

# How to Use KLEWS, Journals, and Exit Tickets

## Exit Tickets

Exit tickets are intended to take a few minutes (1-3) at the end of each session. We recommend this form of evaluation for informal settings, like workshops, especially when you are only expecting youth to do one of the lessons instead of the whole kit. Exit tickets can also be used in an academic, classroom setting.

Exit tickets provide the facilitator feedback about what the youth have learned, what they would still like to learn, and how youth explain what they have learned.

If you are using exit tickets, we recommend setting a timer for 5 minutes before the end of the session. When this alarm goes off, use this time to have youth complete exit tickets (and help to clean up materials). Collect exit tickets as youth leave.

## KLEWS Charts

A KLEWS chart is filled out by youth during the lesson / activity. We recommend this form of evaluation for informal or formal settings, like workshops, clubs, or classrooms. KLEWS charts can be used for groups that will be completing the whole kit, or for groups that are only doing one lesson / activity.

The KLEWS chart has the following five categories:

- **K: What do you think you already know?** This question is intended to get youth to think about their prior knowledge (and possible misconceptions), and lets the facilitator get a feel for what youth already know coming into the lesson.
- **L: What did you learn?** This section lets youth write down claims that they can make based on the lesson.
- **E: How do you know? (What is your evidence?)** This section has youth write down the evidence to support their claim.
- **W: What do you still want to know?** This is where youth can write things they would like to learn. For example, youth can write things they would like to learn through an experiment, or things they would like to explore in the future.
- **S: What scientific principles / vocabulary help explain the phenomena?** This section is where youth write any vocabulary, theories, or principles, that come up during the lesson. This is the reasoning that connects the evidence to the claim.

A KLEWS chart is a way for youth to organize their notes in a structured way. The KLEWS chart is intended to work well with the scientific process.

Give each youth a KLEWS chart at the start of the lesson. The KLEWS chart should be filled out roughly in order as the lesson proceeds; with the exception of S (vocabulary and principles), which should be filled out as vocabulary is defined and principles are derived. At the end of the lesson, youth should have a completed KLEWS chart. If needed, set an alarm for 5 minutes before the end of the session. When the alarm goes off, have youth finish up their KLEWS charts (and help to clean up materials).

We have tried to include cues in the facilitator guides for using the KLEWS chart. We do recommend that you go over the chart with youth ahead of time, so that they understand how they are supposed to use it.

**KLEWS chart for the whole group.** KLEWS can be used by the whole group, during group discussion. Youth can brainstorm with their individual KLEWS charts. A large KLEWS chart can be projected or drawn on a board or poster. Optional: youth can use post-its to add material to the categories on the large chart. This group KLEWS chart can be used to facilitate whole group discussion and agreement.

## Journals

The third option is to have youth keep a science journal. We recommend using a science journal if youth will be completing the Aquaculture Project. A science journal is recommended for a formal academic setting. An unstructured journal can be used in any setting, though we recommend using exit tickets and/or KLEWS if youth are only going to be doing one activity, e.g. a workshop.

There are two options for the journal:

- Unstructured
- Structured (recommended if journal will be graded)

If you choose to use an unstructured journal, youth will use their journal as a place to record definitions, principles, observations, data, and brainstorming. Youth may write things wherever they like in the journal.

If you would like to grade youth journals, we recommend having all youth use the same basic structure. Number the pages of the notebook. The left inside of the front cover is page 1, and the right inside of the back cover is page 34. Journal structure is as follows:

- 1: Title page and youth name (Youth may also decorate the outside cover with images that represent aquaculture to them)
- 2: Table of contents

- 3: Final discussion norms agreed to by the whole group
- 4: Brainstorming about discussion norms
- 5: Introduction to Aquaculture notes
  - Definition of aquaculture
  - Definition of seafood
  - Definition of sustainability
- 6: Brainstorming about aquaculture
- 7 and 8: Initial brainstorming about Aquaculture Project
  - Species, why
  - Water body, why
- 9: Turbidity notes
  - Definition of turbidity
  - Effects of turbidity
  - What changes turbidity
- 10: Brainstorming about turbidity
  - Planning for turbidity project
- 11 and 12: Aquaculture Project
  - Turbidity range of species
  - Turbidity range of water body
- 13: Salinity notes
  - Definition of salinity
  - Typical salinity ranges
  - Effects of salinity
  - What changes salinity
- 14: Brainstorming about salinity
  - Card sort categories
  - Refractometer measurements
- 15 and 16: Aquaculture Project
  - Salinity range of species
  - Salinity range of water body
- 17: Temperature notes
  - Definition of temperature
  - Definition of heat
  - Definition of density
  - Definition of thermocline
  - Effects of temperature
  - What changes temperature
- 18: Brainstorming about temperature
  - Density box hypothesis
  - Observations from density box activity
- 19: Tuva notes
  - How to use Tuva
  - Tips and tricks for Tuva
- 20: Brainstorming about Tuva

- Observations from messing around with Tuva data
  - Questions inspired by Tuva data
- 21 and 22: Aquaculture Project
  - Temperature range of species
  - Temperature range of water body
- 23: pH notes
  - Definition of pH
  - Definition of ocean acidification
  - Effects of pH
  - What changes pH
- 24: Brainstorming about pH
  - Notes from videos
  - pH paper data
- 25 and 26: Aquaculture Project
  - pH range of species
  - pH range of water body
- 27: Dissolved oxygen notes
  - Definition of dissolved oxygen
  - Definition of algae bloom
  - Definition of dead zone
  - Effects of dissolved oxygen
  - What changes dissolved oxygen (i.e. causes of algae blooms)
- 28: Brainstorming about dissolved oxygen
  - Hypotheses and observations from Enviroscope
- 29 and 30: Aquaculture Project
  - Dissolved oxygen range of species
  - Dissolved oxygen range of water body
- 31: Polyculture notes
  - Definition of polyculture
  - Benefits of polyculture
- 32: Brainstorming about polycultures
  - Plotting about game
  - Adding up score of game
- 33 and 34: Aquaculture Project
  - Possible polycultures that would work for chosen species in chosen water body
  - Check water quality characteristics for the new species to ensure that they can live comfortably in the chosen water body