**Unit plan: Making fermented drinks**

**Overview**

Students carry out experiments with yeast and market research to help them modify an existing recipe for a fermented drink (such as ginger beer) to produce a drink that would appeal to their school or community.

**Purpose**

To investigate traditional fermented drinks in order to understand how the fermentation process occurs and how new drinks based on the traditional recipes can be developed.

This unit plan has been trialled with a Year 8 technology class.

## Background

### Suggestions for a scenario

You have found some recipes in your grandmother’s cupboard for traditional fermented soft drinks that you have never heard of! You decide to try out one of the recipes that you think you might like. You wonder if any of these drinks could be produced and sold at school, even though fizzy drinks are not allowed. You also wonder if there might be a market for these drinks in your community. You decide that you will do some market research to see if there is some way you can modify your recipe so that your principal might allow these drinks at school or so that people in your community would buy these drinks.

### Where's the Biotechnology?

In order for students to effectively carry out this task, they needed to link previous information about fermentation to the task of developing their own fizzy drink. Key components of the fermentation process were identified, and students then considered how they could alter these and still achieve the fizzy effervescence of the traditional drink. As this was a product designed for human consumption, they also needed to be aware of factors that may adversely affect the outcomes, for example, bacteria causing the drink to go off, or additives that inhibit the growth of the yeast.

## Curriculum focus

### Technology

**Knowledge:**

* Explore a range of traditional fermented drinks; investigate and explain the use and operation of fermentation in everyday use, such as soft drink production, bread making and brewing
* Identify underlying technological principles, such as adaptation

**Capability:**

* Construct a survey and gather and collate information on traditional recipes from families, friends and neighbours
* Identify the method and techniques employed in producing a fermented soft drink and explore strategies for producing it in the classroom
* Select an appropriate solution through testing, adaptation, refinement, and modification
* Adapt an existing recipe to develop a new fermented drink. Prepare a plan of action identifying the required resources and produce the selected solution to meet specified criteria (as determined by survey)
* Present and explain designs, plans, strategies and outcomes to the class, using an annotated flow chart and other selected forms of communication
* Explain choices, review strategies and appraise outcomes, taking responses of others into account

**Society:**

* Explore the use of fermented drinks in the past and relate their use to the culture of the day and propose ways of making traditional recipes “modern”

### Science

**Developing scientific skills and attitudes:**

* Identify the significant components of the fermentation process
* Record observations and measurements
* Explain how yeast can be used to produce a fermented drink, and identify the components of the fermentation process that can be adapted
* Identify factors that may adversely affect the outcome (e.g. bacteria causing the drinks to go off), or be helpful to the outcome (e.g. using cinnamon or acids such as lemon juice or cream of tartar to inhibit bacterial growth)
* Draw graphs to represent the growth rate of yeast under specified conditions
* Experiment with specified additives in order to identify the effect these have on yeast growth and fermentation

**Making sense of science and its relationship with technology:**

* Design a ‘fair test’ to investigate factors that will affect the growth rate of yeast
* Use the gathered information to provide data for the development of the selected fizzy drink

### Focus of skill & strategy

This unit involves studying an aspect of the living world at a microscopic level, i.e. the action of a fungus – yeast – that brings about the fermentation process in traditional drinks such as root beer and ginger beer.

**Science focus**

* Knowledge of the fermentation process and how it can be adapted
* Fair testing and recording scientific data

**Technology focus**

* Adapting the fermentation process to modify a traditional recipe and incorporate potential client feedback.

### Resources

Get worksheets: [Fermented drinks](https://www.sciencelearn.org.nz/resources/1949-fermented-drinks)

### Health and Safety

Ministry of Education (1998). *Safety and Technology Education: A guidance manual for New Zealand schools*. Learning Media, Wellington

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| UNIT PLAN: MAKING FERMENTED DRINKS |
| **Suggested learning intentions** | Suggested learning experiences*The following learning experiences will provide you with starting points for an exploration of this topic. You may decide to narrow your focus to one component, or include most of the ideas in a unit that incorporates science and/or technology themes.*  | Possible teaching/assessment activities |
| Students define biotechnology.Students investigate and explain the use of fermentation in everyday contexts, such as soft drink production. | **Introduction*** What is biotechnology?
* Yeast are living organisms that can be used to make fizzy drinks.

**Introduce the scenario**During this unit, the students will make a fermented drink and then adapt it according to findings from:* taste testing
* consumer survey about fizzy drink preferences
* science experiments focusing on how to keep the yeast alive.
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| Students explore a range of traditional fermented drinks.Students consider the materials required to make their drinks in a manner that takes into account health and safety. | **Planning and gathering materials*** Form groups of 3 - 4 and choose a recipe for a traditional drink (see Resources).
* List the materials that will be required and allocate various items to each group member.
* Discuss the need to sterilise work surfaces and containers, along with other health and hygiene issues surrounding the preparation of food for human consumption.
* For homework, students begin finding out about the origins of their chosen drink.
 | A written summary describing the origins of the students’ selected traditional drink |
| Students implement the instructions of a recipe in an accurate and hygienic manner. | **Using an existing recipe**Students prepare their workplace, set up their equipment, and follow their chosen recipe, using accurate measuring. Students reflect on how they carried out the task and how they could organise themselves better another time. Get worksheets: [Fermented drinks](https://www.sciencelearn.org.nz/resources/1949-fermented-drinks).In subsequent sessions, students check the progress of their drinks and complete any further processes required, e.g. filtering and bottling.  | Student checklist.Teacher checklist to record students’ ability to accurately follow the recipe and use hygienic practices during its preparation. |
| Students identify key features of commercially available fermented drinks. | **Existing product analysis**Analyse existing products available on the market in terms of their use, the labelling, the look and function of the container, the ingredients, and the taste. Get worksheets: [Fermented drinks](https://www.sciencelearn.org.nz/resources/1949-fermented-drinks) | Product analysis sheet. |
| Students identify the significant components of the fermentation process.Students define fermentation.Students identify one component in the fermentation system that can be altered and justify their choice. Students develop plans for a fair test. | **Designing experiments to test yeast growth*** Identify the common ingredients in their drinks (yeast, sugar, water).
* Brainstorm conditions likely to affect the growth of yeast.
* Learn about fermentation – the yeast break down sugar to release energy; this process also releases carbon dioxide, which is what makes the drinks fizzy.
* Plan how to set up an experiment to test variables involved in yeast fermentation. (The teacher could model an example.)

Design a fair test in which one of the variables is altered. The focus should be on identifying optimum growing conditions for yeast. Get worksheets: [Fermented drinks](https://www.sciencelearn.org.nz/resources/1949-fermented-drinks) | The plan of the group’s experiment/fair test. |
| Biotechnology has been around for many years.  | **Consulting an expert**Invite an adult to share their experiences about making a fermented drink like ginger beer.  |  |
| Using appropriate language to report taste tests. | **Taste testing*** Who should test the taste of the drinks?
* What do they like/not like about the drinks that have been made?
* How can this information be recorded?

Commercially available drinks such as Bundaberg’s ginger beer or lemon, lime and bitters could also be included. | Charts recording results from taste tests. |
| Design a survey to collect information about fizzy drink preferences. | **Surveying consumers*** What is the purpose of surveys?
* What are the key features of surveys? (Clear questions, one idea per question, open versus closed questions – have some examples available for analysis.)
* Design a survey to investigate consumer preferences regarding fizzy drinks: What do we want to find out? Who will we ask? How? What must we remember in our survey design?

For homework, each student collects five responses from their target group (for example classmates, neighbours, teachers). Graph results. | Group survey designed to find out people’s views about fizzy drinks and flavours they may like in a new drink. |
| Biotechnology requires balancing knowledge about the organism with constraints imposed by consumers. | **Analysing findings**Alterations to the traditional drink recipes need to take into account: * taste testing
* yeast experiments
* survey results.

What if the class taste testing of the fermented drinks appears to contradict consumer preferences identified in the survey? What if the taste testing suggests preferences that might not suit the yeast (e.g. making the drink less sweet – but the yeast need the sugar to ferment and produce carbon dioxide)? | Written conclusions drawn from the results of the taste testing, yeast experiments, and surveys.  |
| Adapt a traditional recipe to take into account findings from the taste tests, survey, and yeast experiments.Justify the changes that are made.Prepare a plan of action, identifying the required resources.  | **Adapting the recipe**Students collate the information they have gathered, design their new recipe, and identify the materials and resources they require in order to make their modified drink. This includes writing a schedule showing when they need to scrape, filter, bottle, and refrigerate their drinks.The students discuss their proposal with the teacher before proceeding.  | An annotated flowchart detailing results from previous work and how these are incorporated into the new recipe. |
|  | **Making the modified drink**Students prepare to make their drinks following strict hygiene guidelines. Over the next few days, the students carefully monitor their drinks and carry out the various tasks required until the fermentation process is complete.  |  |
| Taste testing is not an *ad hoc* task. | **Taste testing the modified drinks**Analysing the changes: students consider the taste of their drink, what they like and dislike about their drink, and how they might change it if they made it again. Discuss:* the purposes of taste testing
* appropriate taste testing terminology
* ways in which the students ensured that the yeast were kept alive.
 | Taste testing responses and reflection. |
| List the key features of an attractive, appropriate label. | **Thinking about labelling**Students create an appropriate label for their drink container, drawing on their findings from the earlier session in which they analysed existing products.   | Drink labels. |
|  | **Product launch**Students document their learning in a portfolio and use this as the basis of a presentation to promote their product to an audience.Students may also develop a flow chart or mindmap summarising their journey through the process of developing a new fizzy drink. The presentation should show the connections between understandings about how yeast grow, taste testing results, and survey results, and how they used this knowledge in the development of their final product. Get worksheets: [Fermented drinks](https://www.sciencelearn.org.nz/resources/1949-fermented-drinks) | The students’ group portfolios.The group flow charts that summarise the students’ progress through designing and making the modified fizzy drink. |
|  | **Reflecting on the task**The students evaluate how well they think they have achieved the stated goals. What have they learned about biotechnology? | A self-reflection sheet. |