



Cultural Exchange

Niles West High School, Illinois
Instructor: Josef Neumayer

Learning Sustainability through Cultural Exchange

Machen wir Sauerkraut!

A Project from Niles West High School, Illinois

In this cross-curricular unit created and implemented by Josef Neumayer, students are given the opportunity to learn about German culture and expand their German vocabulary while simultaneously becoming familiar with the fermentation process.

This unit is specifically designed to give students practice in several skill sets. Beyond the use of German language and the familiarization with the fermentation process, students chart and graph their findings, learn to use pH strips, learn about plant families and their biological structures, as well as an opportunity to see the connectivity between science and the culinary arts.

Ein Projekt and der Niles West High School, Illinois

Diese fachübergreifende Einheit, die von Josef Neumayer erschaffen und eingeführt wurde, gibt Schüler*innen die Gelegenheit über deutsche Kultur zu lernen und ihr deutsches Vokabular zu erweitern, währendem sie über den Gärprozess lernen.

Diese Einheit wurde besonders gestaltet, damit Schüler*innen mehrere Fähigkeiten gleichzeitig ausüben können. Im Zusatz zu der deutschen Sprache und der Einarbeitung des Gärprozesses lernen Schüler*innen wie man eine Tabelle ausfüllt, Information graphisch darstellt, und einen pH-Teststreifen benutzt. Sie lernen auch über Pflanzenfamilien und ihre biologischen Strukturen. Zugleich wird den Schüler*innen auch die Verbindung zwischen Wissenschaft und der kulinarischen Kochkunst deutlich gemacht.

CROSS-CURRICULAR UNIT: Machen wir Sauerkraut! (Let's make sauerkraut!)

OVERVIEW

- **TOPIC**

Students learn about the process of fermentation by making sauerkraut, while simultaneously becoming familiar with the cultural significance of sauerkraut.

- **UNIT OBJECTIVE**

- Students explore STEM topics: botany, cellular biology, economics, math, technology, and culinary arts
- Students create a 'How to make Sauerkraut' video.
- Students learn about the culinary uses of cabbage.
- Students learn about the science behind fermentation – biochemical activity, pH change, etc.
- Students are able to chart and graph chemical changes in pH.
- Students discuss the health benefits of fermented foods and how they impact the body.

- **ESSENTIAL QUESTIONS**

- What is cabbage? Where does cabbage belong in the vegetable family? Where and how does cabbage grow best?
- What are the culinary uses for cabbage?
- Which cultures use cabbage and for what? Health benefits?
- How does cuisine relate to people of a culture?

UNIT PLAN

DAY	Lesson Focus	Activities and Materials	HOMEWORK
1	Introduction to cabbage and sauerkraut	<p>Class discussion: Ask students to share what they already know about cabbage/sauerkraut.</p> <p>Create a PPT providing an overview of the plant (what family it belongs to, where it grows, how it can be farmed sustainably).</p> <p>Ask students to sort images showing the steps of making sauerkraut. This can be done in pairs or small groups.</p> <ul style="list-style-type: none"> This is a simple photo series you can cut out and use: http://simpleveganblog.com/wp-content/uploads/2015/10/How-to-make-sauerkraut-step-by-step.jpg <p>As a class, discuss what is happening in each picture.</p> <p>Allow students to work in groups to complete the vocabulary sheet (Arbeitsblatt 1)</p> <p>(if Time) play Vocabulary game with new words</p> <p>Ask students to work in pairs to complete the list of steps (Arbeitsblatt 1)</p> <ul style="list-style-type: none"> the number of steps can vary from group to group depending on how detailed each group chooses to be 	<p>Arbeitsblatt 1</p> <ul style="list-style-type: none"> finish anything that was not done in class <p>Additional activity: Ask students to watch a video on how to make sauerkraut online.</p>
2	Making Sauerkraut	<p>Begin with a live demonstration of the first few steps:</p> <ul style="list-style-type: none"> How to halve, core and slice the cabbage How to weigh out exactly .5kg Weigh and add the non-iodized salt, 8 grams <p>Split students into small groups, each group will make a .5kg batch.</p> <p>After all students have cut and salted the cabbage, demonstrate how to mix and mash the</p>	Review Vocabulary list

		<p>cabbage (using a potato masher or a piece of 2x2 lumber as a tamper) in their bowls to extract the liquid from the cabbage.</p> <p>Groups will then do the same to their batches.</p> <p>Finally, have students transfer their cabbage from the prep bowls into the Gärtopf</p> <ul style="list-style-type: none"> o make sure the Gärtopf is thoroughly sanitized before filling o the cabbage should be completely submerged in liquid after 1-2 days with the weight pressing the cabbage under the salt brine. <p>** Take pictures (or have students take pictures) throughout the preparation process. These will be needed for the 'Kochvideos'. Students should be encouraged to taste-test the raw cabbage and cabbage after salted and tamped.</p>	
3	'Kochvideo' Preperation	<p>Class Discussion: What did the students think about the process of making sauerkraut? Would they ever consider making sauerkraut at home? Was anything surprising? What are their expectations for the fermentation process?</p> <p>Place students in small groups/pairs and have them begin work on Arbeitsblatt 2.</p> <p>Have each group/pair write a different step on the board.</p> <p>The class will work together to check the sentences for grammar/spelling and sort the steps into a logical order.</p> <p>Introduce the 'Kochvideo' and do a demonstration on how to use at least one of the video programs suggested at the bottom of Arbeitsblatt 2.</p>	Students create their 'Kochvideo' using the sentences from Arbeitsblatt 2 and the pictures taken while preparing the sauerkraut.
4	Fermentation Process	<p>Begin by defining fermentation, both in English and in German. Give a brief overview of the process.</p> <p>As a class, create a word web on the board with 'Fermentation' as your central term. Words that</p>	Review Vocabulary list

		<p>are added can include foods/drinks that are a result of fermentation (ex: yogurt, kefir, kombucha, sourdough bread, sour cream, soy sauce, pickles, kimchi) as well as terms that describe the process (ex: yeast, bacteria, metabolic process, anaerobic fermentation, salt brine).</p> <p>Have students work in pairs/groups to fill out the missing translations on the vocabulary list on Arbeitsblatt 3.</p> <p>Shuffle the groups, and have students read the article indicated on Arbeitsblatt 3, and summarize what they read using the table.</p> <p>Ask students to add new vocabulary terms not included on the list to the vocabulary list.</p> <p>Check for understanding: as a class discuss the main points of the article.</p> <p>List new vocabulary words on the board and define as a group.</p>	
5	<p>Introduce taste testing and pH level testing</p>	<p>Begin by talking about acidity and basicity.</p> <ul style="list-style-type: none"> o this graphic can be used to show where foods fall on the pH scale <p>http://res.mindbodygreen.com/img/ftr/acidic-alkaline-phchart.jpg</p> <ul style="list-style-type: none"> o have students guess where sauerkraut would fall <p>Have students taste test the sauerkraut and record their thoughts on Arbeitsblatt 4.</p> <p>Demonstrate how to measure pH levels using the pH strips.</p> <p>Have students work in groups, and record their findings on Arbeitsblatt 4.</p> <ul style="list-style-type: none"> o Each group should take a picture of their pH test strip and paste it onto the worksheet. 	<p>Arbeitsblatt 5</p>

		<p>** Students will taste test and check the pH levels every third day. This can be adjusted to account for weekends. The worksheet is set up for a 3 week fermentation. Each test day, make sure students record their findings on Arbeitsblatt 4.</p> <p>Hand out and walk through the homework (Arbeitsblatt 5).</p>	
6	<p>Health Benefits of Cabbage</p>	<p>Begin by going over the homework from the night before.</p> <ul style="list-style-type: none"> • Have students compare answers with their classmates for section one of Arbeitsblatt 5. • Ask a few students to share their answers for section two with the class. <p>Have students work in small groups to fill out the missing translations on the vocabulary list on Arbeitsblatt 6.</p> <p>Split students into pairs, assign each pair one vocabulary word, and ask them to write a logical sentence using the new word.</p> <ul style="list-style-type: none"> • Review sentences on the board. <p>Keep students in pairs and have them read the article (link on Arbeitsblatt 6). Give students time to complete the table.</p> <p>Recreate table on the board, and ask students to share their findings.</p>	<p>Bonusaktivität</p> <ul style="list-style-type: none"> • give students about 1 week to complete this activity for extra credit
21	<p>Final Taste Test / Meal with culinary arts students</p> <p>** The amount of time that should be allowed for fermentation will vary - when this project was carried out the class taste tested and took ph levels for 3 weeks, then fermentation continued for an</p>	<p>Have students do their final taste test and pH level tests.</p> <p>Work with culinary arts students and teachers to cook and share a traditional German meal with sauerkraut.</p> <p>While students are eating, show some of the best 'Kochvideos' submitted by students.</p>	<p>Complete the Graph on Arbeitsblatt 4.</p>

	additional 6 weeks before the final sauerkraut meal.		
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Teacher Information for Sauerkraut Project

Overview

The goal is to give students the opportunity to study the process of fermentation first hand by making sauerkraut from scratch. As a class (or classes) students will prepare the cabbage, combine it with the salt, and pack it into a fermentation crock. Throughout the fermentation process, students will taste test the sauerkraut, as well as test the changing pH levels.

Collaboration

Working together with culinary arts teachers on this project can make for a fun interdisciplinary project for German, STEM and culinary arts students. When Mr. Neumayer first conducted this project he worked with the culinary arts teachers at his school. In preparation for the meal, he did a workshop with the culinary arts students, teaching them how to make sausages and helped them with cooking the side dishes. Once the sauerkraut was ready to be eaten, the culinary arts students and German/STEM students came together in enjoying a traditional German meal with their homemade sauerkraut. Mr. Neumayer and the culinary arts students at Niles West, for example, made homemade sausages, spätzle, stuffed cabbage, and Rollkuchen. This project provided an opportunity for positive publicity for both culinary arts and German programs.

Teacher Supply List

You may use this list as a general guideline for what to purchase/bring along for making sauerkraut with your class(es). This list was created for **40 students**.

- **Cabbage**
 - 4-5 heads of cabbage for STEM classroom use
 - 12 heads of cabbage for use with culinary class collaboration
- **Sea Salt**
 - 20 oz package of Sea Salt or non-iodized salt
- **Gärtopf – German or Polish**
 - this specialized fermentation pot can be purchased on Amazon
 - if used correctly, this crock will not emit any smell
 - adding water to the outside top of the top will retain odor also help create an anaerobic environment inside the pot prohibiting the growth of normal fungus and mold.
- **Tamper**
 - Students will need to tamp the cabbage in their mixing bowl using a short 2X2 piece of lumber available from a local home improvement store. A larger piece such as a 2X4 or a traditional sauerkraut tamper can be used once the cabbage is added to the sauerkraut crock.
- **Scale**
 - for measuring the cabbage and salt – must be sensitive enough to measure 8 grams of salt

- **pH Test Paper**
 - LAMOTTE 2912 Test Strip, pH, Range 3 to 10, Pack of 200 – can be purchased on Amazon, or similar pH strips can be borrowed from a friendly local science teacher!
- **Large Metal Mixing Bowls**
 - Each small group will require a large metal mixing bowl to prepare their cabbage before adding to the sauerkraut crock. Check with the culinary arts teacher if you can borrow some for this activity.
- **Forks**
 - Each student will need to taste test the sauerkraut several times during the fermentation process. If you are unable to use metal cutlery, you will need to purchase plastic forks for tasting (# of Students x # of taste test days). Metal forks can be purchased from Amazon or locally, and washed after each use using a plastic tub with dish soap in the classroom. Highlight the importance of sustainable practice.

Notes and Tips:

When prepping the sauerkraut be very careful to get an exact cabbage to salt ratio correct. Mr. Neumayer suggests having each small group of students prepare .5kg of freshly chopped cabbage by adding 8g of non-iodized salt to these small batches. All of the groups' prepared cabbage can then be combined in the large crock. A sauerkraut tamper is useful to use at this point and can be purchased online, or a piece of clean 2X4 lumber can also be used. Contact the theater or woodshop teacher for help, or visit a local lumber store.

Be aware of the temperature at which the sauerkraut is fermented. If you need to move the Gärtopf out of the classroom, Mr. Neumayer suggests a fermentation temperature between 65-68 degrees if possible.

Warmer temperatures will speed up the process, and can spoil the kraut if too warm. Refrigeration will essentially halt the fermentation process. So long as the water trough is kept filled there should be no smell. This is why the appropriate Gärtopf is essential if fermentation is to occur in the classroom.

When conducting this project Mr. Neumayer prepared the larger batch of sauerkraut at home and brought this batch in for the collaboration meal with the culinary arts students. The class batch of sauerkraut was distributed to students (using small mason jars) who wanted to complete the extra credit activity of cooking a meal for their families using sauerkraut, or just sharing it with their family.

This project spans 3 weeks but the fermentation process, depending on the temperature, can take 6-12 weeks depending on desired taste of the final product. Mr. Neumayer concluded the project after 3 weeks of investigations but kept the sauerkraut fermenting for an additional 6 weeks. Also, Sauerkrauttage are spread out (not daily tasks) to allow for discernable changes when tasting the sauerkraut during the fermentation process. Students are not forced to try the sauerkraut – students volunteer if they wish. This

project was added to the standard curriculum and required 7 class periods plus release time for the luncheon with the foods department.

In order to cover the costs of the project not covered by his school, Mr. Neumayer's students participated in a small fundraiser. While the costs of this project are not unreasonable (Mr. Neumayer estimated his costs at less than \$120), additional funding may be necessary.

Teachers may want to consider using Google Classroom/Docs or other online platform to facilitate a required digital portfolio for this project completed by students. Worksheets can be imported into the portfolio and digital media such as pictures and video can then be easily incorporated for sharing and assessment.

Arbeitsblatt 1
Vokabelliste

Deutsch	Englisch
der Weißkohl	
das Glas	
der Deckel	
das Spülmittel	
das Sauerkraut	
das Salz	
die Gabel	
der Behälter	
der Kohlkopf	
der Krautstampfer	
der Löffel	
das Spülwasser	
der Esslöffel	
der Strunk	
das Handtuch	
fein schneiden	
das Salz geben	
mit der Hand bearbeiten	
stampfen	
in das Glas geben	
zerdrücken	
probieren	
messen	
aufschneiden	
spülen	
auf die Küchentheke stellen	
abtrocknen	
zu machen	
schmecken	
den Strunk abschneiden	
einmischen	
Hände Waschen	

Sauerkraut Machen

Was sind die Schritte um Sauerkraut zu machen?

Mache eine Liste. Benutze die Wörter und Phrasen von der Vokabelliste.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Arbeitsblatt 2

Kochvideo Vorbereitung

Benutze die Liste von Arbeitsblatt 1 ‚Sauerkraut machen‘ und schreibe 2-3 Sätze zu jedem Schritt.

Schritt	Beschreibung
Hände waschen	Bevor man mit dem Kochen anfängt muss man sich die Hände waschen. Man soll warmes Wasser und Seife benutzen.

Hausaufgabe – Mache ein Kochvideo mit Fotos vom Sauerkraut machen. Benutze deine Sätze aus der Tabelle. Movenote, WeVideo und Photostory sind gute Programme, um das Sauerkraut Kochvideo zu machen.

Arbeitsblatt 3

1. Benutze ein Wörterbuch um die Lücken in der Vokabelliste zu ergänzen.

Fermentation von Sauerkraut - Vokabeln zum Text

der Streifen	
geschnitten	
	intestine
zerdrückt	
damit	
der Zellsaft	
	to escape / to leave something
bewirkt	

die Wasserabgabe	
die Konservierung	
	introduction
die Milchsäuregärung	
die Salzlake	
	covered
entsteht	
sauerstofffrei	
das Milieu	
	to enable / to allow for
anfangen	
der Zucker	
	lactic acid
umwandeln	
schädlich	
Fäulnisbakterien	
	depending on
	to last
zwischen	
	the (more) ... the (better)
der Geschmack	

2. Benutze diesen Link zur *Zentrum der Gesundheit*-Webseite und lese den Text ‚Fermentation von Sauerkraut‘ in einer Gruppe.

<https://www.zentrum-der-gesundheit.de/fermentation-probiotika-ia.html#ixzz42MzcCq22>

Schreibe zu jedem Absatz einen Satz (auf Englisch), der die Infos im Text zusammenfasst.

1.	
2.	
3.	
4.	

3. Welche Wörter, die nicht auf der Vokabellist sind, hast du nicht verstanden? Füge die neuen Vokabeln auf die Vokabelliste hinzu.

Arbeitsblatt 4

1. Messe die pH Werte während des Fermentierungsprozesses. Mache ein Foto von dem pH Wert Test und trage die Information in die Tabelle ein.

Tag	Datum	pH Wert	Foto vom pH Wert Test
3.			
6.			
9.			
12.			
15.			
18.			
21.			

1. Benutze die Information von der pH Wert Tabelle um eine graphische Darstellung der Veränderung von den pH Werten zu zeichnen.

pH Werte während des Fermentierungsprozesses

2. Wie schmeckt der Weißkohl im Laufe der Fermentierung? Beschreibe den Geschmack in der Tabelle.

Tag	Datum	Beschreibung (z.B. 'Der Weißkohl schmeckt heute...')
3		
6		
9		
12		
15		
18		
21		

Arbeitsblatt 5

1. Was wissen wir über Weißkohl?

1. Was ist Weißkohl?

2. Mit welchen Pflanzen ist Weißkohl verwandt?

3. Was kocht man aus Weißkohl? In Deutschland? In Amerika?

2. Sehe dir das *Deutsche Welle* Video 'Deutsche lieben Sauerkraut' an.

<http://www.dw.com/de/deutsche-lieben-sauerkraut/a-18201696>

Dann schreibe 4-5 Sätze. Beantworte die folgenden Fragen:

- Wie essen Deutsche gern Sauerkraut?
- Wie essen Amerikaner gern Sauerkraut?
- Isst du gern Sauerkraut? Wenn ja, wie schmeckt es dir am besten? Wenn nein, warum schmeckt es dir nicht?

Arbeitsblatt 6

1. Benutze ein Wörterbuch um die Lücken in der Vokabelliste zu ergänzen.

das Lebensmittel	
der Nährstoff	
	vital substances
die Heilstoffe	
	cholesterol values (levels)
das Gewicht	
	intestinal tract
zwischen	
	sort, type
der Körper	
kämpfen	
die Haut	
die Laktose Allergie	
	anti-inflammatory
wirken	
	cancer prevention
verzehren	

2. Benutze den Link und lese den ersten Absatz des Artikels auf der ‚Zentrum der Gesundheit‘ Webseite.

<http://www.zentrum-der-gesundheit.de/weisskohl.html#ixzz42X7VlQEs>

3. Füge die passende Information von dem Artikel in die Tabelle hinzu.

Thema	Was hat Weißkohl damit zu tun?
Lebensmittel	
Blutzuckerspiegel	
Cholesterinwerte	
Gewicht	
Probiotika	
Krebs	
chronischen/entzündlichen Krankheiten	

Bonusaktivität

Finde ein Rezept (auf Deutsch oder Englisch) für ein Gericht mit Sauerkraut. Bereite diese Speise für deine Familie zu und fülle das Arbeitsblatt aus.

Name der Speise: _____

Zutaten: _____

Bild von der Speise:

Selfie beim Kochen:

Was hat deine Familie von der Speise gedacht?

Familienmitglied 1

Name: _____

Kommentare (auf Englisch): _____

Familienmitglied 2

Name: _____

Kommentare (auf Englisch): _____
