Kitchen Science Investigators: Kicking Up The Science A Notch
In Your After-school Program
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KSI Overview

What is Kitchen Science Investigators?
Kitchen Science Investigators (KSI) is an after-school or summer camp learning environment where kids learn science and scientific reasoning skills through cooking. In KSI, learners apply science and scientific reasoning to make their food better. Our goal is to relate science to the real world and to learners’ interests and goals.

Why Kitchen Science?
The idea behind our program has been to leverage kids’ interest in cooking and hands-on activities in general to get them interested in and participating in science. Science underlies cooking and the cooking techniques that we use, and we help kids learn and explore the scientific phenomena as they use and alter cooking procedures and ingredients in their recipes. In KSI, kids are also learning scientific reasoning skills (i.e., developing scientific questions, designing experiments, using evidence to draw conclusions).

Frequently Asked Questions:
Can kids really cook?
What does it take?
How do you get them to learn science amidst all this activity?

Can kids really cook?
Yes: but
- To varying degrees. They are a lot slower and perhaps messier than adults.
- You have to trust them to do it.

What does it take?
In terms of cooking, kids often need help with:
- How to read a recipe
- How to get started
- Cooking procedures
- Measurement
- Working in groups
- Recognizing mistakes they made while cooking and their effects
How do you get them to learn science amidst all this activity?
We address this concern with the way that we structure the investigations and experiments and the way that we organize a single KSI session.

Sequencing of Activities
We take our learners through several activities and experiments to learn about Leaveners and Thickeners. Each activity involves preparing a recipe and a corresponding science investigation or experiment to help them see the underlying scientific mechanism in their recipes. In this packet, we provide material for several of the activities we get learners engaged in to learn about leaveners (ingredients that make breads rise).

Conversations
At the beginning and end of every session of KSI, we have Whole group conversations, led by a facilitator. During beginning conversations, we talk about the topic or question that we are answering for that day and we figure out how we can find the answers to our questions (by cooking and doing investigations or experiments). During this time, we design experiments. Learners work in small groups during KSI to prepare their dishes and conduct their science experiments and investigations. This allows them to talk about the science with one another as they are doing the activities. During ending whole group conversations, we discuss the results of all the small groups and use them as evidence to draw conclusions that answer our questions.

Investigations, Experiments, and Explorations
In learning about scientific reasoning and scientific phenomena, learners are engaging in investigations, experiments, and explorations.

Investigations: Sequences of cooking activities, experiments, and explorations to help learners see the scientific mechanism underlying their cooking.

Experiments: Activities where all materials/ingredients and procedures are held constant except for one varying material/ingredient or procedure

Exploration: Informal, tinkering, sometimes spontaneous and unplanned

The Set of Included Investigations
In this packet, we have included three sets of activities (each consisting of a cooking activity and a science investigation/experiment) that we do with the kids. The first activity can be used to get the students involved in cooking and scientific investigation. You can use this set of activities to get the kids used to cooking and making scientific observations during the busy activity of cooking. The science investigation (we call it investigation because it is not an experiment in the sense that we are not holding everything constant and varying one thing) can be used to help them see that science underlies our cooking. Once learners are engaged in cooking and scientific investigation, they can begin to learn about and engage in experiments.
Resources for scientific thought
In implementing KSI, we have found that learners need help stopping during the busy activity of cooking to think about why they’re doing what they’re doing, and what’s going on with respect to the overarching question they are trying to answer. For example, learners often forget to keep ingredients and procedures constant (i.e., shake the same amount, use the right amounts of ingredients, etc.) during an experiment. We have found it to be very helpful to have resources available and in eyesight to help them

- Remember overarching questions and experiment design
- Take note of what they are seeing as they cook/do experiments

Cameras, pens, and paper are very handy for prompting learners to think about the science they are seeing and to take note of it.

Facilitation
As facilitators, some help you may need to provide to your kids include:
- Prompting for scientific observation and thought
- On the fly explanations, experiments, and investigations to help them understand the science that is going on
- Improvising – it’s a lot of things to remember, you’re bound to forget something. So it’s important to be able to work around your mistakes and theirs.

Next Steps: Where you can go from there
Here are some other activities you may consider implementing with your kids based on the activities we discuss in this workshop.
- Introductory activities to get kids used to making observations and thinking scientifically about their food. We often bring in different breads with different textures (from a grocery store or bakery) like cakes, muffins, doughnuts, etc. to get the kids to begin talking about their differences, making descriptive observations.
- Choice Days: Once learners have explored a set of leaveners, you can give them a chance to re-try recipes or create new ones using the science that they have learned. If learners chose to retry recipes, they can re-make a dish they’ve already made, but use the science they’ve learned to make it better (E.g., Deep dish pizza). If learners chose to create new dishes you can find dishes that use the leaveners we’ve looked at in significant ways (E.g., cakes and muffins that use eggs, baking soda, or baking powder combinations).
Does it really work? Quotes from students, parents and teachers

Quote: KSI Participant
And in KSI, you really know you're doing something. People really know you're doing something. And it's more learning, I can learn more easy... they can see you doing stuff and studying and learning and talking about it. Like, when you talk about it like you know something, about it, they can tell you did something.

Quote: KSI Parent
But, after the program, after being involved in the program and understanding a little bit more in her mind, opening up to how Chemistry fits into the science classroom, I think that um, sparked a light inside her mind where she said, 'Man I can do a whole lot with science, and I could do a whole lot more with understanding now.'

Quotes: Science Teacher
So it [KSI] had an experiment twist to it, and she could come back to the classroom and say, 'Okay, this is how we, the recipe and the procedure are, almost the same.' So she's been exposed to that. And so, that would give her an opportunity to, show leadership, make a connection between the different types of equipment that we use in the science classroom and then the same equipment that they use in KSI.