back to reflect on the problem identifying what NOT to focus on seeking specific ideas/tools/materials to solve the problem
Owning Resolving a problem	Applying Unique Solutions	<ul style="list-style-type: none"> materials used in unexpected ways solutions are varied developing work-arounds
	Finding a New Problem to Solve	<ul style="list-style-type: none"> ability to finish one project, take something apart, and start again eager to engage in the process again