ACRES

Afterschool Coaching for Reflective Educators in STEM

a project of

MMSA

Maine Mathematics and Science Alliance

STEM Facilitation and Learning Metaphors

Introduction

Afterschool Coaching for Reflective Educators in STEM (ACRES) is a professional development opportunity for after and out-of-school providers who want to embrace STEM education more deeply.

Frequently, metaphors are used to describe instructional approaches which engage youth in STEM experiences. Coaches might share these metaphors in skill sessions to illustrate a particular concept to afterschool educators, or may find that they're helpful to illustrate a concept when giving feedback in coaching sessions.

I. Ping-pong vs. Volleyball

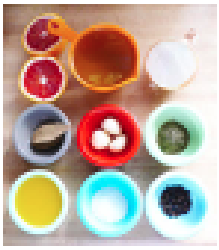
Discussions between educators and youth can often be visualized as a ping-pong match. The educator asks a question, launching the metaphorical ball towards the youth. The youth responds, hitting the ball directly back towards the educator. Discussion continues with the educator asking questions to other youth, who respond directly back to the educator. In this scenario, youth are only engaged when the educator is speaking directly to them.

At ACRES, we encourage educators to make the discussion into more of a volleyball game. The educator will launch a purposeful question (the volleyball) across the net. Rather than having the ball go directly back towards the educator, it will bounce around between the youth. They will compare their approaches and build their understanding by talking with each other, before sending their response back to the educator.

II. Cooks vs. Chefs

In some STEM activities, youth are expected to follow step-by-step instructions. This leads to the sense that they are cooks, able to follow recipes, but not veering off from it. While it may allow youth to engage in STEM experiences, it limits creativity and problem solving.

Another way of viewing youths' role in STEM experiences is to have them become chefs. They are given a goal and ingredients, but they are the ones creating the recipe. There may be a lot of trial and error with chefs, but deeper learning is taking place. Youth are creating the understanding for themselves, solving problems as they arise, and gaining an understanding of STEM principles in the process.

III. Lifeguard vs. Swim Instructor

When youth are struggling with understanding a STEM concept, what role does the educator take? One role is the lifeguard. This is where educators rescue the youth, removing all obstacles and making things easier. While it may feel like the educator is being helpful, it is actually taking away the learning opportunities for the youth.

The role that educators can strive to take instead is the role of the swim instructor. Encouraging the right amount of productive struggle, while providing enough support so the youth aren't 'drowning' in the struggle, is the balance to work towards.

One question that educators can ask themselves to reflect on this concept is "Who is doing the work?" If the educator is doing all of the heavy lifting, the youth aren't learning. The learning experiences should be adjusted so that youth are doing more of the talking, creating, and problem solving. They should be the ones swimming.


IV. Discussion as an Accordion

One challenge educators face when posing purposeful questions and giving youth voice and choice in their STEM learning experiences is that the discussion may feel like it is veering off course. A way to embrace this is to envision the discussion as an accordion. It may start off very compact and tied closely to the learning goal. As the youth are engaged, the discussion expands. When needed, the educator can then bring in the discussion to align it closer to the learning goal. Being fluid with this accordion will embrace the learning that students are creating while still holding true to the learning goal of the STEM experience.

V. Whisk vs. Apple Peeler

Pacing of STEM activities can vary. As educators, in our excitement we may tackle too many concepts, too quickly, acting as a whisk. The result is a mixed up batter, without clarity for the youth on the concepts.

Instead, educators can aim to be more like an apple peeler. Take off one layer at a time, so that youth can uncover their understanding at a pace that is just right. Continue to peel off layers until the youth arrive at the core understanding.