

Learning Dimensions Framework

Learning Dimension	Indicators	Descriptions of learners' interactions
Engagement	Spending time in Tinkering activities	<ul style="list-style-type: none"> • Play, envision, make, explore materials, try something over and over, etc.
	Displaying motivation or investment through affect or behavior	<ul style="list-style-type: none"> • Show emotions such as joy, pride, disappointment, frustration • Remain after they appear "finished," and start something new
Initiative and Intentionality	Setting one's own goals	<ul style="list-style-type: none"> • State goals or pose problems • Plan steps for future action • Develop unique strategies, tools, objects or outcomes • State intention to continue working outside the Tinkering Studio
	Seeking and responding to feedback	<ul style="list-style-type: none"> • Actively seek out feedback or inspiration from materials/ environment • Anticipate further outcomes • Innovate approaches in response to feedback
	Persisting to achieve goals in the problem space	<ul style="list-style-type: none"> • Persist toward their goal in the face of setbacks or frustration within the problem space • Persist to optimize strategies or solutions
	Taking intellectual risks or showing intellectual courage	<ul style="list-style-type: none"> • Disagree with each other's strategies, solutions, or rationales • Try something while indicating lack of confidence in outcome
Social Scaffolding	Requesting or offering help in solving problems	<ul style="list-style-type: none"> • Request or offer ideas and approaches • Offer tools or materials in service of an idea
	Inspiring new ideas or approaches	<ul style="list-style-type: none"> • Notice, point out, or talk about others' work • Innovate and remix by using or modifying others' ideas or strategies • Leave something of their work behind to share with others
	Physically connecting to others' works	<ul style="list-style-type: none"> • Produce work that physically interacts with other learners' work
Development of Understanding	Expressing a realization through affect or utterances	<ul style="list-style-type: none"> • Show excitement when expressing a realization • Claim to realize or newly make sense of something
	Offering explanations for a strategy, tool or outcome	<ul style="list-style-type: none"> • Offer or refine explanations for a strategy, tool or outcome, possibly by testing and retesting
	Applying knowledge	<ul style="list-style-type: none"> • Connect to prior knowledge, including STEM concepts • Employ what they have learned during their explorations • Complexify by engaging in increasingly complicated and sophisticated work
	Striving to understand	<ul style="list-style-type: none"> • Indicate <i>not</i> knowing (e.g., through surprise, bewilderment, confusion) and remain in the problem space to explore their confusion and build an understanding